

1 **VALUE FOR FUNDING (VfF) APPROACH TO ASSESSING LONG-TERM**
2 **INFRASTRUCTURE INVESTMENT DECISIONS**

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1 **ABSTRACT**

2 Long-term infrastructure investment decisions are among the most critical challenges
3 facing the U.S. state and local governments today. The particular choice of infrastructure
4 financing will have important bearing on how far governments can stretch their
5 constrained revenue base and on their overall fiscal health in the long run. *Value for*
6 *Money* (VfM) is an existing standard tool that allows a comparative analysis of
7 alternative financing options, including public-private partnerships (P3s). Although used
8 widely, VfM has several limitations as a practical decision support tool for policymakers.
9 While it considers the relative merits of different *financing* options at the *project* level,
10 VfM is critically limited in its lack of consideration for project revenue *funding* needs (to
11 repay the financing) and the resulting impact on the overall fiscal constraints faced by
12 the local and state *project sponsors*. The proposed *Value for Funding* (VfF) model is
13 designed to address these shortcomings by explicitly measuring the impact of
14 infrastructure investment decisions on the project sponsors' ability to meet their fiscal
15 obligations in the long run, including budget deficit and funding volatility risk effects
16 over the project's life. Recognizing the increasing need to deal with fiscal volatilities,
17 VfF explicitly models the inherent uncertainties through a stochastic framework. This
18 new framework will enable government sponsors to gain new insights into the fiscal
19 risks involved in their infrastructure decisions, in particular, with availability payment
20 (AP) based public-private partnerships (P3s) where the long-term repayment obligations
21 directly dip into the sponsors' general funds.

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1 INTRODUCTION

2 Long-term investment decisions in infrastructure are among the most critical challenges
3 facing the U.S. state and local governments today. The particular choice of infrastructure
4 financing approaches will have important bearing on how far governments can stretch
5 their constrained revenue base and on their overall fiscal health in the long run. *Value for*
6 *Money* (VfM) is an existing standard tool widely accepted in the P3 stakeholder
7 community that allows a comparative analysis of alternative financing options for a
8 specific infrastructure project, including public-private partnerships (P3s). Although used
9 widely, VfM has several limitations as a practical decision support tool for state and local
10 policymakers.

11 There is currently an overabundance of private capital in the global marketplace
12 for infrastructure *financing*. What is in short supply, however, is the revenue *funding*
13 sources needed to repay the financing. These funding sources mostly reside within the
14 public domain and must ultimately be derived from public revenue sources, be they
15 taxes, user charges, intergovernmental transfers, or other means. While it considers
16 relative merits of different *financing* options at the *project* level, VfM is critically limited
17 in its lack of consideration for project *funding* needs necessary to repay the financing and
18 the resulting impact on the overall fiscal constraints faced by the local and state *project*
19 *sponsors*. Due to this and other limitations, the VfM approach has lacked industry
20 credibility as a standalone tool, often contributing to costly reversals and cancellations in
21 the infrastructure procurement process.

22 More and more, government sponsors are looking for better and more
23 comprehensive decision support tools to help assess their long-term infrastructure
24 investment decisions. The proposed *Value for Funding* (VfF) model is designed to
25 supplement the existing VfM tool to help improve the overall infrastructure decision
26 assessment framework. In addition to project-centric risk assessment provided by VfM,
27 VfF provides a methodology to measure explicitly the fiscal risks relevant to project
28 funding, including the budget deficit and funding volatility risk effects of infrastructure
29 investment decisions over the project's life. Understanding the effects of fiscal risk is
30 especially critical for decisions that commit the project sponsors' general obligation
31 funds, including, for example, social infrastructure projects and availability payment
32 (AP) based public-private partnerships (P3s) in general.

33 This paper is organized as thus. We first elaborate in more detail the need for VfF
34 at this juncture in the U.S. infrastructure investment space. We then introduce the basic
35 conceptual framework for VfF and its three basic analytical components. For preliminary
36 proof-of-concept, we test the VfF concept using a simple exploratory VfF model on a
37 real-world case example, in this case, the recent Allentown water project. Finally, we
38 conclude the paper with a summary and a few additional thoughts.

