**P3 Value for Money Analysis Exercise Answers**

**NOTE: ANSWERS ARE SHOWN IN BOLD IN RED FONT**

**Objectives of this exercise**

* Learn how to compare the Public Sector Comparator to the P3 option to determine which option delivers greater Value-for-Money (VfM) from the perspective of the procuring Agency.
* Learn how to identify key drivers in the VfM analysis.

**Project Background**

A study was done previously by a state DOT to estimate Value for Money of P3 delivery for a highway project. The various inputs required for the analysis are included in the P3-VALUE 2.0 spreadsheet model. The project information is as follows:

* 20 miles highway expansion
* Expansion from 3 lanes to 5 lanes in each direction
  + 3 General Purpose Lanes (GPL)
  + 2 Managed Lanes (ML)
* Costs under PSC (excluding risks and financing):
  + Pre-construction & construction: $25M and $400M respectively
  + Routine O&M: $4M per year
  + Major maintenance: $10M (every 8 years)
* Preconstruction under PSC: Start in 2015; 2 years duration
* Construction duration under PSC: 4 years
* Operations period under PSC: 40 years

**Analysis Steps**

**Part A:** Use the Value for Money Analysis training module to review VfM for a toll concession:

1. Review Public Sector Comparator (PSC)
2. Review P3 Option
3. Compare PSC and P3 Option from the perspective of the Agency

**Part B:** Test the impact of an alternative discount rate on VfM

**Part C**: Estimate VfM for an availability payment (AP) P3 concession.

**Part D:** For the AP concession, estimate the contribution to VfM of some key P3 assumptions:

1. Timing of construction completion
2. Efficiencies assumed for preconstruction and construction costs
3. Efficiencies assumed for O&M and major maintenance costs

**Part A: Toll Concession**

1. Open P3-VALUE 2.0 Excel file.
2. When opening the file, Excel may prompt you to approve the use of macros. To do so, click “Enable editing” and/or “Enable content” on the yellow bar across the top of the screen.
3. After the model opens, the following user form will appear.



1. Select the “Training Navigator” to access the training model. The “Training Navigator” contains four training modules that provide limited access to only the most relevant inputs and outputs for a particular training session.
2. Then select “Module 1: Value for Money Analysis” and proceed with the steps below.

***Step 1: Conventional Delivery (PSC) Option***: Review the key project information (except for **Risks** which will be covered later in Module 3 on Risk Assessment):

* **Revenues** and their timeline (see *InpTraffic&Toll* through row 28)
* **Costs** and their timeline (see *InpTiming&Cost* through row 79and *InpSeries* through row 32)
* **Competitive neutrality adjustment** to correct for taxation effects in the P3 option (see *InpFin,* row 22-23)
* **Financing fees**, which are the upfront costs incurred to arrange public debt (see *InpFin,* row 40)

Review and record below the PSC net revenues/costs to the Agency (see **VfM Output Summary** sheet).

**PSC Output**

|  |  |  |
| --- | --- | --- |
| **Costs & revenues under Conventional Delivery** | **NPV @ 4.00%** | **Nominal total** |
| **Units >>** | **USD m** | **USD m** |
| Toll revenues | **756** | **2198** |
| Toll revenues uncertainty adjustment | **(130)** | **(377)** |
| Pre-construction & construction costs | **(397)** | **(454)** |
| O&M costs | **(129)** | **(363)** |
| No Build O&M cost savings | **250** | **680** |
| Base variability | **(79)** | **(112)** |
| Pure risks | **(69)** | **(121)** |
| Lifecycle performance risk | **(228)** | **(574)** |
| Financing fees | **(3)** | **(3)** |
| Competitive neutrality adjustment | **-** | **-** |
| ***Total net revenues / (costs) under Conventional Delivery*** | ***(29)*** | ***873*** |

Below, please respond to the following questions; we will also discuss them at the webinar:

1. *Ignoring uncertainty and risk adjustments for now, and considering the inputs, do the numbers look reasonable?*

**Nominal costs are base year costs, escalated using indexation to account for inflation. Present values are lower than nominal costs due to discounting.**

1. *How do nominal costs compare with the inputs? Can you explain the differences?*

**Nominal costs are higher than inputs due to inflation. Nominal costs include a revenue uncertainty adjustment, pure risks, base variability and lifecycle performance risks that are not part of traditional cost estimates. It is interesting that in present value terms future revenues are worth approximately one-third of their nominal value, and are further reduced due to the toll revenue uncertainty adjustment.**

