Cyclical Accrual

Evaluating a Fiscal Constraint with Implications for Infrastructure Financing Alternatives

Value for Funding Development Project

Stanford University Global Projects Center

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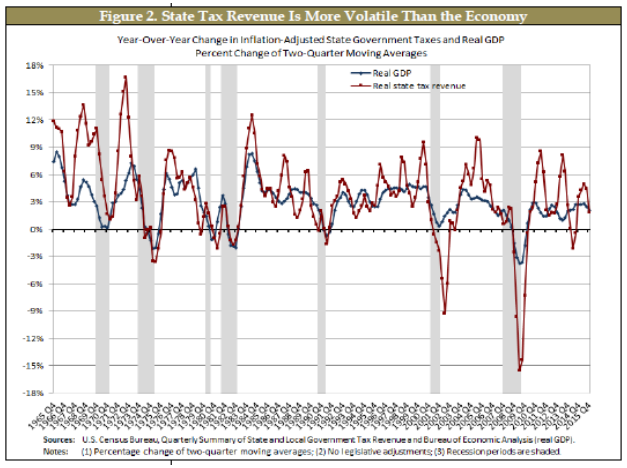
1 Overview: Second-Best Reality

Most US state and local governments have a low cost of financing and capital. Essential public infrastructure assets usually have a low risk profile and limited scope for major cost or efficiency improvements. In these situations, infrastructure financing alternatives like public-private partnerships (P3s) and related variations appear unlikely to add real value.

- However, these same governments may face fiscal constraints (balanced-budget requirements, statutory borrowing limits, procurement rules, etc.) that can add significant direct and indirect costs to infrastructure financing and operations.
- In the real-world of fiscal constraints, infrastructure financing alternatives may provide genuinely valuable second-best solutions. This purpose often requires new ways of elucidating and measuring alternative value in a fiscal context.
- This presentation and the CyCost 1.2 financial model* introduce a new concept to measure the effect of revenue volatility on public-sector spending, with implications for the cost of funding infrastructure in a fiscal context.
- Main concept: when revenue volatility causes fiscal constraints to become binding, some essential public-sector spending may be delayed and accrued, with future remediation often at higher cost. This “Cyclical Accrual Cost” may be a significant factor in infrastructure alternative evaluation and decision-making.

**Available at www.inrecap.com*

2 Revenue Volatility and Delayed Spending



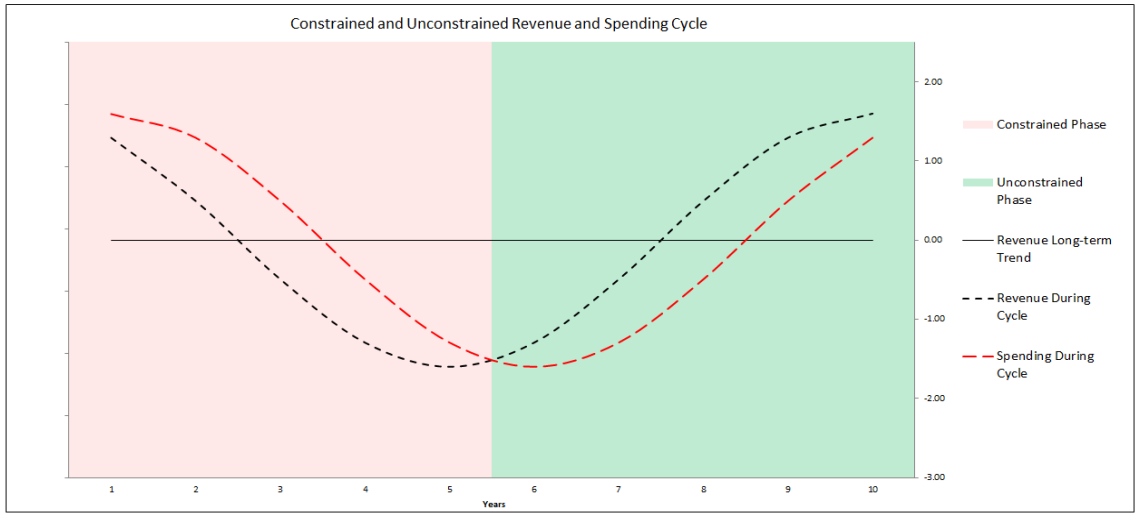
Source: Rockefeller Institute State Revenue Report , June 2016

- US state and local governments have faced increased revenue volatility in recent years and especially since the financial crisis of 2008.
- Fiscal constraints like balanced-budget requirements provide long-term discipline, but can become arbitrarily binding in short-term volatile conditions.
- During a revenue down-cycle, public-sector spending must be cut below long-term optimum levels.