40 WHY VALUE FOR FUNDING (VfF) APPROACH?

41 Public infrastructure projects intrinsically require a long-term perspective with respect to
42 funding. High project costs need to be financed upfront (generally through the municipal
43 bond market) and repaid with often volatile and uncertain project revenue funding stream

1 over the long term. Further, ongoing operations and maintenance (O&M) costs have to
2 be budgeted accurately to ensure that infrastructure provisions are sustained over the life
3 of the project.

4 Public sponsors, however, are often forced to adopt a short-term perspective on
5 infrastructure investments, especially when the fiscal outlook is volatile and uncertain.
6 This is due in large part to their statutory requirements regarding balanced budget and
7 their political sensitivities regarding budget deficits, but also to their social spending
8 needs that are often counter-cyclical to the general economy, i.e., the worse the economy,
9 the lower the revenues but the higher the social spending needs. To make matters worse,
10 for many public sponsors, the off-balance sheet legacy obligations such as unfunded
11 pension liabilities, Medicaid, and other post employment benefits (OPEB) are
12 skyrocketing to an unsustainable level, further exacerbating the situation.

13 Beyond infrastructure, the larger context is the current economic environment and
14 the resulting fiscal constraints that U.S. state and local governments are facing. Although
15 their ability to borrow at historically low interest rates is virtually unconstrained and thus
16 has never been better, since the 2008 financial crisis, their revenues have become a lot
17 more volatile. For example, several recent state-level studies indicate that, when
18 compared to that of the preceding four decades (1960-2000), the volatility of the overall
19 U.S. economy increased twofold in the last decade (2000-2010), which is bad enough,
20 but the volatility of state tax revenues increased as much as fourfold in the same period
21 (1,2). Under the current climate, financing a big and long-term infrastructure project
22 using the traditional public-sector financing will inevitably run straight into this volatility
23 wall. Even if money can be borrowed at close to a zero percent interest rate, the debt still
24 has to be paid back on a fixed schedule, and this is on top of the operations and
25 maintenance (O&M) burden over the long term.

26 When funding is volatile and runs against the high fixed-costs of debt service and
27 O&M, it results in increasingly leveraged situations where the good years will be very
28 good and the bad years very bad. For a big infrastructure project, such a volatility impact
29 on the public sponsor's overall budget will make it much easier to kick the can down the
30 road and delay the needed investment, as evidenced already by serious deferred
31 maintenance issues in many parts of the U.S. Public sponsors are also vulnerable to
32 potential and persistent risks of surpluses and deficits being treated asymmetrically.
33 Under inevitable deficit situations, infrastructure maintenance spending is often delayed
34 in support of other more visible and higher priority programs (such as the counter-
35 cyclical social programs mentioned earlier). Under budget surplus situations, surpluses
36 can be seen as "windfall" to be disbursed not for infrastructure needs but for more
37 "glamorous" purposes to serve short-term political needs. Over and beyond project
38 efficiency considerations, these fiscal factors for project sponsors are the real reasons
39 why the traditional approach has not been a sustainable solution for the U.S.
40 infrastructure problem and why, more and more, many public sponsors are looking to
41 non-traditional solutions.

42 For some time now, there has been a great deal of optimism for P3s as a potential
43 solution to our infrastructure problem, many in the industry predicting a significant

1 growth in the U.S. P3 market. Several of the major driving forces for this growth have
 2 already been in place, including: (1) the need for infrastructure investment in trillions of
 3 dollars, (2) many fiscally strapped state and local governments needing non-traditional
 4 alternatives to pay for their infrastructure, (3) many smart and motivated people, not only
 5 in the private sector but especially in the public sector, that are focused on P3s and
 6 believe they offer a reasonable alternative to the traditional approach, and (4) most
 7 importantly, there is an overabundance of capital interested in and ready to invest in P3s.
 8 The real picture, however, has been very different from these industry predictions.
 9 Although more P3s have been implemented in recent years, the actual volume has been
 10 far lower than expected and these implementations have not made any dent in the
 11 infrastructure crisis we are facing.

