

# Liars! Why Cost Estimators and Budgeters Inflate and Underestimate Costs!

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ICEAA 2016 Professional Development and Training Workshop



SYSTEMS THINKING. SMARTER SOLUTIONS.™

- Purpose: Why has government cost estimating become inherently flawed?
- What is Cost Realism?
- Department of Defense Acquisition
  - Fixed-Price vs. Cost Reimbursable Contracts
  - Competitive vs. Sole Source Proposals
  - Technical Advisory Reports
- Evaluating Estimates for Realism
  - Techniques
  - Point Estimates vs. Range Pricing
  - Risk Implementation
  - Cost Element Prioritization
- Maximizing Taxpayer Value
- Summary
- Contact Us
- References





# Purpose

- Projects and programs regularly suffer from both uninformed cost estimates and suboptimal contracts
  - Uninformed cost estimates lead to insufficient budgets and unanticipated cost overruns
  - Suboptimal contracts set a precedent for all future purchases
- The fallacy of the DoD budgeting process
  - Program offices are resistant to reduce budgets due to fear that government will pull money back
- How can we as cost analysts turn this into a positive?
  - Evaluate contractor estimates for cost realism and use contract negotiations to maximize taxpayer value

This presentation will focus on strategies to assist program analysts in reviewing cost estimates to:

- (1) determine the overall quality of the estimate
- (2) determine the reasonableness of the ratios and factors used within the estimates
- (3) properly analyze, interpret, and apply historical data
- (4) incorporate risk and uncertainty into estimates in order to achieve a range of possible values

# What is Cost Realism?

Cost realism analysis is the process of independently reviewing and evaluating specific elements of a cost estimate to determine whether the cost elements:

- Are realistic for the work to be performed
- Reflect a clear understanding of contract requirements
- Are consistent with the unique methods of performances and materials described in the technical proposal<sup>1</sup>



<sup>1</sup> Contract Pricing Finance Guide, ch. 8



# Department of Defense Acquisition

- DoD budgets billions of dollars for goods, services, programs, etc. per year (\$560B in FY15, \$580B in FY16, \$582B in FY17)<sup>2</sup>
- Program Offices need a better picture of “will-costs” to be able to identify cost drivers and drive better buying power<sup>3</sup>
- How do we achieve this?
  - Improve acquisition processes
  - Shift from point estimates to ranged estimates
  - Achieve a more effective negotiation position and strategy
- Effective risk analysis:
  - Identifies key cost drivers
  - Models potential cost outcomes
  - Calculates range for uncertainty



<sup>2</sup> U.S. DoD Fiscal Year 2017 Budget Request

<sup>3</sup> DoD Better Buying Power Initiatives



# Fixed-Price vs. Cost Reimbursable

- **Cost-reimbursement contracts:** use cost realism analysis to determine the probable cost of performance
- **Fixed-price contracts:** use cost realism analysis to assess responsibility and contract performance risk when:
  - New requirements may not be fully understood by competing contractors
  - There are quality concerns
  - Past experience indicates that contractor's proposed costs have resulted in quality or service shortfalls





# Competitive vs. Sole Source Proposals

- Exceptions from a Competitive Procurement: 10 U.S.C 2304 (c) or 41 U.S.C. 253(c)<sup>4</sup>
  - (1) Only one responsible source and no other supplies or services will satisfy agency requirements
  - (2) Unusual and compelling urgency
  - (3) Industrial mobilization; engineering, developmental, or research capability; or expert services
  - (4) International Agreement
  - (5) Authorized or required by statute
  - (6) National security
  - (7) Public interest



VS



- Drawbacks of sole source
  - Requires more upfront documentation and justification
  - Little incentive for contractors to control costs
- Program offices need additional resources to determine if costs are fair and reasonable

<sup>4</sup> US Code: 41 U.S.C. 253(c) and 10 U.S.C. 2304(c)





# Technical Advisory Report (TAR)

- The TAR is the program office's evaluation to determine if the contractor's proposed costs are fair and reasonable
  - Accompanied by working Excel cost model
- Review includes:
  - Labor Hour Bases of Estimates (BOEs)
  - Direct Material
  - Other Direct Costs (ODC)
  - Labor and burden rates
- Typically results in point estimate
  - Recommended position to start negotiations



