AT Kearney

Modeling Price Outcomes for Complex Government Programs

A novel toolkit for evaluating costs can lead to win-win contracts for government and contractors alike.

Fixed-price incentive firm (FPIF) contracts can be win-win arrangements for government programs and contractors alike. They reveal opportunities for contractors to increase profits by keeping costs below target in exchange for sharing the risk of cost overruns. In turn, government programs enjoy greater cost control and more motivated contractors while sharing in the risk as well.

Using simulations to project FPIF outcomes has proved a **simple tool for improving programs' acquisition strategies.**

For many of our Department of Defense (DoD) clients, using simulations to project FPIF outcomes has proved a simple tool for improving programs' acquisition strategies, and has helped refine their approach to contractor incentive arrangements. One aerospace program achieved a 30 percent improvement in employee productivity and cut the production time for a key subsystem by two-thirds, bringing millions in savings. Another program used simulations to project the probability of achieving different price outcomes under several different compensation arrangements, with eye-opening results that led it to shift its acquisition strategy to include FPIF incentives.

The following sections look at how other government programs can achieve the same results.

Favoring FPIF Contracts

The DoD favors FPIF contracts in its formal guidance. The 2014 annual report, Performance of the Defense Acquisition System, concludes:

> When cost control is predetermined and formulaically incentivized in the contract, vendors respond.... CPIF [cost-plus-incentive-fee] and FPIF contracts perform well and share realized savings. These contract types control cost, price, and schedule as well as, or better than, other types....[1]

So why aren't they used more often?

From our experience, industry and program offices sometimes back away from them because they seem too complicated. Indeed, learning FPIF contracting means mastering a new set of contract variables, such as share ratio and ceiling price.

When programs do consider FPIF contracts, they typically use simple payoff curves to analyze potential outcomes. These curves explain the contractor's payoff at any cost level, but do not consider the likelihood of the firm achieving that cost. This results in programs setting share lines based on gut feel or past experience.

There is a better way. Fairly balancing risk and reward can be achieved with a methodology that combines a budgeting S-curve and payoff-curve analysis to project total price and costs. Knowing the likelihood of achieving total price and profits, both parties can better negotiate, appeal to their own risk appetite, and walk away with a win-win contract.

[1] Performance of the Defense Acquisition System, 2014 Annual Report, 13 June 2014.

FPIF Contracting Basics

Assigning all risk to the contractor results in a contract that is for all practical purposes a firm-fixed price (FFP) contract. Adjusting parameters in the other direction shifts cost risk entirely to the government, effectively resulting in a cost-plus contract. FPIF contracts, on the other hand, combine cost-plus and FFP contracts to dial in risk distributions between government and contractor.

While there is no universally optimized FPIF model, contract parameters can be adjusted to best suit both sides. Flexibility does come with greater complexity, it's true. But when properly executed, FPIF contracts are highly effective in motivating contractors to control costs.

Every FPIF contract has four basic elements: target cost, target profit (expressed as a percentage), share ratio, and ceiling cost.[2] The first two are really nothing new: if a contractor's costs exactly equal target cost, it will receive the target profit. If final costs are higher or lower, the contractor will receive a higher or lower fee and profit.

FPIF contracts incorporate **the best elements of cost-plus and FFP contracts.**

Share ratio refers to the percentage of costs, above or below target, that the government will pay. If the share ratio is 75 percent, the government pays the contractor 75 cents of every dollar that it exceeds the target—and the contractor pays the other 25 cents out of its profit. Conversely, the contractor stands to increase its profit by underrunning the target cost: its profit increases by 25 cents for every dollar it underruns. The undersecretary of defense for acquisition, technology, and logistics recognizes that the government and contractor will negotiate a share ratio that makes the most sense for their program, but emphasizes that an even split should be the default starting point.[3]

Ceiling cost, simply stated, is the cost at which the contract becomes firm-fixed price. At the ceiling, the share ratio goes to zero—and all costs that exceed it will be covered by the contractor. Dr. Ashton Carter, who was recently sworn in as U.S. Secretary of Defense, recommended a default ceiling of 120 percent in a recent memo regarding the Department of Defense's Better Buying Power mandate.

A New Approach to FPIF Contracts

Government programs typically analyze FPIF contracts using payoff curves, which simply plot the contractor's fee at a given cost outcome. Payoff curves are useful to explain a compensation agreement, but they do not consider a program's risk profile, and therefore, the likelihood of achieving plotted cost outcomes.

