

# Case Study

## Financing a Bridge Project

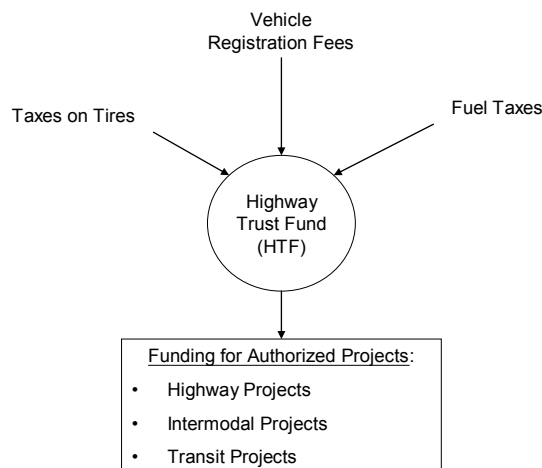
*This hypothetical example explores whether or not it makes sense to consider building a bridge as a public private partnership.*

### Overview of Options for Financing a Bridge Project

A bridge could be built as a public project, a private project, or a public private partnership (PPP). If the bridge were built as a public project, then there would be several options for financing. The bridge could be viewed as part of the highway system, and whatever funds are used to construct highways could be used to pay for the construction of the bridge. For example, the federal or state government may have a highway trust fund (HTF)<sup>1</sup> that uses income from fuel taxes and registration fees to pay for authorized additions to the highway network (Figure 1). If the bridge is approved as a project that can be supported by the HTF, the design and construction of the bridge can begin. This was the basic approach used in the United States to create the Interstate Highway System and many state highways. State and city governments may also use tax revenues to support highway projects, and they can sell bonds to raise some of the funds required for construction (Figure 2).

#### Figure 1 Structure of a Highway Trust Fund

Money collected from various fees and taxes is used to fund authorized projects, sometimes including transit or intermodal projects as well as highway projects.



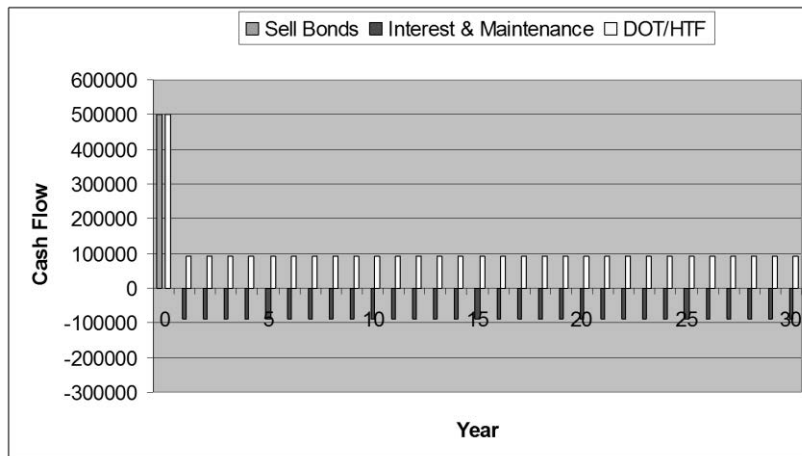
A city or state will commonly finance a bridge project using funds from the HTF or by selling bonds to cover the construction costs and using money from the state's Department of Transportation (DOT) budget to cover annual operating costs. If bonds are sold to help finance the bridge, and if there are no tolls on the bridge, then the bonds are

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<sup>1</sup> The federal HTF was created in 1956 as a mechanism for financing the constructing the Interstate Highway System. Fees and taxes on fuel and heavy trucks provided sufficient revenue to cover the federal government's 90% of the construction costs. Subsequent legislation allowed small amounts of the fund to be diverted to transit and intermodal projects. The federal fund can only be used for construction, not for operations or maintenance, which remain state responsibilities. States have similar funds, with fuel taxes again providing the major source of revenue. For the complete history of the HTF and the Interstate Highway System, see Tom Lewis, *Divided Highways*, Penguin Books, NY, 1997.