1. *Review the discounted values (i.e., NPV) of costs and revenues. Do they make sense?*

**It makes sense that discounted costs are lower than nominal costs and that the discount is greater for costs that occur later in the concession term.**

1. *Do you think the discount rate of 4% selected to calculate present values is reasonable? Why?*

**The discount rate is a project risk-free rate and should be equivalent to the long-term government borrowing rate. This rate would depend on the creditworthiness of the government sponsoring the project.**

***Step 2: P3 Option***:

Differences relative to conventional delivery that may be achieved from P3 delivery include:

* Longer project preparation time
* Shorter construction duration
* Higher public procurements costs
* Lower lifecycle costs
* Lower risk contingencies

The P3 Option inputs comprise the following:

* **Revenues:** PSC revenues and timeline, but adjusted to take into consideration assumed P3 differences; for this project, toll rates are the same as PSC, but begin sooner due to earlier completion of construction.
* **Costs:** PSC costs and timeline, but adjusted to take into consideration assumed P3 differences; review the differences assumed in timing and cost between PSC and P3 in the ***InpTiming&Cost*** sheet through row 65**.**
* **Risks:** PSC risks, but adjusted to take into consideration assumed P3 differences; we will review these later in Module 3 on Risk Assessment
* **Financing:** This includes fees, which are the upfront costs incurred to arrange loans/bonds; as well as parameters for debt, equity, reserves and agency contributions (i.e., subsidy/milestone payment); review these in rows 50-68 in ***InputFin***.

Now please consider how a P3 developer might prepare a bid, as reflected in the third table on the ***VfM Output Summary*** sheet. Combining all revenues, costs, risks and financing allows the concessionaire to prepare a bid. Depending on the structure of the transaction, the bid is either a subsidy/concession fee for a toll concession, or an availability payment for an AP concession. Since we are considering a toll concession, the model calculates either a subsidy (for a revenue-negative project) or a concession fee (for a revenue-positive project).

Review and record below the P3 net revenues/costs to the Developer (see ***VfM Output Summary*** sheet, third table).

**P3 Output – Private Perspective**

|  |  |  |
| --- | --- | --- |
| **Costs & revenues to Developer under P3** | **NPV** | **Nominal total** |
| **Units >>** | **USD m** | **USD m** |
| Toll revenues for private side | **298** | **2224** |
| Pre-construction & construction costs (transferred) | **(304)** | **(390)** |
| O&M costs (transferred) | **(43)** | **(296)** |
| Base variability (transferred) | **(54)** | **(94)** |
| Pure risks (transferred) | **(40)** | **(98)** |
| Net subsidy from Agency to Developer | **146** | **205** |
| Financing fees | **(2)** | **(3)** |
| Taxes | **-** | **-** |
| ***Total net revenues / (costs) to Developer under P3*** | ***0*** | ***1548*** |

Below, please respond to the following questions; we will discuss at the webinar:

1. *Ignoring uncertainty and risk adjustments for now, and considering the inputs, do the numbers look reasonable?*

**Nominal revenues are about 1% slightly higher for P3 while nominal costs are about 10-15% lower. This seems reasonable, since the P3 inputs assumed a 10% reduction in costs due to P3 differences.**

1. *Review the nominal toll revenues. How do they compare with PSC revenues? Considering the inputs, why do you think they differ?*

**Nominal revenues are about 1% higher under P3. This is due to the accelerated completion of the P3 allows for an additional year of operational revenue.**

1. *Review the discounted values (NPV) of revenues. Why are they lower than under the PSC?*

**The NPV of revenues is lower under the P3 than under the PSC, because the discount rate used is the WACC, not the project risk-free rate.**

1. *Is the discount rate used to calculate present values reasonable? Why?*

**It is reasonable to use the WACC because it accounts for lifecycle performance risk and revenue uncertainties, which are not separately valued in the developer’s bid.**

1. *Why is there no estimate for lifecycle performance risk or for revenue uncertainty, as for the PSC?*

**This is because these are accounted for in the higher discount rate, and the WACC used as the discount rate is a “market-based” valuation of these risks.**

1. *Why is the NPV of total net revenues / (costs) to Developer under P3 equal to zero?*

**The P3 bid is being optimized to meet the required equity (12%) and debt returns (6%), as captured in the project’s overall WACC (8.84%). The NPV of the cash flows to the Developer discounted at its WACC is therefore zero. If the NPV were to be non-zero, that would mean that the returns to financiers are either too high (meaning that the bid could be lower) or too low (meaning that the financiers’ required returns are not met). An optimized bid should therefore have an NPV of zero.**

From the procuring Agency’s perspective, the cost of P3 includes the above bid as well as any retained costs or risks. Review and record below the P3 net revenues/costs to the Agency (see the second table in the ***VfM Output Summary*** sheet).