Required cuts are often chosen for short-term budget expediency, not optimality. Three types of spending are relevant to these choices:

1. Elastic spending that can be cut with same-period, permanent effect (e.g. some quality-of-life services)
2. Essential spending that cannot be cut (e.g. debt service, essential operations, some social services)
3. Essential spending that can be temporarily delayed and accrued but must be made up at some point (e.g. maintenance and capex, funding pension and OPEB obligations, economic development investment, long-term social obligations)

3 Constrained and Unconstrained Spending Cycle



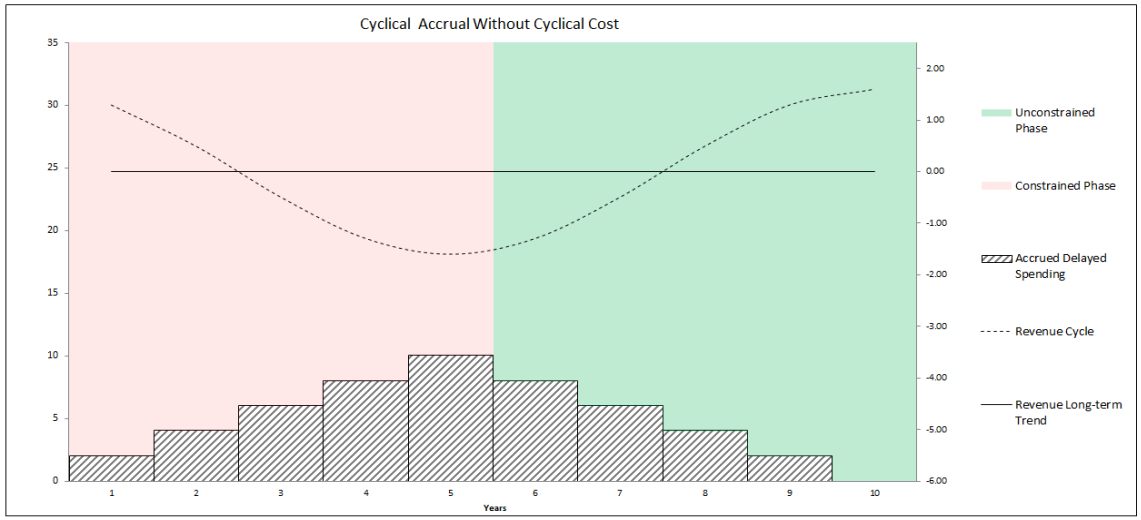
- By definition, volatility means up-phases as well as down-phases.
- Revenue and spending may be balanced optimally on average through cycle phases but imbalanced in most single periods.

For this analysis, a ‘spending cycle’ includes two phases:

- ‘Constrained’ phase: revenue is *falling* faster than elastic spending and budget balance can only be achieved by delaying some essential spending
- ‘Unconstrained’ phase: revenue is *rising* faster than elastic spending and there is room in the budget to address delayed essential spending from the prior phase

A spending cycle will likely be correlated to economic cyclicality but may also reflect the time required to adjust to emerging secular trends.