backed by credit of the state or local government. If there are tolls, then the bonds would be backed by the expected toll payments. Once the bridge is constructed, it clearly belongs to a particular government agency and that agency or another agency is responsible for maintaining and if necessary rehabilitating the bridge. If bonds were sold to pay for the bridge, then those bonds may affect the credit rating of the city or state. If the project were funded out of tax revenues, then it may have been necessary to defer work on schools, water resource projects, or other government projects or activities. Also, some cities or states have limits on the total debt that they can incur. Borrowing to pay for the bridge therefore may limit their ability to borrow for some other purpose. Hence, there may be strong incentives to use tolls to finance the bridge.

**Figure 2 Cash flows for a typical bridge project.**



Some additional analysis is needed to determine whether toll financing, a state highway project or a public private partnership (PPP) is the best option for this bridge. The first question is whether or not the bridge is on a route that would qualify for funding as part of the state highway system. If not, the next question is whether or not high enough tolls can be charged to cover the costs of interest and operations. If so, then the question is whether the city should build the bridge and collect the tolls or whether the city should create a public private partnership to build and operate the bridge. The city could authorize the bridge and provide the connections to local roads, while a private company could raise funds to pay for the construction costs. The private company would then charge tolls so as to earn a return on its investment. This approach works only if the expected value of the tolls is sufficient to provide an adequate return on capital, e.g. more than enough to cover the interest due on bonds and annual operating expense. The limit on the toll would be the value that users would place upon using the bridge. The toll could be quite high for a bridge that would provide a much shorter or less congested route, but if other bridges are located nearby, then the presence or absence of tolls on those bridges would affect what can be charged on the new bridge. With this approach to building the bridge, the costs would be borne by the private company, not by any public agency, so the construction of the bridge would not affect any public budgets or capital plans. On the other hand, if the bridge is built privately, then the design and capacity of the bridge, as well as the level of tolls charged would be determined by the private company, possibly with an eye toward maximizing profits rather than maximizing public benefits. There could be intense public opposition to allowing a private company to charge what might be viewed as exorbitant tolls in order to make excessive profits on an ugly bridge with limited capacity. Thus, there would likely be political pressure to retain some aspect of public control over the project.



**Figure 3 Toll Booth on the West Virginia Turnpike**

Most of the turnpikes in the U.S. were constructed by state governments prior to the start of the Interstate Highway Program. Tolls cover the interest and redemption costs related to the bonds sold to finance the roads and also cover the costs of maintenance and operations. Tolls can also be used to manage congestion, by charging higher rates at peak hours or by charging higher rates for an express lane. Some states have considered privatizing their toll roads as a means of capturing the value of their investments, either to finance future transport system improvements or to reduce their states' indebtedness.

Various options could be used in a PPP. One common approach is for the public agency to seek bids in which the key variables would include a) the design of the bridge, b) the tolls to be charged and c) the length of time over which the private company would operate the bridge. The bridge would be owned (or eventually be owned) by the public agency, but it would be operated for an extensive period before it was turned over to the public agency. The public role could be to retain control over the size, design, location, and purpose of the bridge; to ensure that the tolls are reasonable; to provide some financial security for the private company by providing some sort of minimum annual payment if traffic volumes do not rise as expected; or to provide assurance that a competitive project would not be built within some specified period of time.

Let's examine the various financing options using a hypothetical bridge project. Suppose that a new bridge has been proposed that would reduce the travel time and cost between two rapidly growing regions in the rural portion of a state. The bridge, which is strongly supported by local officials, would create a route that would save each user an average of 10 miles and 15 minutes. The bridge is expected to cost between \$40 and \$60 million to construct, and annual maintenance and operating costs are expected to be \$4 to \$5 million. There are currently 10,000 vehicles per day that use the route, and a preliminary study indicates that nearly all of this traffic would use the new bridge. About 80% of the vehicles on this route are automobiles, while nearly all of the rest are trucks. We will consider three options, namely structuring the project as a routine state highway project, as a private toll bridge, or as a public/private initiative.

