



Dealing with Economic Volatility

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Agenda

- **Introduction**
- **Review Economic and Capex Volatility**
- **Define Escalation**
- **Review Traditional Estimating Practices**
- **Review a Best Practice for Estimating Escalation Considering Capex Volatility**
- **Conclusions**



Purpose

- ▶ Discuss recent volatility in the **Capex** market including levels of spending *and* prices
- ▶ Discuss **Escalation**, which is where Cost Engineers deal most directly with Economic Volatility
- ▶ Present a proposed **Best Practice** for Escalation Estimating



John K. Hollmann, PE CCE CEP

- **30 years experience in engineering, project control, cost estimating, consulting, benchmarking**
- **Owner, Validation Estimating LLC since 2005**
 - **Specialize in helping owner companies improve their cost engineering/project control capabilities**
- **International Cost Engineering Associations**
 - **Current AACE Tech Director: Recommend Practices**
 - **Current AACE Co-Chair Decision and Risk Management Professional (DRMP) Certification Task Force**
 - **Past Director, ICEC Region 1 (Americas)**
 - **Past AACE Board Member**



Validation Estimating LLC Clients (since 2006)

- ▶ **Aramco (Saudi Arabia)** ▶ **Nuon (Netherlands)**
- ▶ **Braskem (Brazil)** ▶ **Ontario Power (Canada)**
- ▶ **BP (US)** ▶ **Petro-Canada (Canada)**
- ▶ **Black&Veatch (US)** ▶ **Rio Tinto Alcan (Canada)**
- ▶ **Dow Corning (US)** ▶ **Sasol (S. Africa)**
- ▶ **Eastman (US)** ▶ **Suncor (Canada)**
- ▶ **Ecopetrol (Colombia)** ▶ **Synenco (Canada)**
- ▶ **Enbridge (Canada)** ▶ **Syncrude (Canada)**
- ▶ **Husky (Canada)** ▶ **TransCanada (Canada)**
- ▶ **Manitoba Hydro (Canada)** ▶ **Vale (Brazil)**
- ▶ **Nalcor Energy (Canada)** ▶ **Votorantim (Brazil)**



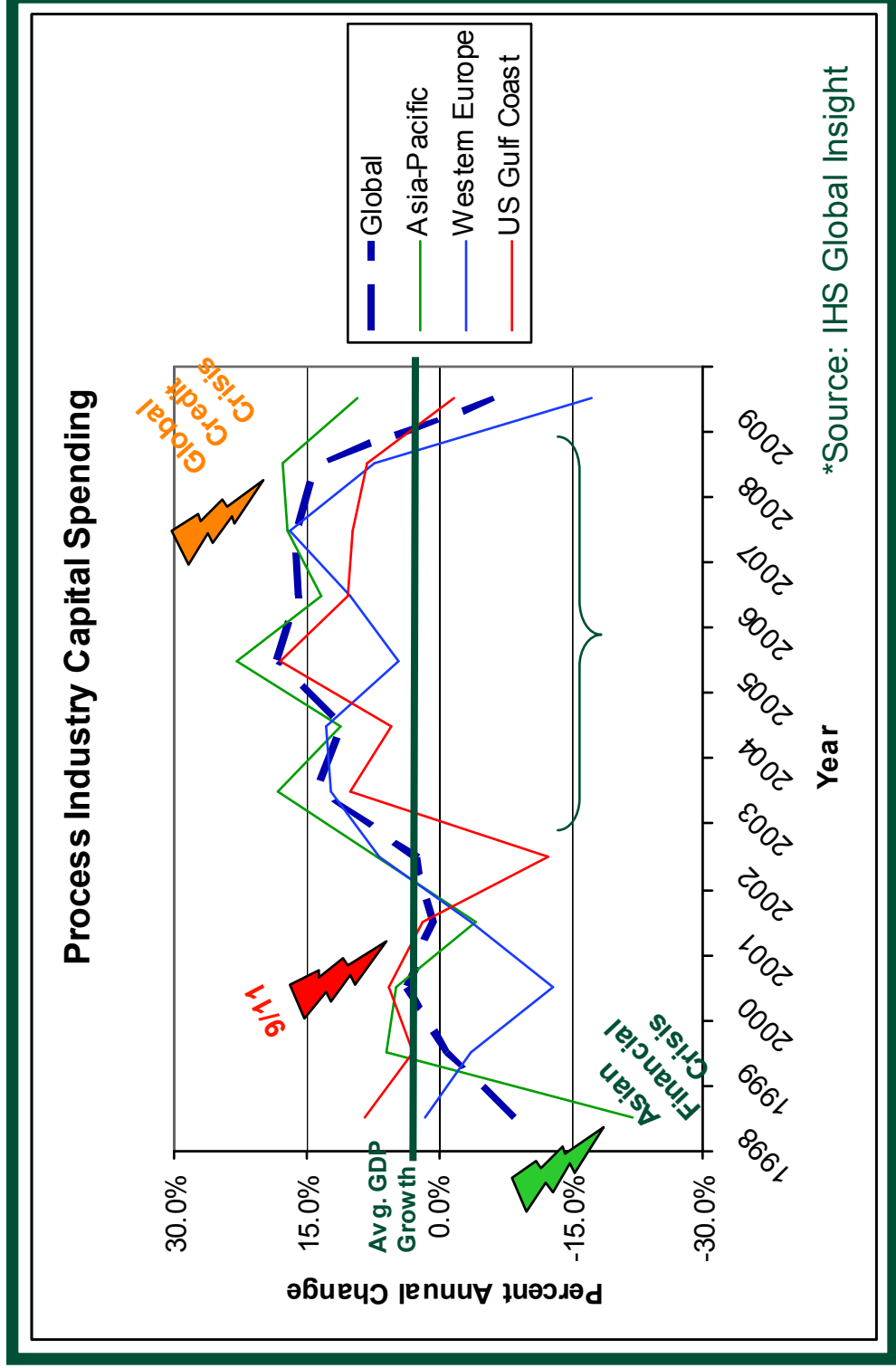
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“May You Live In Interesting Times”