When evaluating labor BOEs, estimators need to carefully scrutinize:

- Complexity Factors
  - Challenge factors  $< 0.5$  and  $> 1.5$
- “Engineering Estimates” or SME input
  - Request backup data or alternate estimating method
- Touch/Support Labor Learning Curves
  - Verify the process, validate the results
- Future predictive rates that vary from inflation
  - Ensure rates fit within context of estimate

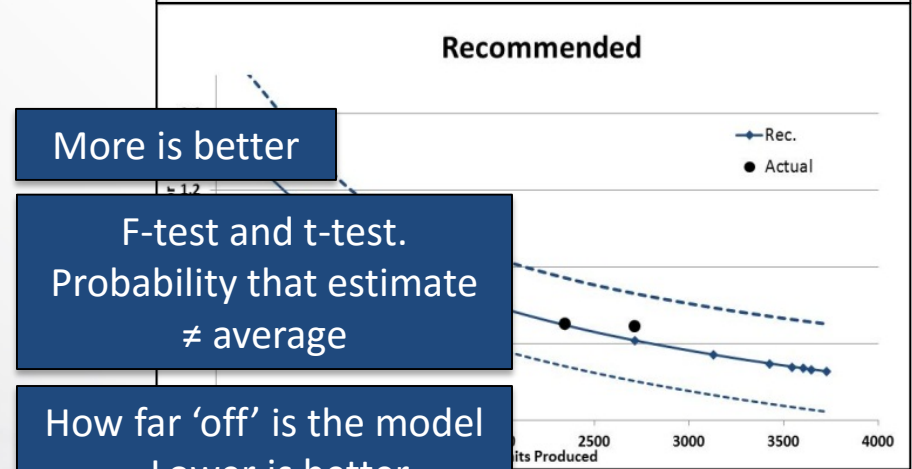
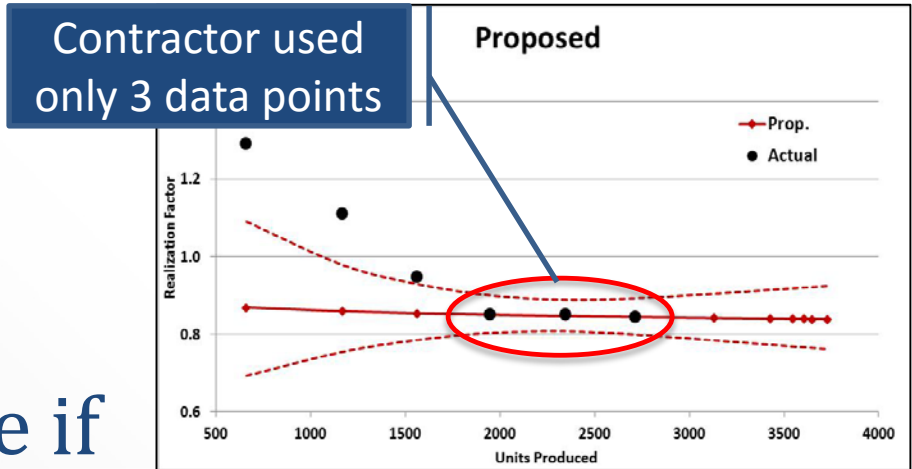




# Learning Curve Example

- Touch and Support Labor typically use learning curves
- How do we determine if this is reasonable?