4 Cyclical Accrual and Remediation

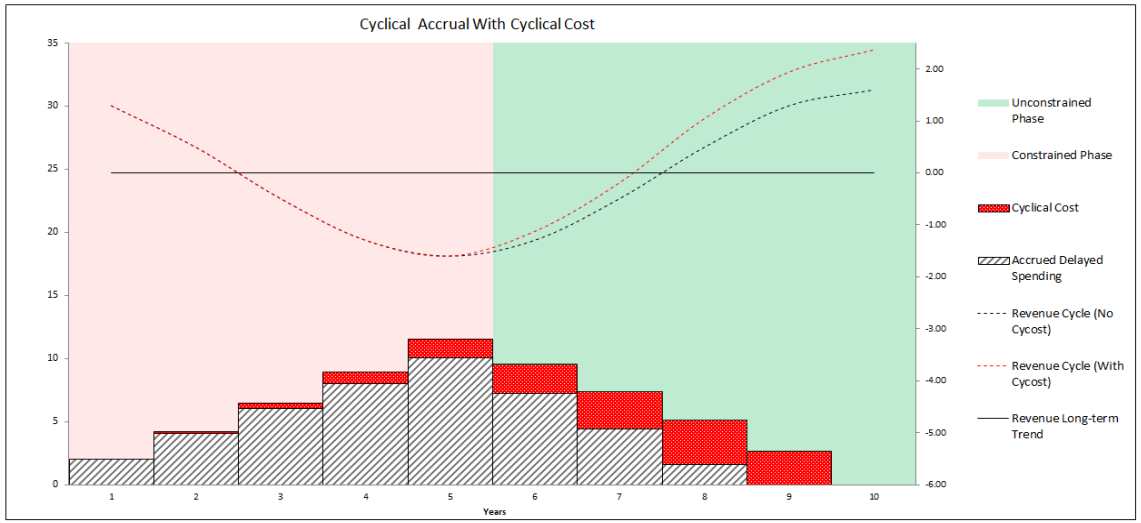


- Delayed essential spending 'Accrues' during Constrained phase
- Accrued balance may – or may not – be 'Remediated' in Unconstrained phase

Cyclical Accrual is the Accrual and Remediation of delayed essential spending over a spending cycle. It can be analyzed as a form of off-budget public-sector 'borrowing':

- The principal balance of the 'loan' is drawn during the Constrained phase and is (ideally) repaid during the Unconstrained phase.
- When full Remediation requires more funding in total than the amount accrued, the 'loan' in effect has an 'interest rate' that is related to the characteristics of the delayed spending. For the current analysis, this rate only includes the amount of future funding obligations, not same-period, permanent losses (e.g. lower service quality) caused by the delay.

5 Cyclical Accrual Cost



- The cost of Cyclical Accrual reflects effect of delay and is likely uneven.
- For this analysis, the cost is levelized over the cycle and added to the accrued balance like capitalized interest.

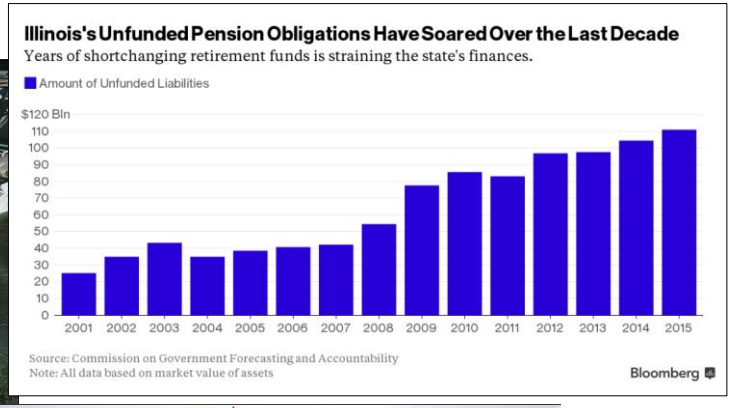
Four types of cyclical accrual cost appear to be typical:

- 'Physical Cost': accelerated deterioration of public-sector physical plant
- 'Funding Opportunity Cost': loss of investment earnings on funding for future obligations
- 'Economic Cost': loss of local economic potential caused by delayed investment
- 'Social Cost': higher future healthcare and other costs caused by delayed delivery

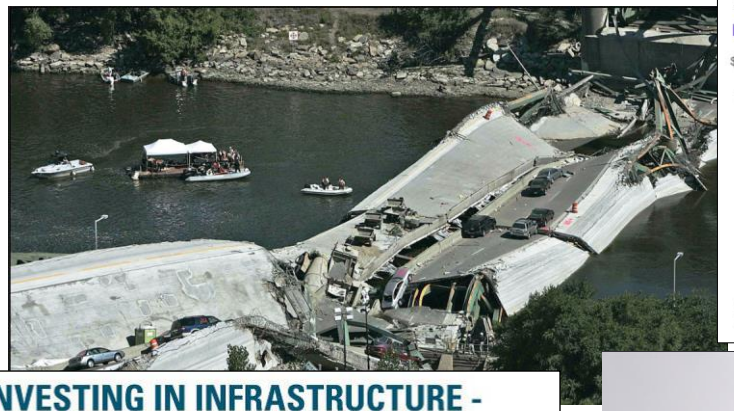
When the cost of Cyclical Accrual is significant, the off-budget and opaque nature of this type of public-sector borrowing can have severe consequences.