Recent Capex Volatility

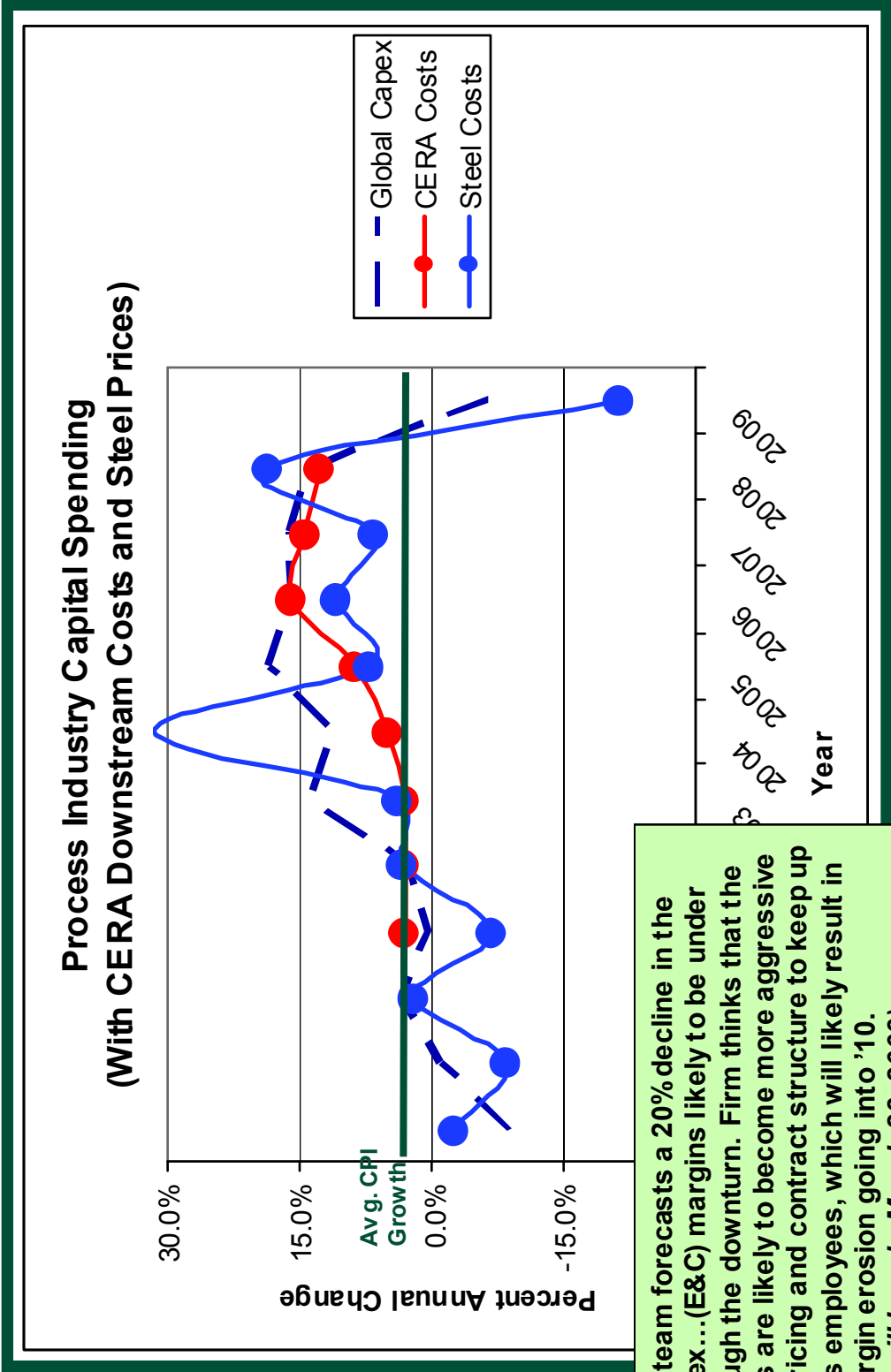
(percent annual change)