Stat	Prop	Rec
n/df	3/1	6/4
Significance F	.380	.001
X Var. P-Value	.380	.001
SE (log space)	.003	.043
R <sup>2</sup>	.683	.952



F-test and t-test.  
Probability that estimate  
≠ average

How far 'off' is the model  
– Lower is better

Amount of variability explained by  
model – higher is better



# Labor BOE Example

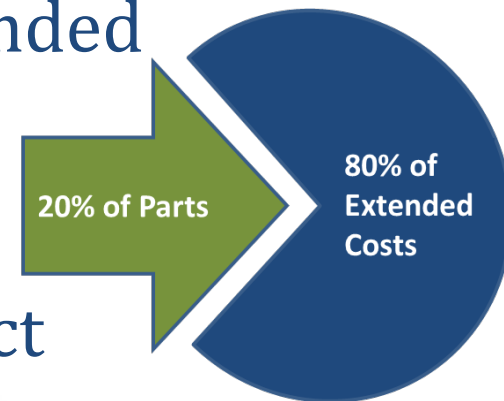
- Contractor proposed using Compound Annual Growth Rate (CAGR) to project future labor required for a subcontractor

PO	PO Dates	Total Value	Monthly Average	Yearly Total
1	7/1/2010 - 12/31/2010	\$ 72,000	\$ 12,000	\$ 144,000
2	1/1/2011 - 6/30/2011	\$ 72,000	\$ 12,000	\$ 144,000
3	1/1/2012 - 12/31/2012	\$ 200,000	\$ 16,667	\$ 200,000
4	1/1/2013 - 6/30/2013	\$ 100,000	\$ 16,667	\$ 200,000

- Result was a projected 11.5% increase
- CAGR is an investment metric and should not be used for labor cost projections.

## When evaluating material costs:

- Use Pareto principle based on extended costs to save time
- Ensure quotes are valid
- Consider Quantity Curve/Rate Effect
- Apply appropriate inflation
- Don't overlook labor bid as material (from sub-contractors)

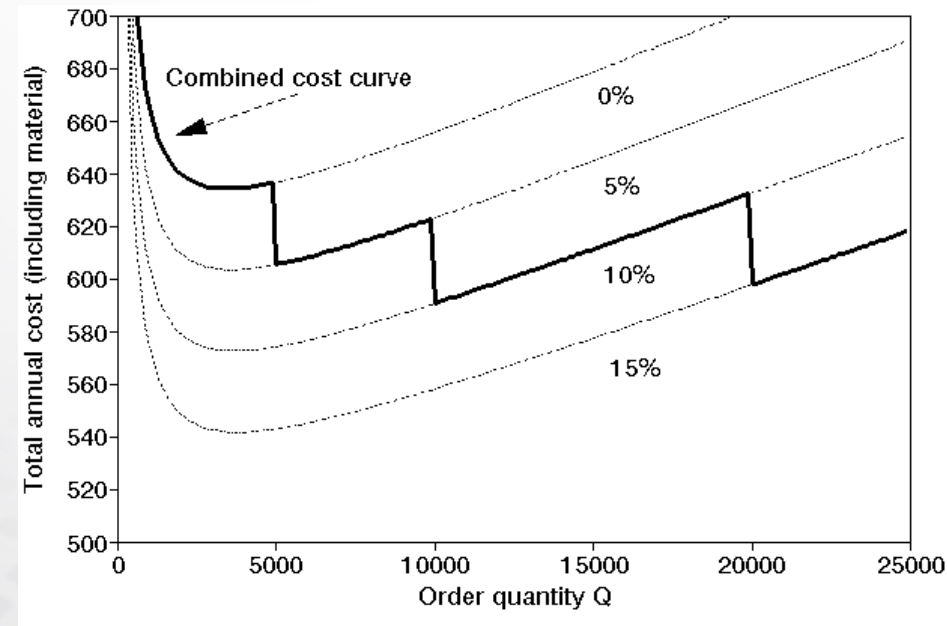


**Recent Purchase Order history > Quotes > Estimates**



# Quantity Curve/Rate Effect

- Compare PO History to valid Quotes
  - Contractors can typically achieve a price reduction through negotiations
- Determine Bid to Buy Ratio
  - Make/Buy decisions
  - Step-Down factors
  - Major subcontractors



## Other Direct Costs can makeup a large portion of cost estimates:

- Travel Costs should be carefully examined
  - Number and purpose of trips
  - Business vs. Coach travel
- Shipping & transportation
  - Should the contractor be charging for these?
  - Are there efficiencies to be gained?
- Licensing





# Evaluating Rates

Labor & Burden rates also need to be evaluated:

