Oregon Department of Transportation

Office of Project Letting:

Cost Estimating Process

August 12, 2010

Current Practice

- **Estimates Created by Project Team**
- **Central Review is Performed**
- **Commodity Prices Updated/Adjusted**
- **Plans & Specifications are Reviewed**

Some Methods Used

- **CEVP Used on Some Projects**
- **Anticipated Items Used to Manage Risk**
- **Have Not Chased Market**
- **Use A+C Contracting to Manage Risk**
- **Seeking FHWA Input on Approaches**

OTIA III State Bridge Delivery Program:

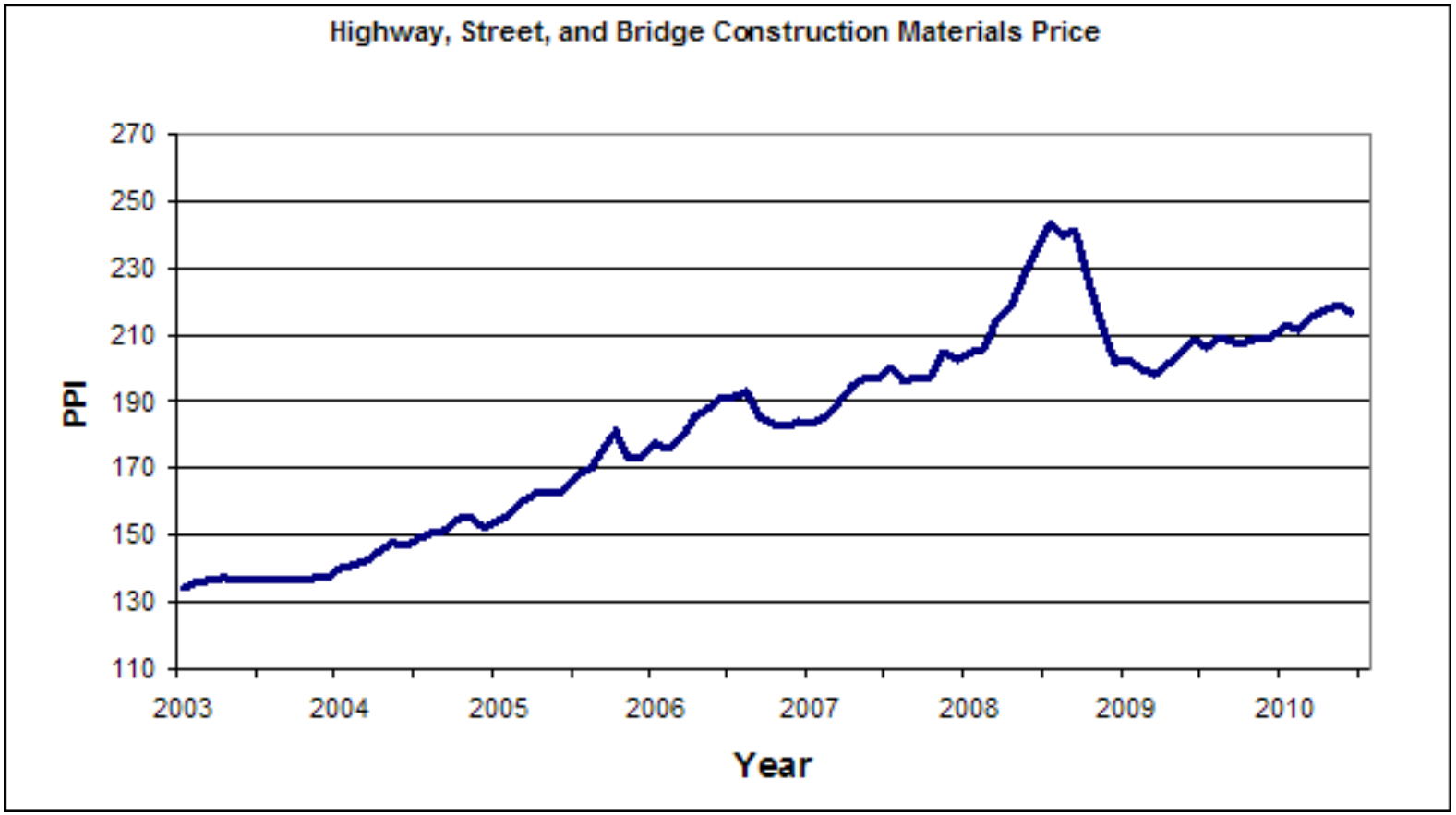
Cost-Risk Analysis

Cost Risk Analysis

What is Cost Risk Analysis for OTIA III?