“Give Me One More Boom Before I Retire”

Capital Cost Volatility

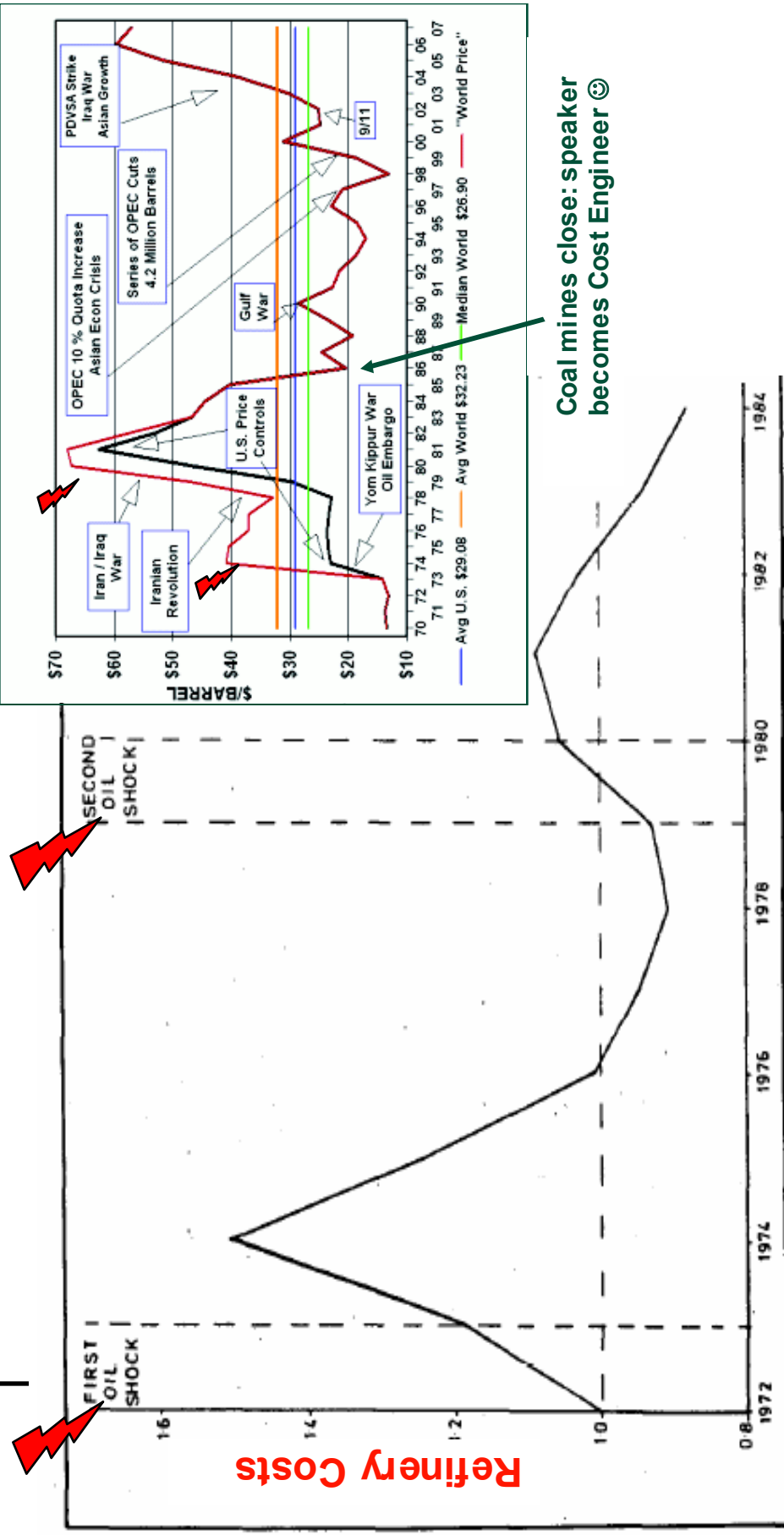
(percent annual change)