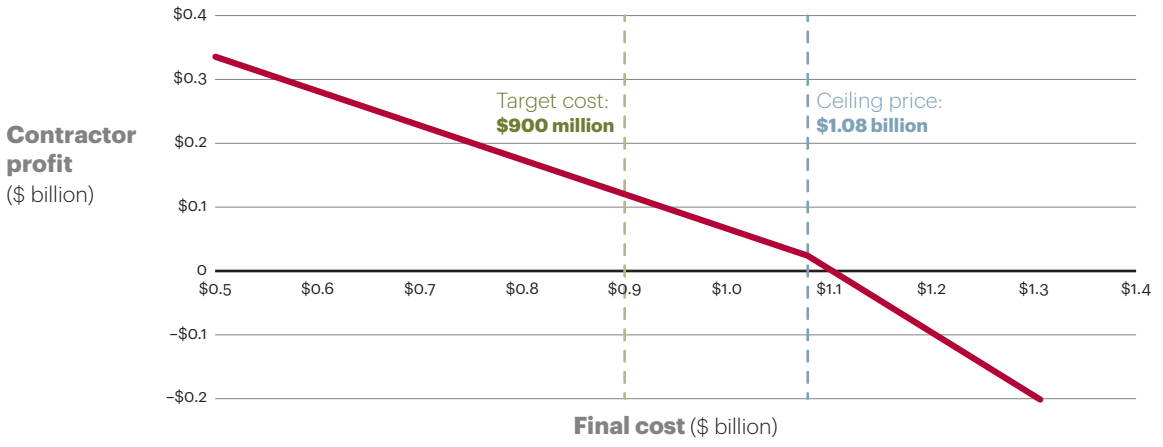
Looking at figure 1 on page 3, the payoff curve illustrates the ceiling price of $1.08 billion, in addition to indicating the government's total price of $1.01 billion, which is the combined target

[2] There are other FPIF variants outside of this paper's scope.

[3] September 2012 memo, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics

Figure 1

Sample FPIF payoff curve, with target profit of 12 percent **Illustrative**



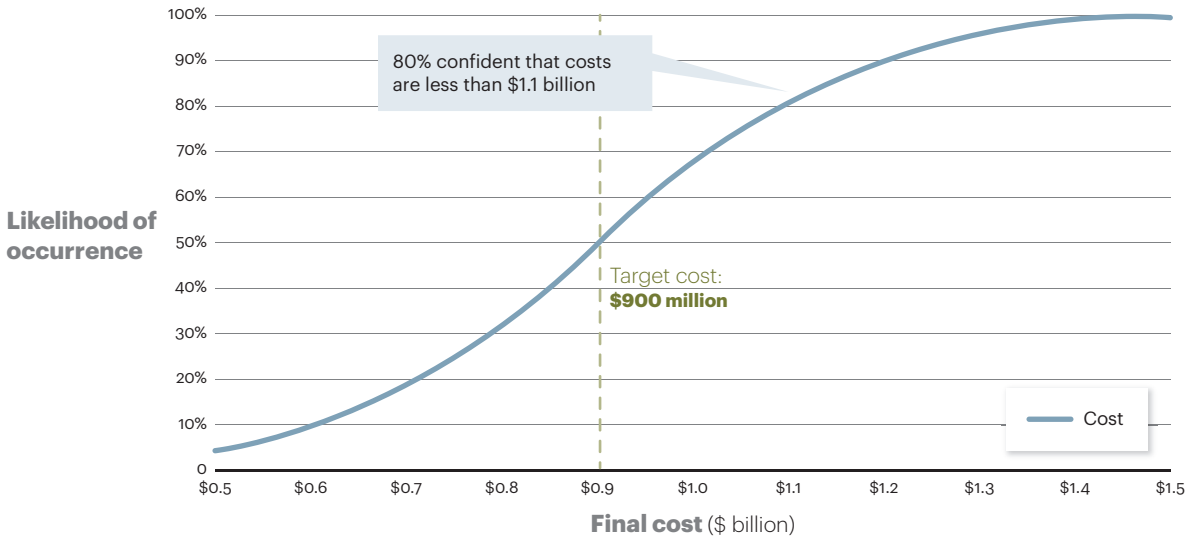
Source: A.T. Kearney analysis

cost and contract fee. The line angles downward here because after this ceiling is hit, the contractor pays for all costs, diminishing its fee until it runs a loss.