12 One important reason for this underwhelming volume of P3 transactions is due to
 13 a *measurement* problem (3). Currently, the main rationale for the value of P3s is the
 14 project-level risk transfer and cost efficiency and VfM model is specifically designed to
 15 measure these P3 values. Given the current economic outlook of low growth and
 16 increased volatility, however, the state and local fiscal context is likely to become a
 17 major factor in evaluating infrastructure investment decisions in the future. Beyond
 18 project level risk transfer and cost efficiency, P3s are also valuable because they can
 19 address the fiscal volatility risk for the public sponsor, which is not captured explicitly in
 20 VfM analysis.

21 In VfM, when the difference between traditional and P3 options are measured
 22 from cost-efficiency standpoint, the results are often not so dramatic (Figure 1). A P3

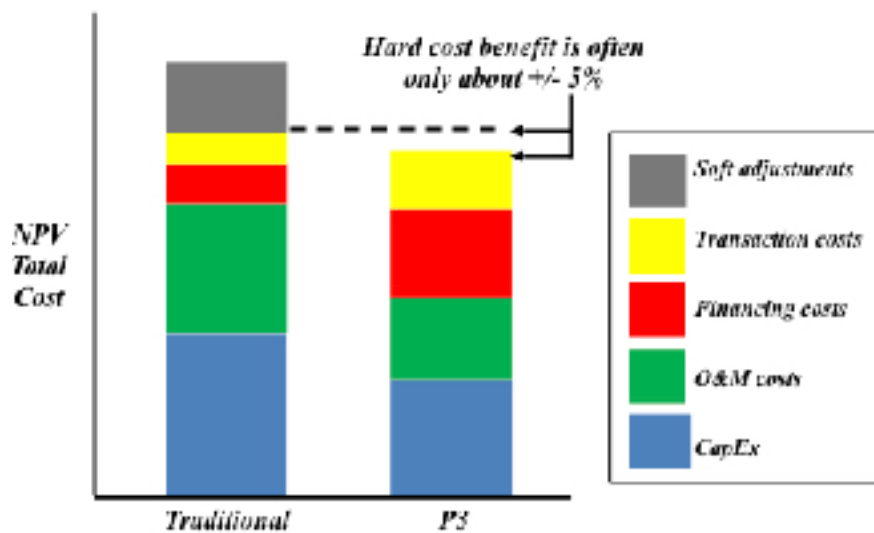


FIGURE 1 Traditional vs. P3 VfM Comparison.

does have lifecycle cost efficiency (both from capital expenditure and O&M cost standpoint) but its higher financing and transaction costs often balance out any efficiency gains. The “hard” net cost savings thus are often not so dramatic or compelling. From a project risk transfer standpoint, the VfM analysis also includes “soft adjustments” that often add more cost to the traditional side to reflect,

23 for example, an “optimism bias” or risks associated with environmental, site, and/or
 24 technical issues. These risk transfers might be real but the risk assessments are often not
 25 very compelling and sometimes lack credibility in the P3 stakeholder community. The
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recent overturn of the plan to build the Indy Justice Center as a P3—due to differing conclusions about VfM input assumptions and risk transfer assessments—is yet another example of the VfM credibility issue and its costly consequences (4).

WHAT IS VALUE FOR FUNDING (VfF) APPROACH?

The basic theoretical foundation for the VfF approach has already been laid out in some detail by the authors in a series of three technical papers published in 2015 (5,6,7). In essence, VfF is a decision support tool specifically designed for U.S. state and local governments to assess the impact of alternative infrastructure delivery and financing options on their long-term fiscal sustainability, especially as relates to funding volatility risks.

VfF Conceptual Framework and Components

The VfF conceptual framework is comprised of the following three basic analytical components (Figure 2):



FIGURE 2 Basic VfF Conceptual Framework.