...Oil & Gas team forecasts a 20% decline in the sector's capex...(E&C) margins likely to be under pressure through the downturn. Firm thinks that the E&C companies are likely to become more aggressive in bidding on pricing and contract structure to keep up utilization of its employees, which will likely result in margin erosion going into '10.
(Merrill Lynch, March 23, 2009)

This Has Happened Before

1973-1986 Oil Shocks



From: "Cost Estimating-Dealing With Uncertainty", Wright, P.A., and T.V. Hill, AACE Transactions", 1986 and www.oilism.com



What Have We Learned?

- ▶ **Volatility is here; we need to deal with it**
- ▶ **Commodity Boom=Capex Boom (with lag)**
- ▶ **Financial Bust=Capex Bust (with lag)**
- ▶ **We do not learn our lessons well**
 - Cost Engineers were unprepared for “China effect” in 2004 and the climb in capex EPC prices thereafter
 - How many of you saved your money in last boom?
- ▶ **We need to start using best practices to try to forecast capex affects on prices**
 - Also, our historical data will be useless if we don't capture the real trends (better normalization)



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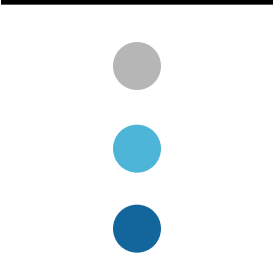
Escalation

- **Changes in price levels driven by economic conditions (volatile or not)**
- **Includes economic conditions that prevail in your micro-economy such as:**
 - **Industry productivity and technology**
 - **Industry and regional market conditions (demand, labor shortages, margins, etc.)**
- **Includes, but differs from inflation which is a caused by debasement of a currency**
- **Varies for different cost items, regions, procurement strategy, etc.**



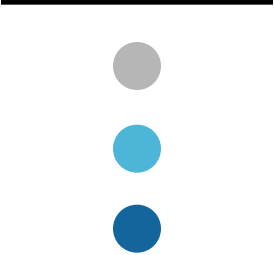
Escalation is a Risk

- ▶ Future pricing is highly uncertain
- ▶ It must be managed and controlled as a risk fund:
 - a separate cost account in the control budget that is managed using Change Management
 - estimated using probabilistic methods (i.e., estimate outcome should be a probable cost distribution from which management selects their desired level of confidence (e.g., p50) of underrunning



Escalation Includes Economically Driven Productivity Trends

- ▶ The price you pay for services depends on
 - Vendor's underlying "costs" (e.g., wages)
 - Mark-ups, OH&P, Margins, Premiums
 - **Hours** to provide a deliverable (productivity)
- ▶ Escalation includes *economic-driven* changes in the hours (productivity) such as prevailing shortages of skilled labor resulting from supply/demand imbalance
- ▶ Escalation does not address productivity impacts resulting from your project scope (e.g., site conditions, strategy, practices, etc.)