As we mentioned earlier, A.T. Kearney's method projects total FPIF price outcomes by combining payoff curves with cost-likelihood S-curves. Figure 2 is a typical S-curve, which reflects the program's confidence that costs will be less than a particular number. In this figure, the program is 50 percent confident it can meet target costs of $0.9 billion, and 80 percent confident it can keep costs below $1.1 billion.

Figure 2

Sample cost S-curve **Illustrative**



Source: A.T. Kearney analysis

When final cost equals target cost, **price is the same for both FPIF curves.** Thus, contractor profits grow as costs decrease.

Yet, this S-curve does not illustrate contractor profit nor the government's total price, which can be accomplished with the FPIF contract's payoff curve. In figure 3, we have plotted two total-price curves (gold and grey) using the same cost S-curve (in blue). The curves illustrate how the target price, cost ceiling, and share-ratio contract terms shape the contractor's potential profit and government's potential cost.

When final cost equals target cost, price is the same for both FPIF curves. At any other point, the contractor will receive a different profit, and the government will pay a different total cost.

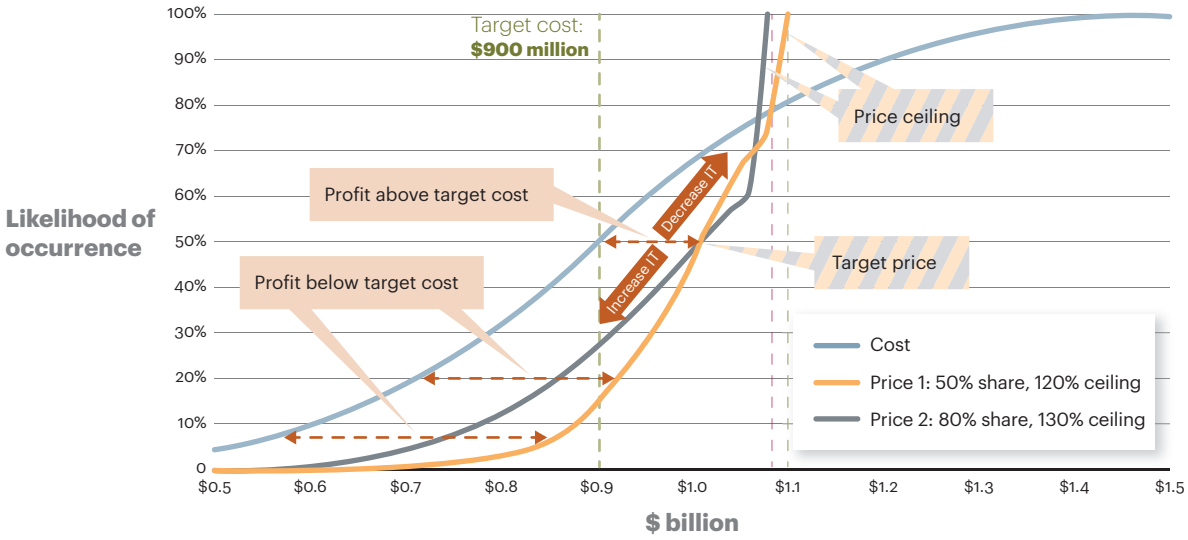
Thus, by design, contractor profits grow as costs decrease. The government takes on more risk with the 80-percent-share line versus the 50-percent-share line. Below the target, the contractor earns less profit with the 80-percent-share arrangement. If the contractor truly believes it can take costs out, it will be better off negotiating the FPIF 50 percent, where it keeps half of savings below target.

Figure 3 also illustrates how the ceiling price can offset the risk of a cost overrun. Both FPIF arrangements turn upward as the contract approaches the ceiling cost. For example, in the case of the 80-percent-share and 130-percent-ceiling option, the government will pay 80 cents of every $1 of cost overruns up to about $1 billion, when the contractor then must pay for all cost overruns.

Figure 3

Cost S-curve with projected price outcomes for different FPIF contract structures

Illustrative



Source: A.T. Kearney analysis

The moral of the story is that, depending on price certainty, the government and contractor may have different views on what the target and ceiling price and the share ratio should be. Basing agreements on these factors will help both parties develop a fair contract. If limiting total price is key for the government, it can use target ceiling to cap its costs. Likewise, if the contractor believes that it is unlikely to exceed the target cost by more than a few percentage points, it can negotiate a lower target ceiling to obtain the share ratio it prefers.