6 Cyclical Accrual: Costly Examples

Opportunity Cost: Public Pension Funding



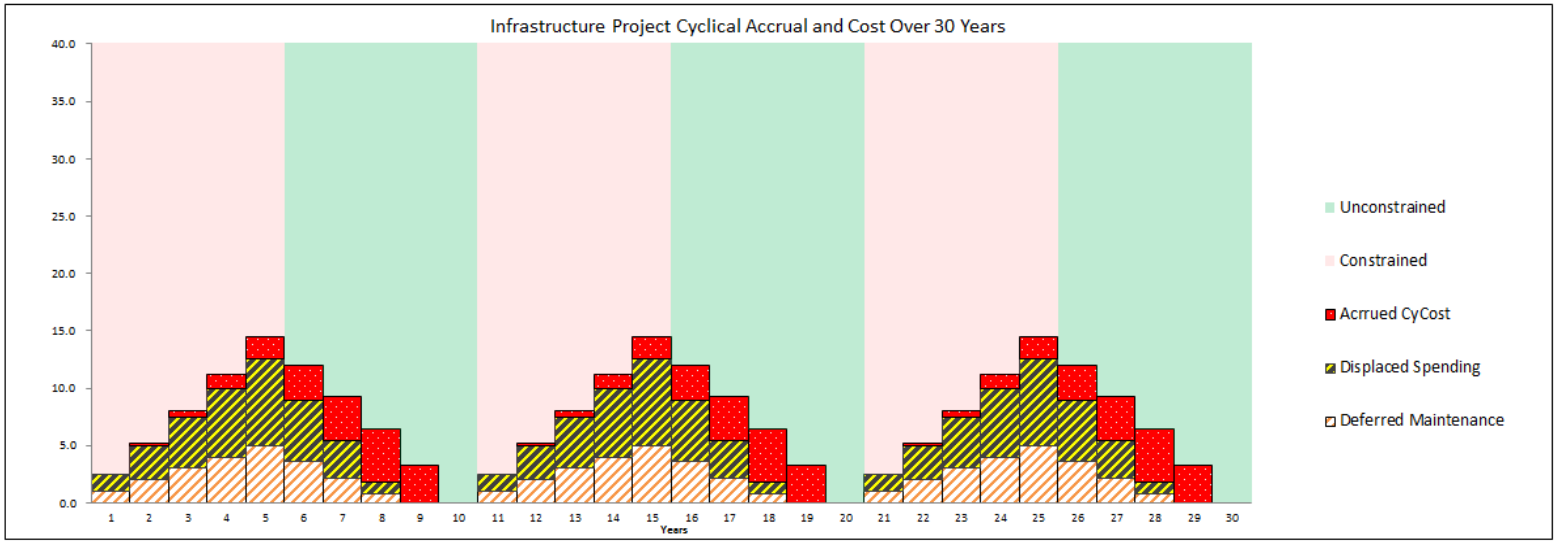
Physical Cost: I-35W Bridge Collapse



Economic Cost: Loss of GDP Potential

Social Cost: Flint MI Lead Poisoning

7 Cyclical Accrual and Long-Term Infrastructure



Major infrastructure projects will require funding (taxes or user fees) for financing, operations and maintenance across several spending cycles.

Delayed essential spending related to the project can arise in two ways:

- ‘Deferred Maintenance’: essential spending delayed at the project itself (e.g. some maintenance, capital upgrades and replacement)
- ‘Displaced Spending’: delayed essential spending elsewhere in the budget due to displacement by project spending that cannot be delayed (e.g. debt service, operations)

8 CyCost Model: Infrastructure Alternative Evaluation

A state or local government that frequently incurs significant Cyclical Accrual cost should include this factor in the design and evaluation of infrastructure financing alternatives. This is especially true in a 'second-best' context where alternatives offer little or no realistic value with regard to risk transfer or cost efficiency when compared to traditional public-sector financing.

- The basic evaluation methodology is to add projected Cyclical Accrual balances and their interest-like cost to a project's formal debt financing. In effect, this approach measures the increased cost of public-sector financing for an infrastructure project when fiscal constraints are binding and costly Cyclical Accrual occurs.

- Alternative financings may (or may be designed to) react differently to fiscal constraints than traditional public-sector financings. If an alternative can be shown to reduce expected Cyclical Accrual cost, it may have value as a second-best solution.