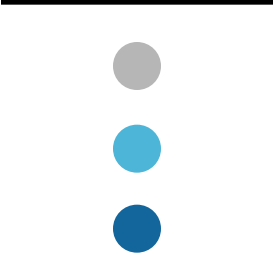
Escalation Includes Often Unrecognized Market Impacts

- ▶ Most people understand that prices change when supply and demand becomes imbalanced
- ▶ What many do not understand is that published “price” indices often do not measure market pricing for the goods and services used in capital projects
 - For example, there are no published indices for the price of construction labor services
 - Bids include markups, overhead and profit; indices only track “worker compensation”)



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Traditional Escalation Estimating Method

- Estimated using price index factors
- Indices are measures of price levels, usually normalized (e.g., 1990 = 1.00)
- Economists forecast future price indices
 - Correlate outcomes of their *macroeconomic* models to trends for specific price indices
- Estimated using index ratios

Escalation = \$base x [(index for date committed)/(index for est. basis date)-1]

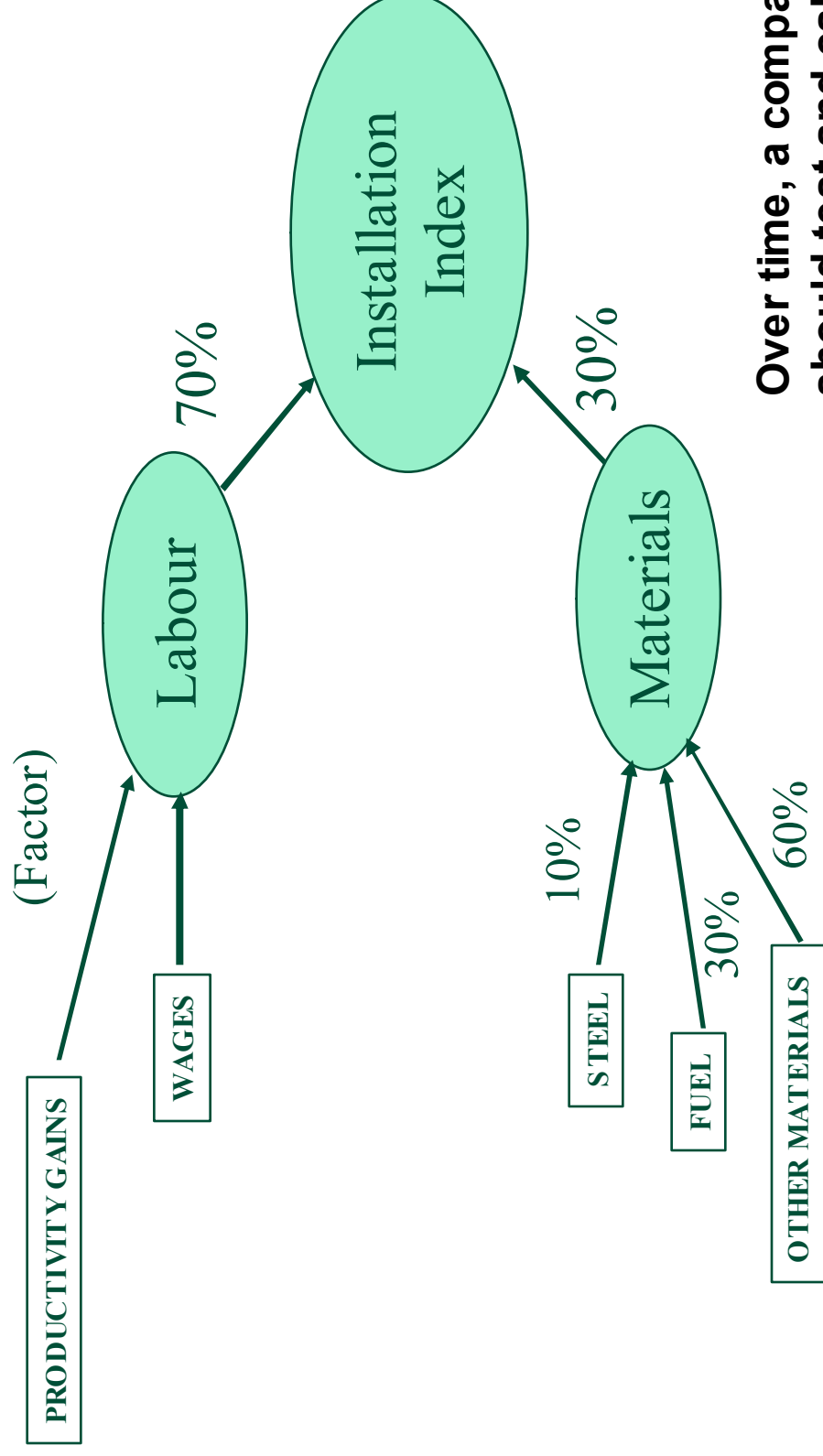
Escalation = \$100 x [1.15/1.00 -1] = \$100 x 0.15 = \$15