Probability Density Analysis Reveals Likelihoods: A Scenario in Several Stages

Modifications to an incentive structure's cost curves are central to price and profit projections. Plotting price curves on top of budget curves illustrates how FPIF terms impact price and profit, but the likelihood of achieving them is difficult to see.

Modifying the FPIF parameters can create **win-win situations for the government and contractors.**

Probability density analysis solves this issue with repeated random sampling (see figure 4 on page 6). In a scenario that starts with typical parameters of a 50 percent share ratio and a cost ceiling of 120 percent, we consider the price and profit outcomes. The government is guaranteed the project will cost less than this ceiling and has a roughly 45 percent confidence level that the project will cost less than the targeted $1 billion. This is calculated simply by adding the probabilities for all outcomes below $1 billion.

Increased odds of an outcome close to the target price form a "hill." In fact, 53 percent of outcomes are just above or below $60 million of the target price.

The spike around $1.1 billion illustrates that the government has a higher probability of reaching a total price near the ceiling price, instead of the target price, because the underlying cost S-curve implies a good chance of outcomes above the target cost. During the price simulation, the model projected total price to equal ceiling price each time the S-curve resulted in a cost greater than the target ceiling cost.

The contractor has some uncertainty in this scenario. There is a 25 percent likelihood that its profit will be less than $50 million and a 15 percent likelihood that it will lose money (calculated by adding the probability of all outcomes with profits less than $50 million and zero dollars, respectively). On the upside, the contractor has a 60 percent chance of making more than $100 million.