1. Fiscal Constraints and Fiscal Risk Benchmarking (highlighted in red in Figure 2)

For a specific government project sponsor, (a) identifying and measuring the most critical and relevant *fiscal constraint* metric (e.g., revenue volatility, debt capacity, unfunded obligations such as pensions and OPEBs) and (b) establishing *fiscal risk benchmarks* that define specific limits and/or targets for these constraints (e.g., acceptable limits of deficit/surplus, debt capacity usage, reserve fund usage, limits on deferred maintenance). Fiscal constraints and benchmarks are derived from fiscal performance data, which are constituted from a combination of (a) historical data (e.g., Comprehensive Annual Financial Reports (CAFRs) data compiled annually by state and local governments that meet the Governmental Accounting Standards Board (GASB) standards), (b) relevant projections about the future, and (c) other goals or targets as aspired by the sponsor. As desired, fiscal risk benchmarks can be customized for an individual government sponsor and/or established for its peer group as further referencing and benchmarking in its infrastructure decision-making.

2. Project Volatility Assessment (highlighted in yellow in Figure 2)

1 For each alternative infrastructure financing and delivery option being considered by the
2 project sponsor—be it traditional, P3 (whether availability payment (AP) or revenue risk
3 (RR) models), or any other options—estimating (a) potential variations in project
4 revenues (e.g., taxes, user charges, grants, others), (b) potential variations in project costs
5 (e.g., construction, O&M, financing, other transaction costs), and (c) resulting volatility
6 in net cash flow over the project’s life. Project volatility data, developed as a probability
7 distribution, can be derived from several existing project performance data sources,
8 including (a) available literature on project costs and reliability, (b) historical project
9 performance data maintained by the project sponsors themselves, (c) where available,
10 past project finance (PF) transaction data where detailed project cash flow analyses were
11 undertaken (including, e.g., from bond documents and VfM assessments), and (d) where
12 available, actual P3 performance data worldwide obtained directly from P3
13 concessionaires. Project volatility distributions can be customized for an individual
14 project for the sponsor and/or established more generically for different categories of
15 infrastructure projects (e.g., roads, bridges, water/wastewater facilities, public buildings,
16 fiber optic network, etc.) for additional referencing and benchmarking.

17 3. *Comparative Analysis of Fiscal Risk Impacts (highlighted in blue in Figure 2)*

18 Based on project volatility estimates, (a) assessing the impact of each alternative
19 infrastructure financing option on the sponsor’s fiscal constraint metric(s) and (b)
20 comparing the resulting fiscal impacts with respect to the acceptable risk limits as
21 defined by the fiscal risk benchmarks described above. Over and beyond the project-level
22 risk transfer and cost efficiency, such fiscal risk impact comparisons allow the sponsor to
23 determine more accurately whether taking a non-traditional financing route such as P3 is
24 warranted, weighing the added (financing and transaction) costs of risk transfers against
25 their values as measured in the context of the sponsor’s *overall fiscal risk* picture. Key
26 examples of VfF fiscal risk impacts that may be considered by the sponsors include those
27 on annual budget deficit level, revenue volatility, debt capacity limit, credit rating,
28 reserve fund level, unfunded pension obligations, unfunded deferred maintenance level,
29 and the need for other spending deferrals.

30 **VfF Stochasticity and Fiscal Volatility Modeling**

31 As mentioned, fiscal uncertainties and resulting volatilities are key challenges facing
32 state and local governments today. In the VfF framework, one way to address these
33 uncertainty and volatility issues explicitly is to use a cumulative probability distribution
34 (“S-curve”). For example, a key fiscal constraint facing a government sponsor might be
35 the risk associated with deficits. We can gain insight into actual deficit constraint faced
36 by the sponsor by developing its “deficit risk profile” derived from its long-term
37 historical budget data (including the frequency of deficits). As shown in Figure 3, by
38 defining annual deficit (AD) as a percentage of annual revenues (AR), we can show such
39 a profile by a cumulative probability distribution of the government sponsor’s deficit
40 history (blue S-curve). The generic sponsor shown in Figure 3 balances its budget (i.e.,
41 AD=0) 50 percent of time and, most of the time (98 percent), its annual deficit level is
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below one percent of annual revenues (red lines). For this sponsor, the overall deficit/surplus levels have historically ranged from -1.4 to 2 percent of annual revenue (black dotted lines), indicating the sponsor’s potential volatility range of 3.4%.