- For burden rates, validate with DCMA/DCAA
- For Profit/Fee rates, use DD-1547 Weighted Guidelines Form

RECORD OF WEIGHTED GUIDELINES APPLICATION						REPORT CONTROL SYMBOL		
						DD-AT&L(Q)1751		
1. REPORT NO.	2. BASIC PROCUREMENT INSTRUMENT IDENTIFICATION NO.				3. SPIIN		4. DATE OF ACTION	
	a. PURCHASING OFFICE	b. FY	c. TYPE PROC INST CODE		d. PRISN		a. YEAR	b. MONTH
5. CONTRACTING OFFICE CODE					ITEM	COST CATEGORY		OBJECTIVE
6. NAME OF CONTRACTOR					13. MATERIAL			
					14. SUBCONTRACTS			
7. DUNS NUMBER			8. FEDERAL SUPPLY CODE		15. DIRECT LABOR			
					16. INDIRECT EXPENSES			
9. DOD CLAIMANT PROGRAM			10. CONTRACT TYPE CODE		17. OTHER DIRECT CHARGES			
					18. SUBTOTAL COSTS (13 thru 17)			0.00
11. TYPE EFFORT			12. USE CODE		19. GENERAL AND ADMINISTRATIVE			
					20. TOTAL COSTS (18 + 19)			0.00
WEIGHTED GUIDELINES PROFIT FACTORS								
ITEM	CONTRACTOR RISK FACTORS		ASSIGNED WEIGHTING	ASSIGNED VALUE		BASE (Item 20)		PROFIT OBJECTIVE
21.	TECHNICAL		%					
22.	MANAGEMENT/COST CONTROL		%					

**FPRA > FPRR > FPRP**





# Dynamic Cost Model

Total Price		Print Reports	
Total Proposed Price	\$ 10,320,142		
Total Recommended Price	\$ 5,905,005		
<b>Delta</b>	<b>\$ 4,415,138</b>	<b>42.78%</b>	

**Input Profiles**

- Proposed
- NAVSEA
- DCAA
- Aggressive
- Moderate

**Manage Inputs**

**Contracting Inputs**

Rates	FPRR	▼	<u>Comments:</u>
Profit	Aggressive: 0.0832	▼	<hr style="border: 1px solid black;"/>
Include Profit on ODCs	No	▼	
Profit on Fixed Fee CLIN	0.1	▼	
Yellow Sheet Changes?	Yes	▼	

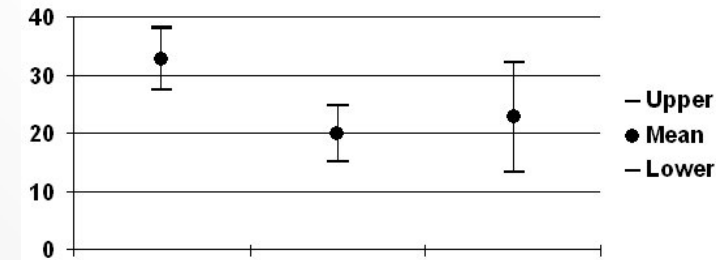
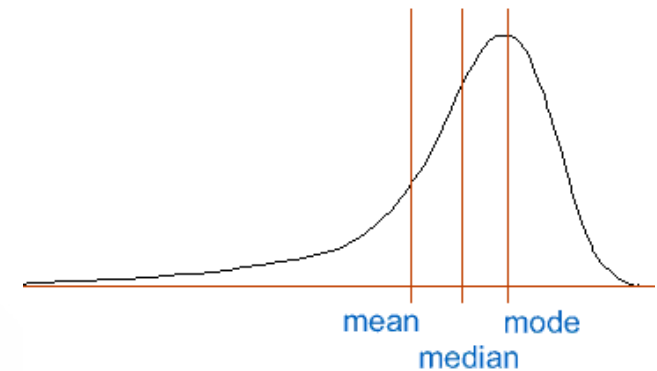
**Technical Inputs**