- Traditional and alternative cases can be directly compared with respect to lowest PV of cost. This is similar to the Value for Money evaluation typically done for P3s, but with the addition of fiscal context through budget cycle and Displaced Spending parameters.

- The CyCost 1.2 model is intended to demonstrate these principles in a simple and accessible format for a schematic $100m project.

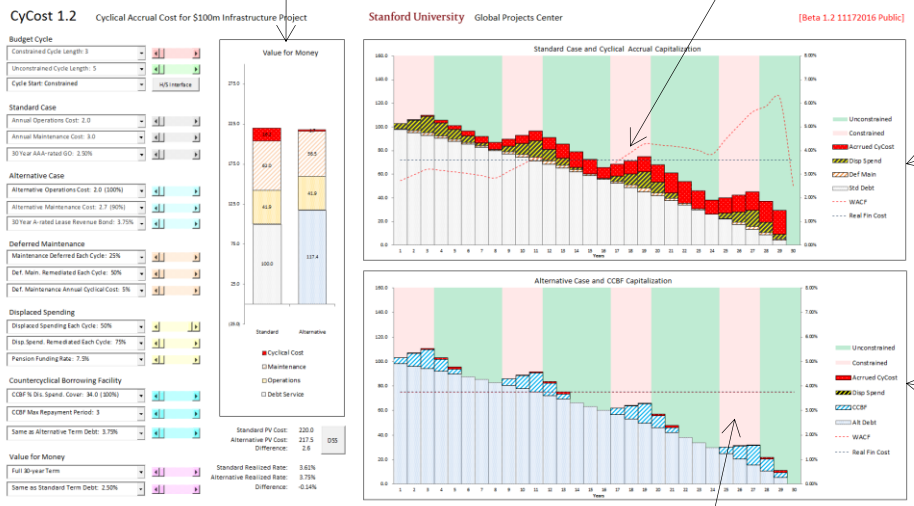
9 CyCost Model: Demonstration Dashboard

Input menus allow comparison of numerous scenarios

Simple PV comparison in VfM format

30-year charts of debt and Cyclical Accrual balances for $100m infrastructure project

Drop-down options reflect various project and fiscal parameters and assumptions



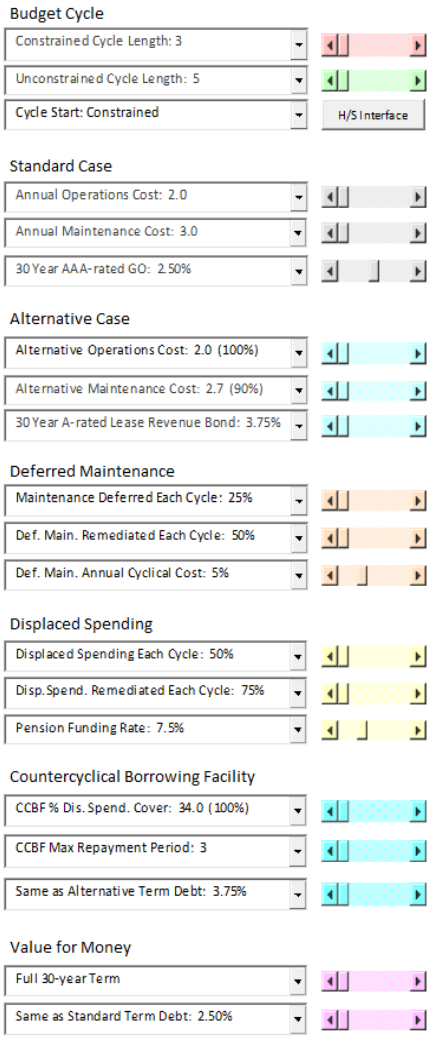
Standard Case (traditional financing, O&M)

Alternative Case (P3 or lease-type financing, O&M)

Sliders for user-specified input values

Comparison of 30-year Realized Rate and current WACF financing rates

10 CyCost Model: Input Menus



Budget Cycle: Defines length of Constrained and Unconstrained Phases of spending cycle during term, and first phase

Standard Case: 30-year term debt and annual operations and maintenance (O&M) assumptions for traditional-type financing

Alternative Case: 30-year term debt and annual O&M assumptions (defined as % of Standard Case) for P3 and lease-type infrastructure alternatives