Method Used to Quantify Unit Cost Component Elements in order to Bridge the Engineer/Construction Contractor Expectations Gap, and to Improve Estimating Efficiency

Why Perform Cost Risk Analysis



Why Perform Cost Risk Analysis

- 30% Rise in Material Costs 2003-2006
- 86% Rise in Material Costs 2003-2008
- Utilized as a Tool for Management Decision Making in Fixed Budget Environment
- Utilized as a Tool for Planning and Cost Management
- Allowed for Active Management of Risk Drivers
- Provides Early Indication of Problems on Program/Project for Proactive Response

Why Perform Cost Risk Analysis

- Identifies Program/Project Cost Risks
- Utilized as a Tool for Management Decision Making
- Utilized as a Tool for Planning and Cost Management
- Allows for Active Management of Risk Drivers
- Provides Early Indication of Problems on Program/Project for Proactive Response

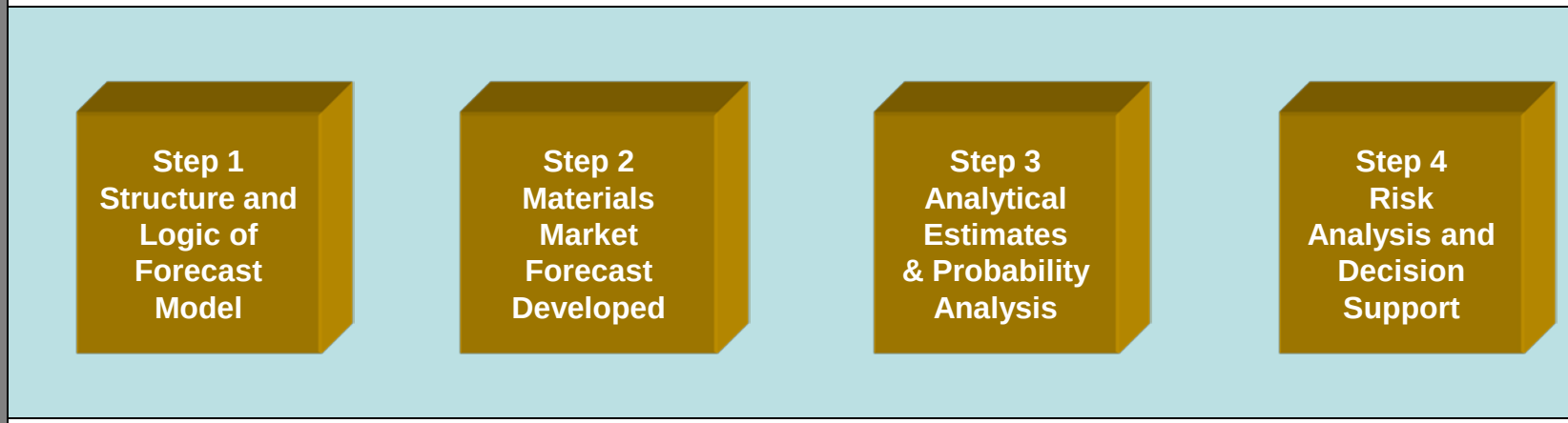
Why Perform Cost Risk Analysis

Bundle 210 – Sandy River

- Initial Analysis Showed High Cost for Concrete Bridge Due to Amount Needed for Footings
- Determined Steel As Less Expensive Alternative
- Redesigned to Steel
- Bids Came in Much Lower Than Originally Estimated

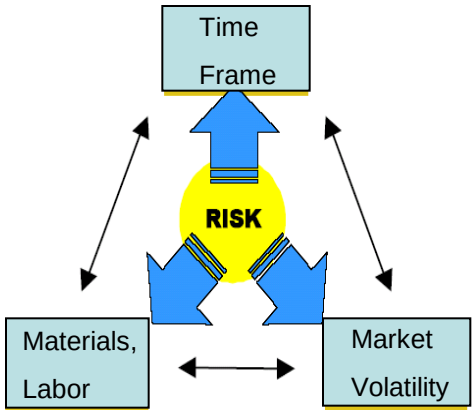
Risk Analysis Process

A Four-Step Process



The Context – Risk Exposures

For Individual Project Cost Estimates



Risk Causes

- Technical issues
- Pricing uncertainty
- Industry Capacity
- Available resources
  - Labor
  - Unit Quantities
- Location
- Market Volatility
- Regional Market Conditions
- Historical Pricing Trends
- Seasonality
- Time of Construction Bid
  - Year
  - Time of Year

Risk Impacts

- **Individual Unit Cost Risks**
  - *Risk that budget elements (unit prices, quantities) will deviate from the estimate.*
- **Volatility and Pricing Risks**
  - *Risk of labor and material markets rapidly changing by the time a project goes to construction.*
- **Location and Timing Risks**
  - *Risk of significant cost premiums due to time of bid, year of bid, industry capacity, and location of project.*

Summary of Process for Performing Cost Validation

- Obtain cost estimate from A&E firm
- Identify specific problems (missing items, misidentified items)
- Set up cost-risk model to run using Risk Analysis software
- Develop Cost Ranges on Each Line Item
- Develop report to give to internal engineering staff regarding results
- Iterate through process throughout the design phase

Economic Analysis

- Cost Ranges Developed Considering Market factors such as
  - NW Market conditions (for materials & escalation)
  - Location & duration of work
  - Time frame of when work is bid (early vs. late)
  - Capacity of the construction industry in the State
  - Materials (steel vs. concrete)
  - Economies of scale obtained