Similar S-curves corresponding to each alternative infrastructure financing options can also be developed by integrating the project and the fiscal volatility data,

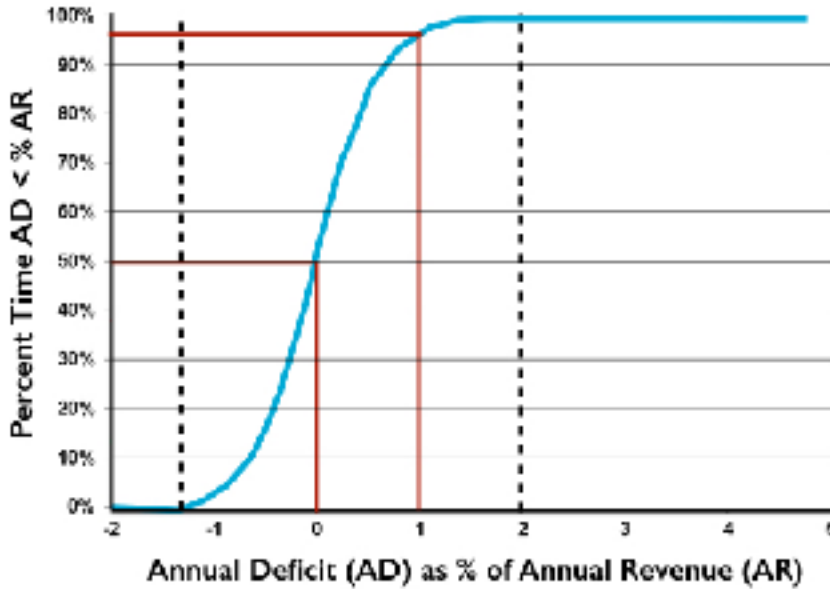


FIGURE 3 Deficit Risk Profile (Generic).

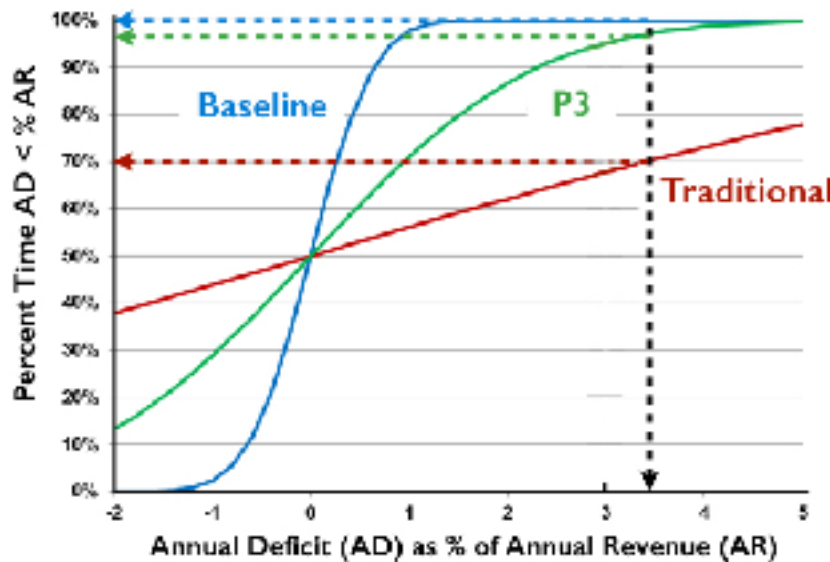


FIGURE 4 Fiscal Risk Impact Comparisons (Generic).