**P3 Output – Agency Perspective**

|  |  |  |
| --- | --- | --- |
| **Costs & revenues to Agency under P3** | **NPV @ 4.00%** | **Nominal total** |
| **Units >>** | **USD m** | **USD m** |
| Toll revenues (for public side) | **-** | **-** |
| Toll revenues uncertainty adjustment (for public side) | **-** | **-** |
| Pre-construction & construction costs (retained) | **(39)** | **(43)** |
| O&M costs (retained) | **(12)** | **(33)** |
| No Build O&M cost savings | **259** | **691** |
| Base variability (retained) | **(7)** | **(10)** |
| Pure risks (retained) | **(6)** | **(11)** |
| Net subsidy from Agency to Developer | **(175)** | **(205)** |
| ***Total net revenues / (costs) to Agency under P3*** | ***19*** | ***389*** |

Below, please respond to the following questions; we will discuss at the webinar:

1. *Ignoring uncertainty and risk adjustments for now, and considering the inputs, do the numbers look reasonable?*

**The numbers include costs and risks retained by the Agency, and the payments made by the Agency to the Developer/Concessionaire.**

1. *Why are there no toll revenues?*

**The toll revenues are retained by the concessionaire.**

1. *Review the discounted present values of pre-construction and construction costs. Why are they lower than under PSC or the Developer costs?*

**This is because these costs include only those costs retained by the Agency. The remaining costs are transferred to the Developer and accounted for in the subsidy from the Agency to the Developer.**

1. *Why is the discounted value (NPV) of the net subsidy from the Agency to the Developer different from the same subsidy in the table on the Developer’s bid?*

**This is because the developer perspective uses a higher discount rate than the public agency perspective.**

1. *Why is the discount rate different from the rate used to calculate the Developer bid?*

**The fact that all risks considered on the public side are already included in the cash flows allows us to use the project risk free discount rate.**

Please fill in the blanks below (see ***VfM Output Summary*** sheet):

* NPV of net revenues/costs to Agency under PSC **$\_(29)\_M**
* NPV of net cash flows to Agency under P3 **$\_\_19\_M**
* NPV of difference (= VfM) **$\_\_48\_M**

Below, please respond to the following questions; we will discuss at the webinar:

1. *Is the VfM estimate sufficient to decide whether the State DOT should procure this project as a P3 or use conventional procurement? Why or why not?*

**No, because it is important to take into account benefits and costs of the project that are not monetized, as well as qualitative factors related to the ability to develop and enforce viable P3 contracts.**

1. *Why do No Build O&M cost savings differ between PSC and the Agency Costs & Revenues under P3? Why are No Build O&M cost savings excluded in the Developer table?*

**No build cost O&M savings are higher under the P3 option. That is because P3 construction is completed a year earlier than it would be under the PSC; as a result O&M cost savings begin earlier and accrue for an extra year. The No Build O&M cost savings are excluded from the Developer table because they accrue to the Agency, not to the Developer.**

**Part B: Impact of change in discount rate from 4% to 5%**

Now change the discount rate used in the VfM analysis from 4% to 5% (cell F14 in ***InpFin***), optimize the model and record the revised estimates below. (Note: Optimizing the model may take a few minutes)

* NPV of net revenues/cost to Agency under PSC **$\_\_(63)\_\_M**
* NPV of net cash flows to Agency under P3 **$\_\_(18)\_\_M**
* NPV of difference (= VfM) **$\_\_\_45\_\_M**

Below, please respond to the following questions; we will discuss at the webinar:

1. *Review the nominal and present value of subsidy costs to the Agency under P3. Can you explain the difference relative to the VfM output using a 4% discount rate?*

**The NPV of the subsidy is $6m greater under the 4% discount rate than under the 5% discount rate but the nominal value is the same. The subsidy is given upon completion of construction, or 4 years in the future. The difference in the subsidy is entirely due to discounting rather than differences in what is paid to the developer.**

1. *Did the NPV of the value for money increase or decrease? How would you address an uncertainty with regard to which discount rate to use?*

**The NPV decreased slightly. One could run a sensitivity test with a range of plausible discount rates to identify the range of VfM estimates that may result under alternative discounting assumptions.**

**Part C: VfM for an Availability Payment P3**

Change the discount rate used in the VfM analysis back to 4% and change the active scenario to “PSC: Toll; P3: Availability Payment” (cell F6 in ***InpFin***).