WBS 1.1.1.1.1 - Use inflation vs. CAGR?	Yes	▼	<u>Comments:</u>
WBS 1.1.1.1.2 - Use 2011-2013 data vice just 2013 data?	Yes	▼	CAGR is an investment metric and should not be used for suppliers
WBS 1.1.1.1.3 - Use past history data vice engineering estimate?	Aggressive	▼	More data gives a better representation of effort needed
			Use 2011-2013 past actuals data (120 hours/unit)



# Point Estimate vs. Range Pricing

- Point estimate provides an educated guess for an unknown cost
  - In what context is the point estimate (mean, mode, percentile)?
  - Limited insight into risks (accuracy) and uncertainty (precision) associated with contract
- Range pricing allows for uncertainty to be incorporated in the cost estimate
  - Depicts fluctuation of total price based on the inputs supplied



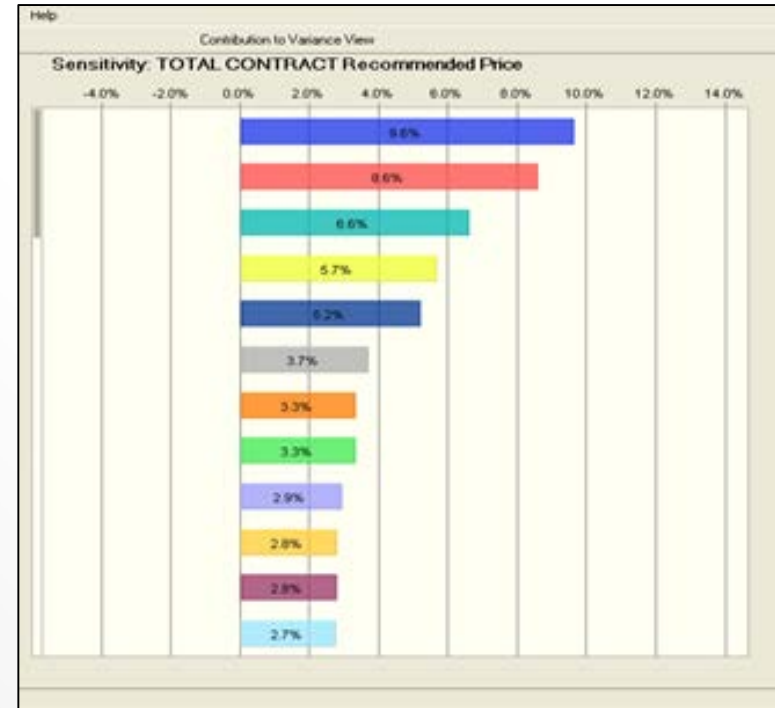
- Any cost element in a proposal is subject to some form of risk or uncertainty, including:
  - Labor hours
  - Learning curve slopes
  - Inflation indices
  - Material quotes/pricing
  - Engineering estimates
- To incorporate this risk and uncertainty, each element is assigned a statistical distribution:
  - Distribution chosen based on relevant information for that cost element





# Cost Element Prioritization

- Tornado chart measures each cost element's impact to final price
  - Single-factor sensitivity analysis
  - Given as a percentage of contribution to variance
- Identifies cost drivers
  - Allows for prioritization of most significant cost elements during negotiations
  - Helps when procurement schedules are tight





# Maximizing Taxpayer Value

- Fixed Price vs Cost-Plus
  - Fixed Price: Focus on amount of risk the Government is willing to accept
  - Cost-Plus: Focus on the right labor mix to ensure affordability
- Hardware vs Services
  - Hardware: Focus on adding critical O&S spares or additional units for testing capability
  - Services: Focus on maximizing capabilities gained

- We are living in the reality where programs don't want to lose budget, so cost estimates and resulting contracts suffer
- Cost realism gives the Government a clear view of what the program "Will Cost" and an accurate basis for future "Should Cost" estimates
- Through smart contract negotiations, this view can be leveraged to maintain current budgets AND maximize the value of each contract



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# References

- 1) Contract Pricing Finance Guide, ch. 8
- 2) U.S. DoD Fiscal Year 2017 Budget Request
- 3) Department of Defense Better Buying Power Initiatives
- 4) US Code: 41 U.S.C. 253(c) and 10 U.S.C. 2304(c)