Deferred Maintenance: Accrual, Remediation and Cyclical Cost rate assumptions, applied to Standard Case only

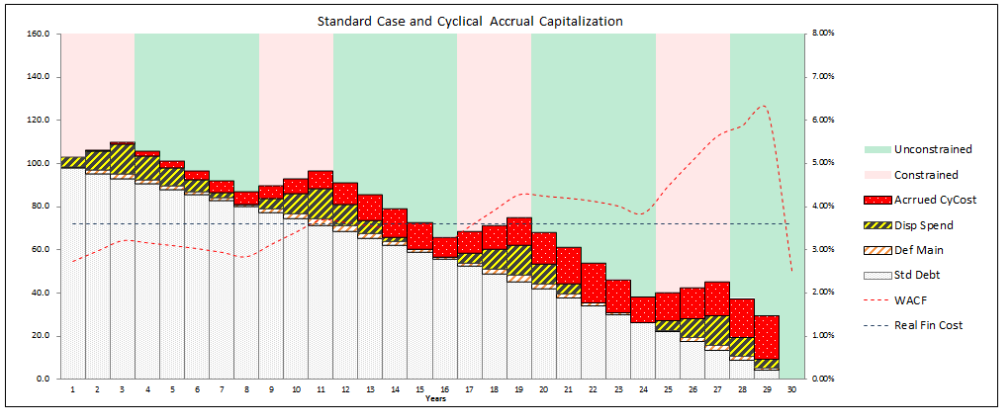
Displaced Spending: Accrual, Remediation and Cyclical Cost rate assumptions

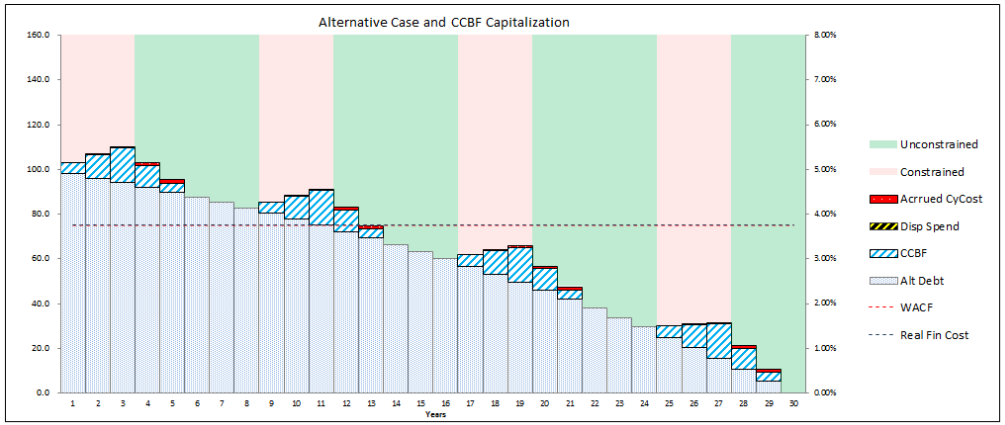
CCBF: Defines capability in Alternative Case to self- finance project costs through a spending cycle. Coverage as % of project cost during Constrained Phase; maximum full repayment period is Unconstrained Phase length

Value for Money: Present value cost comparison term and discount rate assumptions

11 Cycost Model: Accrual Graphics

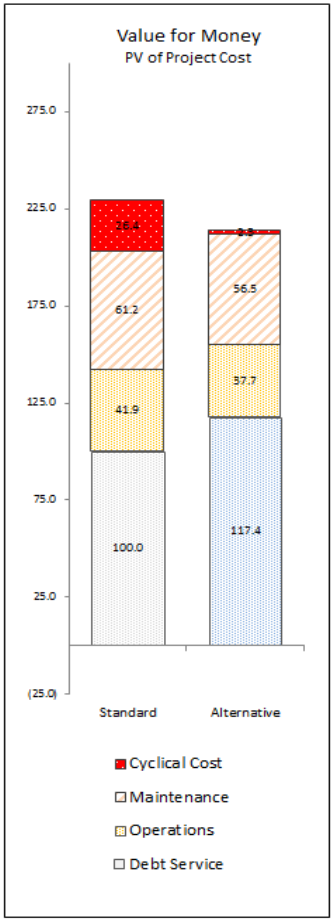
Accrual graphics summarize annual term debt and Cyclical Accrual balances, and reflect the effective capitalization of the project for each year of the evaluation term. Any outstanding balances are assumed to be paid in final year.