which can then be compared with pre-established fiscal risk benchmark. In Figure 4, for example, for simplicity, the fiscal risk benchmark is shown to represent the “baseline” deficit risk profile (blue S-curve) before any infrastructure investments are made. Figure 4 also shows S-curves for alternative infrastructure financing options, in this case, traditional (red S-curve) and P3 (green S-curve). As a reference point, the current average annual reserve as a percentage of annual revenues for U.S. state governments is approximately 3.4% (black dotted line) (8). Figure 4 shows that under baseline

condition for this sponsor, the annual deficit is always less than this average annual reserve level (blue dotted line, 100%). In comparison, under traditional financing, the probability that annual deficit is less than the average annual reserve level is 70% (red

1 dotted line). In the example shown in Figure 4, the situation could potentially be
2 improved significantly to 98% if P3 option was chosen (green dotted line). These S-
3 curves also illustrate volatility risks as represented by the spread of the curves, i.e., the
4 flatter the curve, the more it deviates from the annual budget and the higher the volatility
5 risk generated by the option. In Figure 4, traditional option is shown to trigger greater
6 variations in annual deficit (and, thus, available funding) when compared to P3 option,
7 thus increasing overall volatility risks.

8 S-curves (cumulative probability distributions) are used here for demonstration
9 purposes only and chosen to specifically illustrate the uncertainty and probabilistic nature
10 of volatility risks. Other more straight forward fiscal constraint metrics can be used just
11 as easily. For example, in the generic example demonstrated in Figure 4, instead of a
12 probability distribution, the metric can simply be the average percentage of time that the
13 annual deficit is greater than the average annual reserve level. It would be up to the
14 government sponsors to select the fiscal risk metric(s) most relevant to them to establish
15 their own fiscal constraints and fiscal risk benchmarks.

16 17 **VFF EXPLORATORY TEST CASE: ALLENTOWN WATER PROJECT**

18 To begin the process of validating the basic functionality of the Vff analytical
19 framework, we developed a simple exploratory model to test the concept retroactively on
20 a real-world case example. For output display, we used *Analytica*, a proven off-the-shelf
21 benefit-cost analysis software from Lumina Decision Systems, for simplicity and
22 convenience.

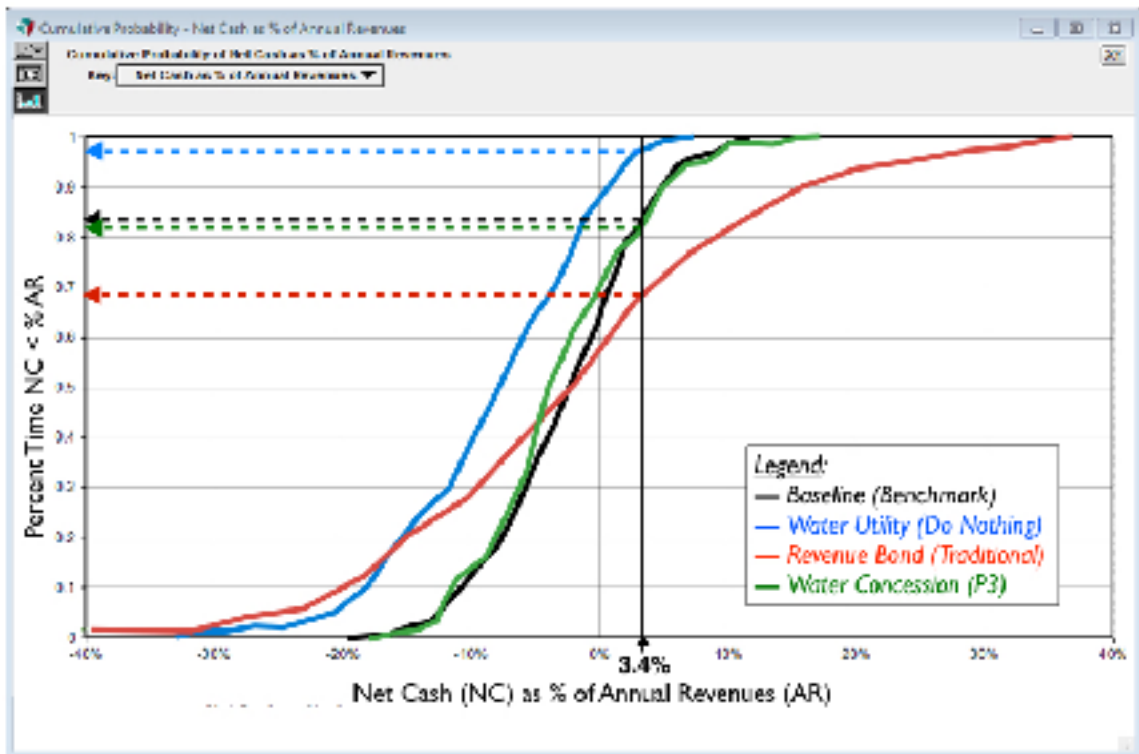
23 We chose the recent water utility concessions transaction completed in 2012 from
24 Allentown, Pennsylvania, as the real-world test case example. The Allentown project
25 involved utilizing the city's infrastructure assets to improve its fiscal position to address
26 the critical unfunded pension obligation issues. This project was particularly relevant
27 from the Vff analysis standpoint because of the direct linkage between the city's fiscal
28 position (specifically, net cash position) and infrastructure financing decisions. To
29 improve its fiscal position, the city considered several options to raise about \$150 million
30 in net cash. Two of the options described below involved the city-owned water utility
31 assets:

- 32 • Issuing new water utility revenue bond (traditional option): Allentown owned and
33 operated its municipal water utility directly. Historically, the water utility had little
34 debt but also produced little cash flow. The bond issuance of \$150 million was to
35 be backed by its future revenue streams, thus forcing the utility to generate
36 positive cash flow and adding significant risks to its future operations
- 37 • Leasing water utility through long-term concession (P3 option): This option
38 involved relinquishing the utility to a third-party owner/operator through a long-
39 term 50-year concession. The proceed from the concession totaled about \$150
40 million and all operational risks were to be transferred to the third party.

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42 The retrospective Vff analysis of the Allentown case focused on the above two
43 options. We used the city's general fund budget as the primary indicator of fiscal health

1 and stability. Specifically, the fiscal constraint metric we used was the city's annual net
 2 cash budget at year end as a percentage of annual revenues (as illustrated by cumulative
 3 probability S-curves described earlier). We assessed the following four scenarios for
 4 comparison purposes (Figure 5):

- 5 1. *Baseline (Benchmark)* pertaining to General Fund balances (excluding water
 6 utility and pension fund cash contributions), which was assumed to represent the
 7 long-term sustainable *benchmark* (data derived from General Fund balances and
 8 other CAFR data for 1997-2012 period)
- 9 2. *Water Utility (Existing Condition)* pertaining to water utility net cash position as
 10 currently operated by the city combined with General Fund balances (data derived
 11 from historical averages and variations from the actual water utility operations)
- 12 3. *Revenue Bonds (Traditional)* pertaining to the first of the two options described
 13 above where water utility is still owned and operated by the city but water
 14 revenue bonds were issued (data derived from actual water revenue bond
 15 documents)
- 16 4. *Water Concession (P3)* pertaining to the second of the two options described
 17 above where long-term concession was awarded to a third party with the net
 18 proceeds to the city and all operational risks transferred to the third party



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40 **FIGURE 5: Allentown Exploratory VIF Test Case Results.**

41 Figure 5 depicts a summary of the test case results for the four scenarios described
 42 above. As shown, the baseline (black S-curve) represents fiscally stable benchmark
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1 position for the city where the net cash position fluctuates between -20% to 12% of
2 annual revenues (about 32% in overall range per the historical CAFR data between
3 1997-2012). Using 3.4% as a point of reference (equal to the average reserve level for
4 U.S. state governments mentioned earlier, black solid line), under the baseline condition,
5 the probability that net cash level falls below the average reserve level is about 83%
6 (black dotted line).