### **Can the Bridge be Justified as a State Project?**

Local officials would like naturally prefer the option in which the state pays for the bridge and does not charge a toll, as this would result in the maximum benefits for local citizens and companies. They would also like the bridge to be constructed as soon as possible, preferably within the next two to five years. The big question is whether or not this bridge project can be justified as part of the state's transportation investment plan.

To answer this question, it is necessary to consider the state's transportation budget and the nature of other projects competing for state funds. The state has a prioritized list of transportation projects based upon a formula that recognizes the benefits of reducing congestion, improving safety, reducing travel times, and promoting economic development. For this example, assume that it is apparent that the proposed bridge would not have a very high priority. There are many projects involving bridges and road rehabilitation involving much more heavily traveled routes in more densely populated areas of the state, while the existing route, though long, has very few accidents and essentially no congestion. In short, this is a low priority bridge, and there is no immediate way to dramatize the need for it. Moreover, the state's highway trust fund is substantially underfunded, primarily because fuel taxes have not been increased for nearly 20 years. The trust fund can barely provide enough funds for high priority projects, and medium

priority projects have been set back ten or more years in the state's investment plan. In short, local officials cannot expect to have the state pay for the proposed new bridge.

### **Could a Private Bridge Project be Financed with Tolls?**

Would it be possible for a private company to build the bridge? If so, would that be a good idea for the region? The economic value of the bridge is the time and cost saved by those who use the bridge to shorten their travel distances plus additional benefits related to economic development that is likely to result from the increase in mobility provided by the new bridge.

In this example, assume that the major economic benefit comes from a reduction in travel expense for those that use the new bridge. The state DOT estimates the marginal cost per mile for driving an automobile to be \$0.20, taking into consideration the cost of fuel and the wear and tear on the vehicle. The marginal cost per mile for driving a truck is on the order of \$0.50. The average value of the time saved is on the order of \$10/hour for automobile passengers and \$20/hour for trucks.

Would a private company be able to finance the bridge by selling bonds backed by toll revenues? The first step is to estimate the annual revenue that must be raised by the tolls. If the bridge is financed by selling corporate bonds, the interest rate would have to be about 8%. The interest costs would therefore be 8% of the construction cost, or \$3 to \$5 million.<sup>2</sup> The total annual cost, including maintenance and operations as well as interest, would therefore be \$8 to \$10 million.

The next step is to estimate the potential annual revenue. The toll can be no higher than the economic benefit of using the bridge. Using the DOT cost numbers, the average benefits per user can be estimated:

$$\begin{aligned}\text{Auto benefits} &= 10 \text{ miles } (\$0.20/\text{mile}) + 0.25 \text{ hours } (\$10/\text{hour}) = \$4.50 \\ \text{Truck benefits} &= 10 \text{ miles } (\$0.50/\text{mile}) + 0.25 \text{ hours } (\$20/\text{hour}) = \$10 \\ \text{Weighted average benefits per vehicle} &= 0.8 (\$4.50) + 0.2 (\$10) = \$5.60\end{aligned}$$

If 10,000 vehicles used the bridge per day, the annual economic benefits would be as follows:

$$\text{Annual benefits} = \$5.60/\text{veh.} (10,000 \text{ veh./day}) (365 \text{ days/yr}) = \$20 \text{ million per year.}$$

In other words, the annual economic benefits appear to be at least double the annual costs for interest and operations, even if the bridge costs are at the high end of what is anticipated. A toll of \$3 for automobiles and \$6 for trucks would be sufficient to cover annual costs. Moreover, since the regions served by the bridge are rapidly growing, traffic volumes and toll revenues would be expected to rise. Thus, it does appear to be feasible for a private company to build the bridge using money raised by selling bonds and paying the interest on the bonds with tolls that users would be willing to pay.