Engineering Input

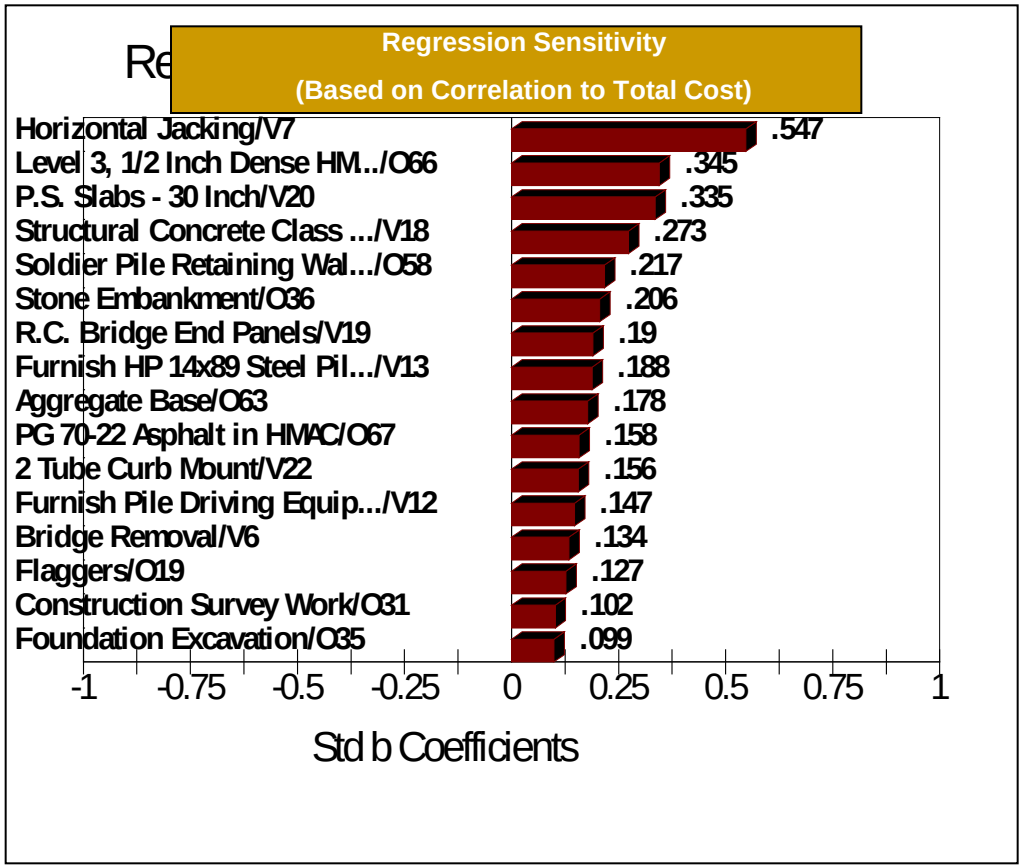
- Input from engineers is incorporated into the formulation of risk model:
  - Information which may drive costs that engineers know, but is not apparent looking at cost data alone
  - Information regarding the project that may be unique (tightly curved bridges, isolated location with unique issues, etc.)
    - Spliced reinforcing steel or staged pours
    - Limited work window

Results

- Each independent line item has its own unique distribution determined by the defined price parameters
- High Risk (to overall cost) Items Are Identified in Report
- A&E Firm Makes Adjustments to Estimate
- Process re-run at Advance Plans and Final PSE

Results

Tornado Diagram developed to show highest risk items in the Project



Cost Risk Validation/Analysis

Why Use Cost Risk Analysis

- Identifies Program/Project Cost Risks
- Helped Capture Fast Moving Material Costs
- Utilized as a Tool for Management Decision Making
- Utilized as a Tool for Planning and Cost Management
- Allows for Active Management of Risk Drivers
- Provides Early Indication of Problems on Program/ Project for Proactive Response

Real Benefits

- Difference between engineering cost estimates and construction bids drastically reduced.
  - Down from differential of more than 30% to 7%
- Aids in realizing true ‘market’ cost of a project
- Material risks realized early in the design phase
- Provides discussion piece for value engineering

Results

Average Absolute Differential			
	DAP*	Advance Plans	Final PS&E
A&E Firms	29.81%	26.12%	12.28%
OBDP ESG	7.91%	8.00%	7.41%

*OBDP DAP Estimates don't include Bundles 205 and 222. Bundle 205 added 14 repair bridges after DAP analysis was performed. Bundle 222 had a change in scope, as well as additional materials to be utilized after DAP analysis. **This will be updated – I can use through 2008 which is latest update now**

Results II

Weighted Average Absolute Differential			
Differential to: Low Bid	**DAP***	**Advance Plans**	**Final PS&E**
A&E Firms	37.40%	28.84%	15.26%
OBDP ESG	52.52%	31.42%	23.18%
OPL Estimate	-	-	41.19%

*OBDP DAP Estimates don't include Bundles 205 and 222. Bundle 205 added 14 repair bridges after DAP analysis was performed. Bundle 222 had a change in scope, as well as additional materials to be utilized after DAP analysis. **This analysis includes bids through June 2010 and the difference between this and the other table is largely related to how low bids have come in since 2008.**

QUESTIONS?