7 Superimposing the city's water utility as currently operated (blue S-curve) on the
8 baseline adds significant fiscal stress to the city's net cash position. When combined with
9 the existing utility, keeping in mind that net cash metric behaves inversely to the deficit
10 metric used for the generic example used in the previous section, the probability of the
11 city's net cash level falling below the average annual reserve level increases to 98% (blue
12 dotted line). Under this scenario, the net cash position fluctuates between -32% to 7% of
13 annual revenues (about 39% spread, slightly higher than the 32% spread for the baseline
14 case), indicating that the current utility operation is relatively stable and additional
15 volatility introduced is rather small.

16 When revenue bonds are issued (red S-curve) with the current utility operations in
17 tact, the net cash position improves significantly from the bond proceeds. With the bond
18 proceeds, the probability of the city's net cash level falling below the average annual
19 reserve level decreases substantially to 69% (red dotted line). The utility, however, is
20 exposed to potential rate increases and resulting commercial risk that is correlated to the
21 local economy. The upside is net cash positive, but the downside will force hard
22 decisions on water ratepayers, most of whom are taxpaying voters. As shown in Figure 5,
23 the fluctuation in net cash position under this scenario is between -40% to 37% (about
24 77% spread) generating high volatility risks and jeopardizing the city's fiscal stability
25 over the long run.

26 With the long-term concession agreement (green S-curve), most of the operational
27 risks are transferred to the third-party concessionaire. The third-party is generally in a
28 better position (especially regarding business risk correlation) to aggressively manage the
29 utility. With the risk transfer, the city is exposed to neither the upside nor the downside.
30 As shown, the net cash position under this scenario reverts back very close to the
31 baseline (black S-curve).

32 This test case example captures the effect of infrastructure financing decisions on
33 the overall fiscal health of the government sponsor, including added insight into the fiscal
34 volatility risks the sponsor is taking on, which is not transparent in the VfM assessments.

36 **SUMMARY AND ADDITIONAL THOUGHTS**

37 VfF analytical framework offers potential enhancement to the current decision support
38 tools available for state and local government sponsors in their infrastructure investment
39 decision making. When used in conjunction with VfM, VfF can add important and much
40 needed fiscal risk context of the project sponsors not apparent in the current VfM project-
41 centric assessment framework. VfF analyses can provide additional insights into
42 alternative infrastructure financing and delivery solutions that can help, for example, to
43 (a) develop better risk transfer strategies with explicit consideration for fiscal volatility

1 effects for more effective private sector engagement and (b) design new financial
2 instruments with fiscally sensitive risk allocation strategies that better address the long-
3 term U.S. infrastructure investment needs.

4 Two top challenges faced by state and local governments today in ensuring
5 sustainable public finance are (a) revenues (both shortage and volatility) and (b)
6 infrastructure investment needs (9). Given the dual need to deal with both of these
7 issues, a significant benefit can potentially be derived from developing the VfF concept
8 to a fully functional tool that could be used alongside the VfM assessments. Although
9 the simple exploratory test case presented in this paper provided some level of validity
10 and insight into the VfF approach, undoubtedly, a great deal of more testing and vetting
11 with government and industry stakeholders are needed. In developing the fully
12 functional VfF tool, we can also specifically address some of the shortcomings of VfM,
13 including issues related to industry credibility and costs.

14 When fully functional, the authors envision the tool to be highly data-driven and
15 data-intensive, relying largely on existing data sources, as described in this paper. The
16 analysis will be transparent with few inputs and assumptions, requiring no more than
17 those already provided in the normal public sector budgeting and financial planning
18 process. Embedded within the tool will also be useful industry-wide benchmarks,
19 including those related to fiscal risk and project volatility. The tool will provide non-
20 technical user interfaces requiring little to no expertise. It will be simple to use, easily
21 accessible, and have cloud-based on-line databases that can be easily downloaded. We
22 also envision the tool to have no to little cost implications for the government sponsors
23 to use. Finally, the tool can be used at different stages of the infrastructure investment
24 decision process. With the embedded fiscal risk and project volatility benchmarks, VfF
25 can be a powerful standalone tool during planning and budgeting stages and as well as a
26 supplement to VfM during pre-procurement/project feasibility and post-procurement
27 stages.

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