### **Should the Bridge Be Built as a Public Private Partnership?**

The public might well object to the prospect of a private company building the cheapest possible bridge and charging the highest possible tolls. The analysis has shown that a toll of \$3 per car and \$6 per truck would be more than sufficient to cover the 8% interest rate that the private company would pay on its bonds. However, the same analysis showed that the toll could be nearly 50% higher and still attract most of the traffic. If the bridge is as critical as the local officials believe, and if the region continues to grow as expected, then traffic volume – and toll revenues – would

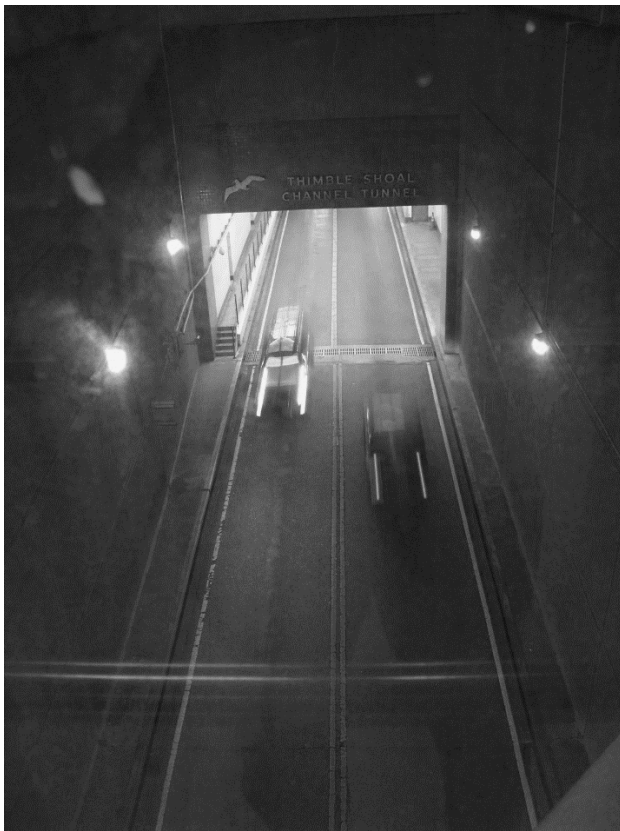
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<sup>2</sup> If the construction cost is at the low end of the estimates, then the annual interest will be 8% of \$40 million; at the high end of the estimates, the interest would be 8% of 60 million. These are all estimates, so all that can be said is that the interest payments are likely to be \$3 to \$5 million per year.

be expected to increase substantially over the life of the bridge. Might it be better to structure the project as a public/private partnership?

The logic for public involvement is that interest costs could be lowered and that tolls could be controlled. A regional authority could be created that would approve the design for the bridge and own the bridge, and this authority could seek a partner or partners to construct and operate the bridge. With public backing, it would be possible to get lower interest rates by selling tax-free municipal bonds to fund the project. Even if the regional authority were unwilling or unable to sell bonds to finance the project, they could still seek bids for constructing and operating the bridge. They could also stipulate that the bridge (and the toll revenues) would revert to the regional authority after a period of twenty or more years.

In fact, major bridges are commonly funded by tolls. So long as there is a substantial amount of potential traffic that will enjoy considerable time savings, tolls can be used to pay the interest on the bonds issued to finance the project. Figure 1 shows the entrance to the tunnel portion of the Chesapeake Bay Bridge/Tunnel. This project drastically improved connectivity within the State of Virginia and also provided a much shorter route for travel up and down the East Coast.



**Figure 1 The Chesapeake Bay Bridge/Tunnel**

This 20-mile bridge/tunnel was built between 1960 and 1964 in order to link the Norfolk region with the Eastern Shore of Virginia. The tunnel portions of the project ensure that Chesapeake Bay will always remain open to shipping and to the U.S. Navy; islands created for the entrances to the tunnels are in themselves a tourist attraction.

The bridge/tunnel not only provides a link between two areas of the state, it provides a much shorter and less congested through route than Interstate 95 for much travel along the East Coast. Because the bridge saves so much time compared to a ferry, and because the route is much shorter and less congested the I95 route, travelers are willing to pay the substantial tolls of up to \$15 for automobiles and \$26 for trucks. A second two-lane bridge was added in 1999 in order to provide extra capacity and avoid congestion. Both bridges were financed by tolls, and no local, state, or federal tax dollars were used.

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