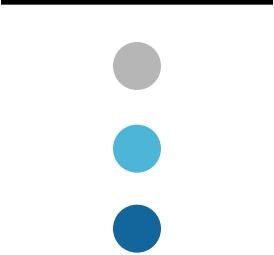
Price Indices

- ▶ **Some sources of historical price indices**
 - Government (BLS, StatsCan, Eurostat, etc)
 - Magazines (ENR, Chemical Engr, etc.)
 - Web Sites (Turner, CERA: note that these two sources are “*cost to owner*” or *sell price indices*)
- ▶ **Challenges for traditional use of indices**
 - **There are no available *forecast indices* that address the current markets for EPC**
 - **You must always adjust indices from any source**

Weighted Indices Are Usually Used



Over time, a company should test and calibrate the weightings



Traditional Escalation Estimating Steps

- Determine cash/commitment flow by summary cost account
- Establish published indices to use
- Use price indices to calculate price increase for each summary account by period
 - **Since 2004 volatility: estimators override indices with subjective values because published indices are not credible (making the whole method suspect)**
- Multiply each time period's expenditure by the cumulative price increase percentage (compounded by period)
- Sum the escalation amounts to derive a point-estimate value (not treated as a risk fund)



Mid-point of Spending Versus Cash Flow Method

- In this approach, the change in price to the midpoint of spending is multiplied x base costs
 - E.g., base account costs: \$1,000 in 2009
 - Duration of spending: 2010 to 2014
 - Price change from 2009 to 2012 (midpoint): 20%
 - Escalation = $\$1,000 \times 20\% = \200
- This is only reliable if...
 - Price change is constant over time
 - Expenditure rate is constant
- Since these condition rarely apply, it is not recommended



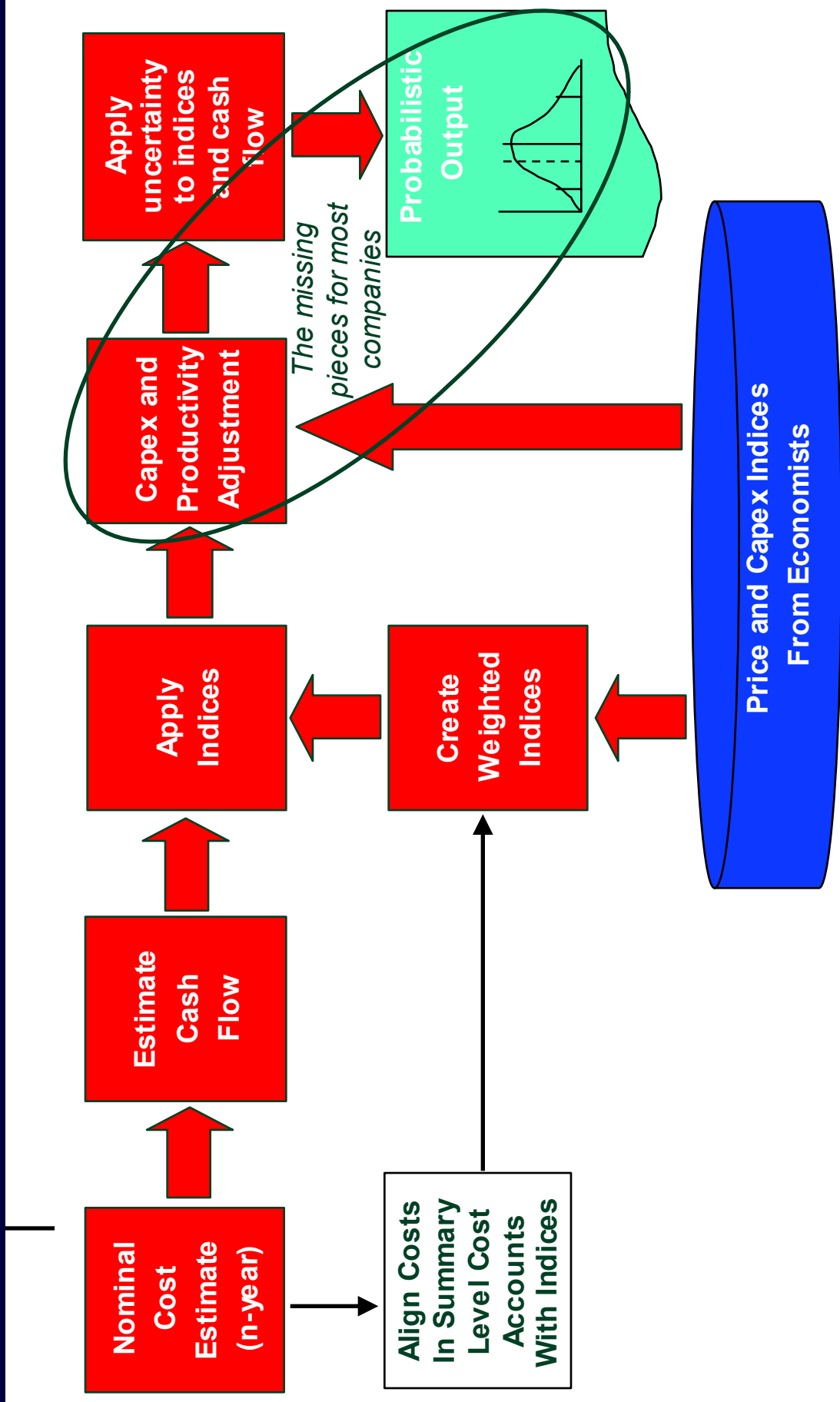
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Escalation Estimating Best Practice