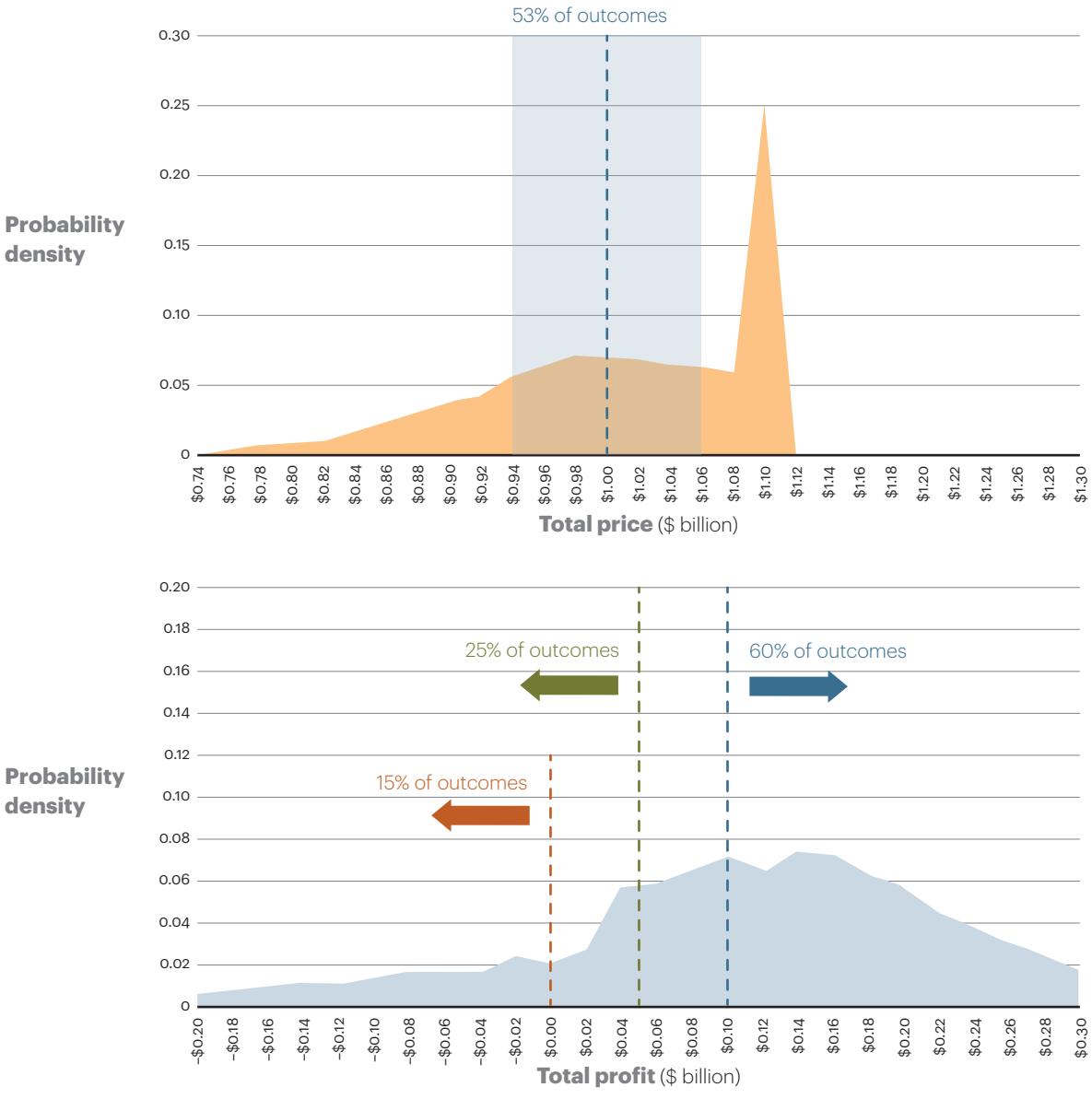
Modifying parameters

By changing the FPIF parameters, it is possible to define a contract that may better meet each party's risk appetite. Modifying these parameters can create win-win situations for the government and contractors.

Figure 4

Projected price and profit outcomes with 50 percent share ratio and 120 percent cost ceiling

Illustrative



Source: A.T. Kearney analysis

Modifying terms to satisfy different risk appetites. Changing the share ratio to 80 percent and the cost ceiling to 130 percent results in a new distribution (see figure 5 on page 7). The government has absorbed more risk, which is evidenced in a flatter, less volatile distribution in price probabilities. It has relatively similar odds with most price outcomes. Analyzing those close to the target price shows that the government now only has a 34 percent chance of an outcome that is just above or below $60 million of the target price—a substantial drop from the earlier scenario's 53 percent chance.

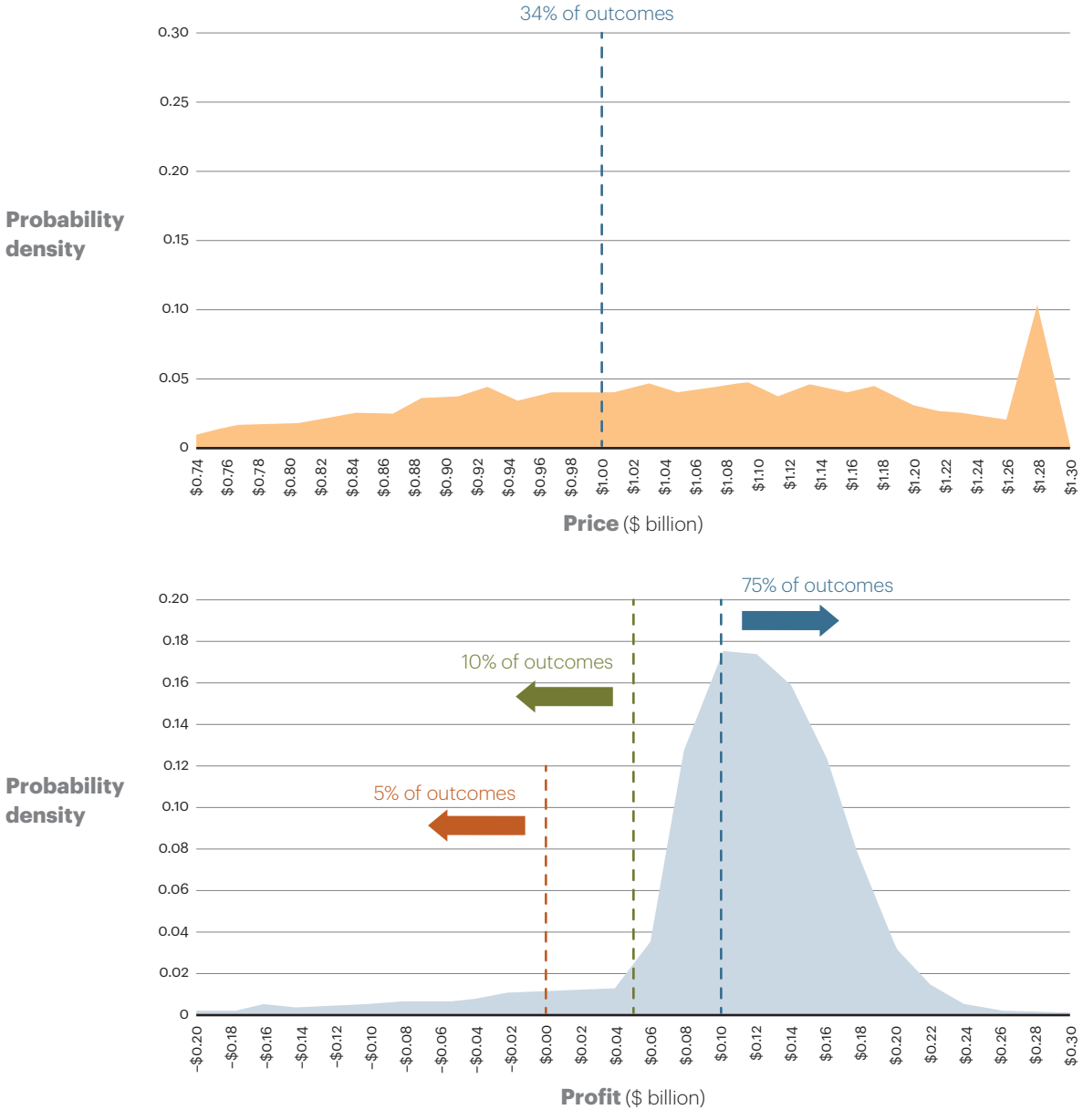
The lower peak shows that the likelihood of the contractor hitting the cost ceiling is also reduced, but the ceiling itself is now higher than in the previous example.