- Left x-axis is millions of dollars; right x-axis is annual financing rate
- Deferred Maintenance balance in Standard Case only; CCBF balance in Alternative Case only
- Remediation payments applied to principal accrual first, Cyclical Cost second
- Weighted Average Cost of Financing (WACF) reflects financing rate each year based on then-current effective capitalization

12 CyCost Model: PV Cost and Rate Comparison



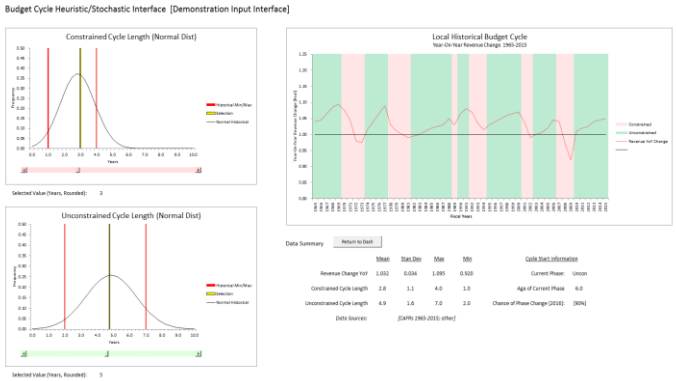
Standard PV Cost:	229.5	DSS
Alternative PV Cost:	213.9	
Difference:	15.5	

Standard Realized Rate:	4.25%
Alternative Realized Rate:	3.75%
Difference:	0.50%

- Annual project costs include debt service, operations, current maintenance, and Remediation payments applied to the principal amount of Deferred Maintenance during Unconstrained phase.
- Annual Cyclical Costs include Remediation payments applied to the interest amount of Deferred Maintenance, Displaced Spending and the CCBF balances (principal amounts of Displaced Spending and CCBF net to zero during 30-year term).
- Each type of cost is present valued to time-zero for the term and discount rate selected in the Value for Money menu with results shown for both cases in a bar chart graphic (as typically used in P3 VfM analysis)
- Cyclical Cost may be negative when the selected VfM discount rate is higher than the assumed accrual rate of Deferred Maintenance and Displaced Spending.
- The ‘Realized Rate’ for each case is an approximation of the full-term financing rate of project capitalization including both term debt interest and Cyclical Accrual Cost.

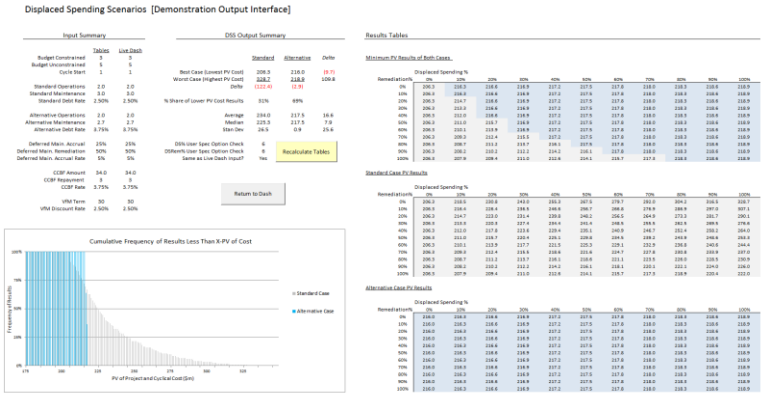
13 CyCost Model: Experimental Interfaces

The model includes two experimental interfaces: (1) a ‘Heuristic/Stochastic Input’ (the H/S Input button) for Budget Cycle inputs and (2) a ‘Displaced Spending Scenario’ (the DSS button) for comprehensive ‘what-if’ output analysis.



- H/S Input seeks to assist intrinsically heuristic judgements on long-term forecasts by adding stochastic context.
- The input uses local historical data to define a probability distribution on which the user specifies Budget Cycle choices

- DSS output automatically generates a table of project cost PV of both cases for all possible combinations of Displaced Spending Accrual and Remediation as other assumptions are held constant.
- The output summary provides a sense of best and worst cases and the general distribution of all results.