- ▶ Differentiate between escalation, currency and contingency
- ▶ Use indices that address differential price trends between accounts
- ▶ Use indices that address levels of detail for various estimate classes
- ▶ Leverage procurement/contracting specialists knowledge of markets
- ▶ **Leverage economist's knowledge (i.e., based on macroeconomics)**
- ▶ **Ensure that indices address capex market demand**
- ▶ Consistent approach applied in a tool that facilitates best practice
- ▶ Data is calibrated with historical data
- ▶ **Use probabilistic methods**
- ▶ Use the same economic scenarios for business and capital planning
- ▶ Part of an integrated project/cost management process
- ▶ Facilitates estimation of appropriate spending or cash flow profile

Escalation Estimating Process





Obtain Indices from Economists

- ▶ They provide historical and forecast price indices
- ▶ Based on macro-economic models of world economy
 - From this, correlations are made to specific cost items (e.g., wages, steel, etc.)
- ▶ All my clients have been working with *Global Insight*
 - Base subscription of many commodities (many more than used in tool)
 - Special wage & capex indices as requested
- ▶ Updated quarterly (Jan, Apr, July, Oct)
- ▶ Covers 10 years past and 10 future
- ▶ Delivered in Excel spreadsheet; cut and paste operation to transfer to user tools



Adjust Indices for the Capex Market


- ▶ In volatile markets (e.g., since 2003), price indices do not reflect EPC* price trends
 - The prices you pay ≠ what the BLS** surveys
- ▶ Prices are correlated with the seller's leverage
 - high **demand** + limited supply = seller pricing power
 - In short run, many EPC items are in limited supply
- ▶ Reliable price indices can be derived if you have a measure of the **demand** driver (market)
 - Market Index = Base Index (i.e., BLS) x **Demand** Factor

*EPC=Engineering, Procurement, Construction (and also Fabrication)

**BLS = US Bureau of Labor Statistics



Capex Market or Demand Factor

- ▶ Proxy Measure of EPC market = Capex index
 - ▶ Economists forecast Capex for various regions
 - For labor, region is about 800km radius of travel
 - For most materials, a global capex market is assumed
 - ▶ The capex market adjustment factor used by is an exponent applied to the capex increase. For example:
 - Given:
 - underlying wages and other costs to a contractor increase by 8%
 - capex in the associated EPC market increases by 20% (1.2x),
 - capex exponent (i.e., capex market demand factor) is **0.4**,
 - **Price increase = $1.08 \times 1.2^{0.4} = 1.08 \times 1.08 = 1.17$ or 17%**
- 