In this final modification of the scenario, the narrower profit curve in figure 5 illustrates the contractor's higher certainty of profit and lower odds for loss. Earning less than $50 million falls to just 10 percent, and the contractor now has 75 percent confidence of earning at least $100 million. Further, the expected profit is $129 million, higher than with the original FPIF parameters.

Figure 5

Projected price and profit outcomes with 80 percent share ratio and 130 percent cost ceiling

Illustrative



Source: A.T. Kearney analysis

Better Outcomes

While cost-plus contracting may be simpler at the outset, FPIF is better in the long run at helping government programs achieve better cost outcomes. Modeling price alone does not predict human behavior, but modifying the cost S-curve during negotiations can help evaluate compensation plans and their likelihood of achieving the total price outcome that will appease government programs and contractors alike.

Authors

Steven Hurt, partner, Washington, D.C.
steven.hurt@atkearney.com

Ryan Elliott, principal, Washington, D.C.
ryan.elliott@atkearney.com

The authors wish to thank Christopher Merlo and Geoffrey Quint for their valuable contributions to this paper.

A.T. Kearney

A.T. Kearney is a leading global management consulting firm with offices in more than 40 countries. Since 1926, we have been trusted advisors to the world's foremost organizations. A.T. Kearney is a partner-owned firm, committed to helping clients achieve immediate impact and growing advantage on their most mission-critical issues. For more information, visit www.atkearney.com.

Americas	Atlanta	Detroit	San Francisco
	Bogotá	Houston	São Paulo
	Calgary	Mexico City	Toronto
	Chicago	New York	Washington, D.C.
	Dallas	Palo Alto	
Asia Pacific	Bangkok	Melbourne	Singapore
	Beijing	Mumbai	Sydney
	Hong Kong	New Delhi	Tokyo
	Jakarta	Seoul	
	Kuala Lumpur	Shanghai	
Europe	Amsterdam	Istanbul	Oslo
	Berlin	Kiev	Paris
	Brussels	Lisbon	Prague
	Bucharest	Ljubljana	Rome
	Budapest	London	Stockholm
	Copenhagen	Madrid	Stuttgart
	Düsseldorf	Milan	Vienna
	Frankfurt	Moscow	Warsaw
	Helsinki	Munich	Zurich
Middle East and Africa	Abu Dhabi	Dubai	Manama
	Doha	Johannesburg	Riyadh

For more information, permission to reprint or translate this work, and all other correspondence, please email: insight@atkearney.com.

The signature of our namesake and founder, Andrew Thomas Kearney, on the cover of this document represents our pledge to live the values he instilled in our firm and uphold his commitment to ensuring "essential rightness" in all that we do.