Review all financing inputs for this scenario. Then optimize the model and record the revised estimates below:

* NPV of net revenues/cost to Agency under PSC **$\_\_(29)\_M**
* NPV of net cash flows to Agency under P3 **$\_\_\_45\_M**
* NPV of difference (= VfM) **$\_\_ 74\_M**

Below, please respond to the following questions; we will discuss at the webinar:

1. *Given the inputs alone, why are revenues under P3 different from revenues under conventional delivery?*

**This is because construction is completed earlier and toll revenues are collected sooner under the P3.**

1. *Why did the discount rate used for the Developer cost change?*

**Given the lower risk profile of an availability payment concession, lenders typically accept a higher leverage (debt-to-equity ratio) than under a toll concession. Furthermore, equity providers may reduce their required returns. As a result, the WACC for an availability payment concession will be lower than for a toll concession.**

1. *Did the NPV of the value for money increase or decrease relative to the toll concession VfM? Can an Agency make a choice of P3 structure based only on these results? Why or why not?*

**The NPV increased. The Agency should also consider financial viability and the impact of uncertainty of revenues.(Revenues are uncertain whereas the Agency is required to pay the availability payment to the Developer no matter whether or not revenues are adequate). Additionally, the Agency should s assess non-monetized benefits.**

**Part D: Test P3 Value Drivers:**

For the AP scenario, check one by one the effect of key P3 cost efficiency assumptions on VfM. After each input change, optimize the model and record the revised VfM estimates. Each model run should be additive, i.e., do not reverse any changes you made in the prior run.

Construction timing – Increase P3 construction duration to 4 years to match PSC schedule (L14 in ***InpTiming&Cost***), hit “calculate now” under Formulas on the Excel toolbar, and adjust InpSeries accordingly so that 25% of construction cost is expended in each of the 4 years (row 66-73). Record the results below:

* NPV of net revenues/cost to Agency under PSC **$\_\_\_(32)\_\_M**
* NPV of net cash flows to Agency under P3 **$\_\_\_22\_\_\_\_M**
* NPV of difference (= VfM) **$\_\_\_54\_\_\_\_M**

Pre-construction and Construction Cost – Eliminate the reduction in P3 pre-construction cost (L26 in ***InpTiming&Cost***) and construction costs (L37-L38 in ***InpTiming&Cost***) to match PSC inputs, i.e., 0% P3 cost efficiencies. Record your results below:

* NPV of net revenues/cost to Agency under PSC **$\_\_\_(32)\_\_\_M**
* NPV of net cash flows to Agency under P3 **$\_\_\_(39)\_\_\_M**
* NPV of difference (= VfM) **$\_\_\_(7)\_\_\_\_M**

Operations Cost – Eliminate reduction in P3 operation costs (O&M and major maintenance) to match PSC operation costs (0% P3 cost efficiencies, L52 and L59 in ***InpTiming&Cost***)

* NPV of net revenues/cost to Agency under PSC **$\_\_(32)\_\_\_M**
* NPV of net cash flows to Agency under P3 **$\_\_(52)\_\_\_M**
* NPV of difference (= VfM) **$\_\_(20)\_\_\_M**

Below, please respond to the following questions; we will discuss at the webinar:

1. *Which set of P3 efficiency assumptions appear to have the biggest impact on VfM?*

**The efficiencies related to construction and preconstruction costs.**

1. *Why did the PSC’s net cost to the Agency change in comparison to the base AP run, even though no changes were made to PSC input data?*

**In Part C and D, no changes were made to the PSC cost or revenues. However, there was a (relatively small) change in net cost to the Agency under PSC between the base AP run (Part C) and the three tests of P3 efficiency assumptions (Part D). This change is due to the valuation of PSC lifecycle performance risk and revenue risk uncertainty, which are calculated using the market-based cost of capital or P3 WACC. Changes in the P3 costs and timing can result in a (small) change in P3 WACC, which then leads to a change in the PSC lifecycle performance risk and revenue risk uncertainty. In reality, a change in P3 costs and timing may also trigger changes in the financing structure and conditions, which should logically undo any changes in the PSC costs. However, as in this exercise we did not adjust the financing conditions, a small difference in PSC net cost to Agency persists. The logic behind the lifecycle performance risk and revenue uncertainty adjustment calculations will be discussed in detail in the Webinar on Risk Assessment.**