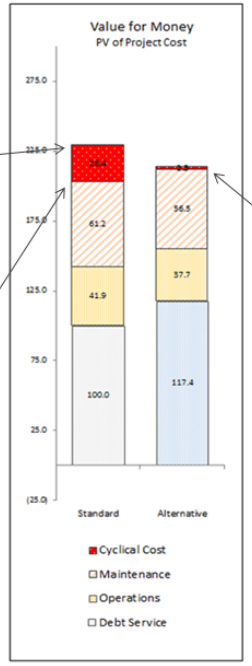


14 P3 as a Second-Best Solution

The CyCost model can demonstrate the value of an Alternative P3 approach to infrastructure financing as a second-best solution to Cyclical Accrual.

With realistic Cyclical Accrual Cost estimate, Traditional approach is **Third-Best** Solution ($230m)

Excluding Cyclical Accrual Cost, Traditional approach is **First-Best** Solution ($204m)



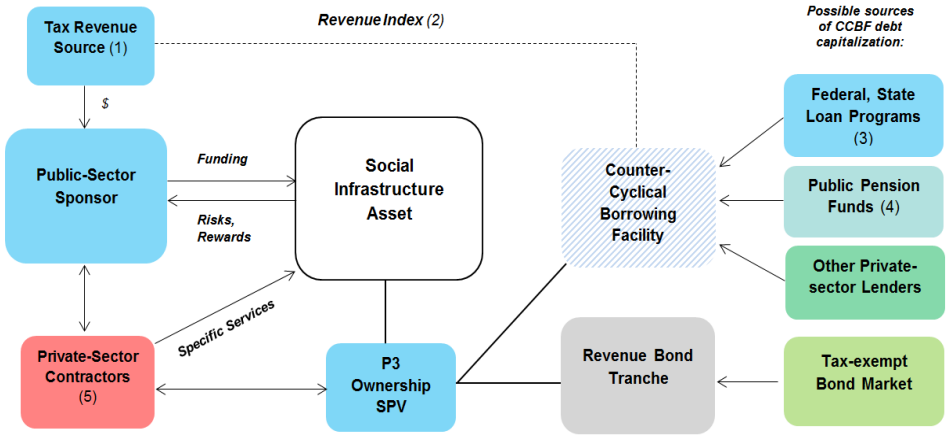
With realistic Cyclical Accrual Cost estimate, Alternative P3 approach is **Second-Best** Solution ($214m)

Standard PV Cost:	229.5	
Alternative PV Cost:	213.9	DSS
Difference:	15.5	
Standard Realized Rate:	4.25%	
Alternative Realized Rate:	3.75%	
Difference:	0.50%	

15 CCBF as “Bolt-On” Facility

The Counter-Cyclical Borrowing Facility in the CyCost model may be intrinsic to Alternative capitalization (e.g. a P3 that takes revenue risk) or it may in theory be added separately as a “bolt-on” facility to project capitalizarion.

- A bolt-on CCBF would require an index mechanism referring to public-sector cyclical phase status (i.e. Constrained vs. Unconstrained). Other structural aspects are likely straightforward.



(1) General fund, dedicated tax source (e.g. special sales tax) and/or asset user fees
(2) Index adjusts annual debt service payments up or down based on observable revenue metrics
(3) Federal and state infrastructure loan programs (e.g. TIFIA, WIFIA, SRF etc.)
(4) Direct alternative investment or indirect through infrastructure debt funds
(5) Long-term contracts compliant with IRS Rev. Proc. 2016-44

16 Further Development of the Concept

The Cyclical Accrual concept introduced here and in the CyCost 1.2 model is at the initial stage of development. Further development areas:

1. Data: Anecdotal evidence suggests that Cyclical Accrual cost is prevalent and significant in the US state and local public sector. But research into existing data is required to confirm and quantify this. Data availability and quality is also a crucial aspect of evaluation model validity.

2. Methodology: CyCost 1.2 is a simple deterministic model but many of its components would benefit from a stochastic approach where sufficient data is available.

3. Resonance: For the Cyclical Accrual concept to be useful to public-sector decision-makers and stakeholders, the concepts and models must resonate with their perspectives and concerns. Outreach to current participants in public-sector infrastructure funding and budgeting is a key part of concept development.

4. Alternative Innovation: Many current forms of P3s and public-sector leases are designed primarily to address cost and risk issues or other fiscal constraints unrelated to Cyclical Accrual. The Cyclical Accrual concept may expand the scope for alternative innovation but determining what new forms are practical requires research and outreach.

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