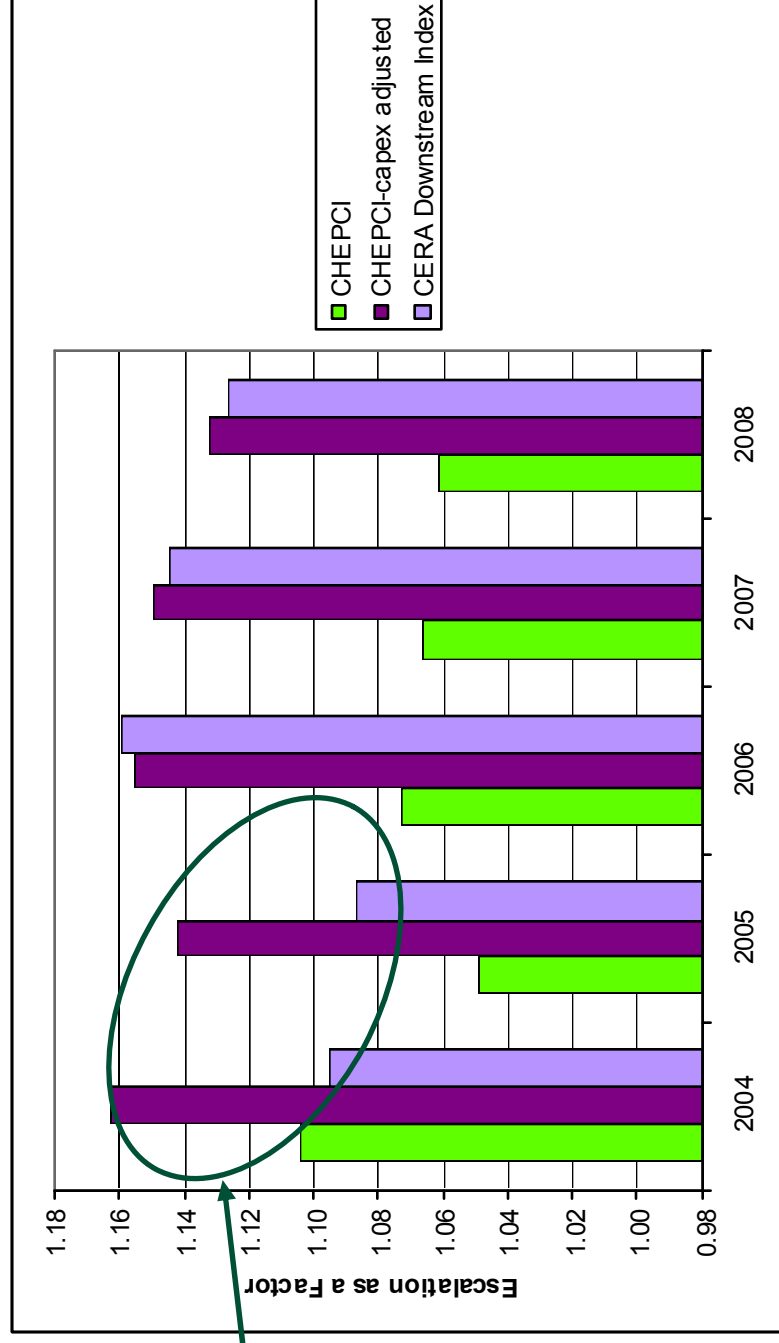


Capex Market Factor

- ▶ **Capex factor exponent varies from 0 (many suppliers) to 0.5 (very few bidders).**
 - **Each cost type will have its own capex factor**
 - **Factor increases with project size (fewer bidders)**
 - **When capex decreases, suppliers may work at a loss**
- ▶ **Estimators need to confirm these factors as experience is obtained**

Empirical Evidence that Capex-Adjusted Method Works

- Comparison of adjusted BLS-based index (adjusted-CHEPCI) vs. *market based benchmark (CERA)*



Market pricing lags the capex increase (same 1-2 year lag as in BP paper from the 1980s) (lag can be addressed in the method using floating averages)

*CHEPCI=Chemical Engineering Plant Cost Index; CERA=Cambridge Energy Research Associates Downstream Cost Index



Volatility Emphasizes Need For Probabilistic Methods

- **Several methods available**
 - **Predetermined ranges**
 - e.g., add X % to each index value
 - **Range estimating**
 - assess high/low on indices and cash flow burn rate and incorporate Monte-Carlo modeling
 - **Scenario analysis**
 - working with business & economists, develop various economic scenarios, assign probabilities and index ranges, and incorporate Monte-Carlo modeling
 - good for linking estimate w/business assumptions

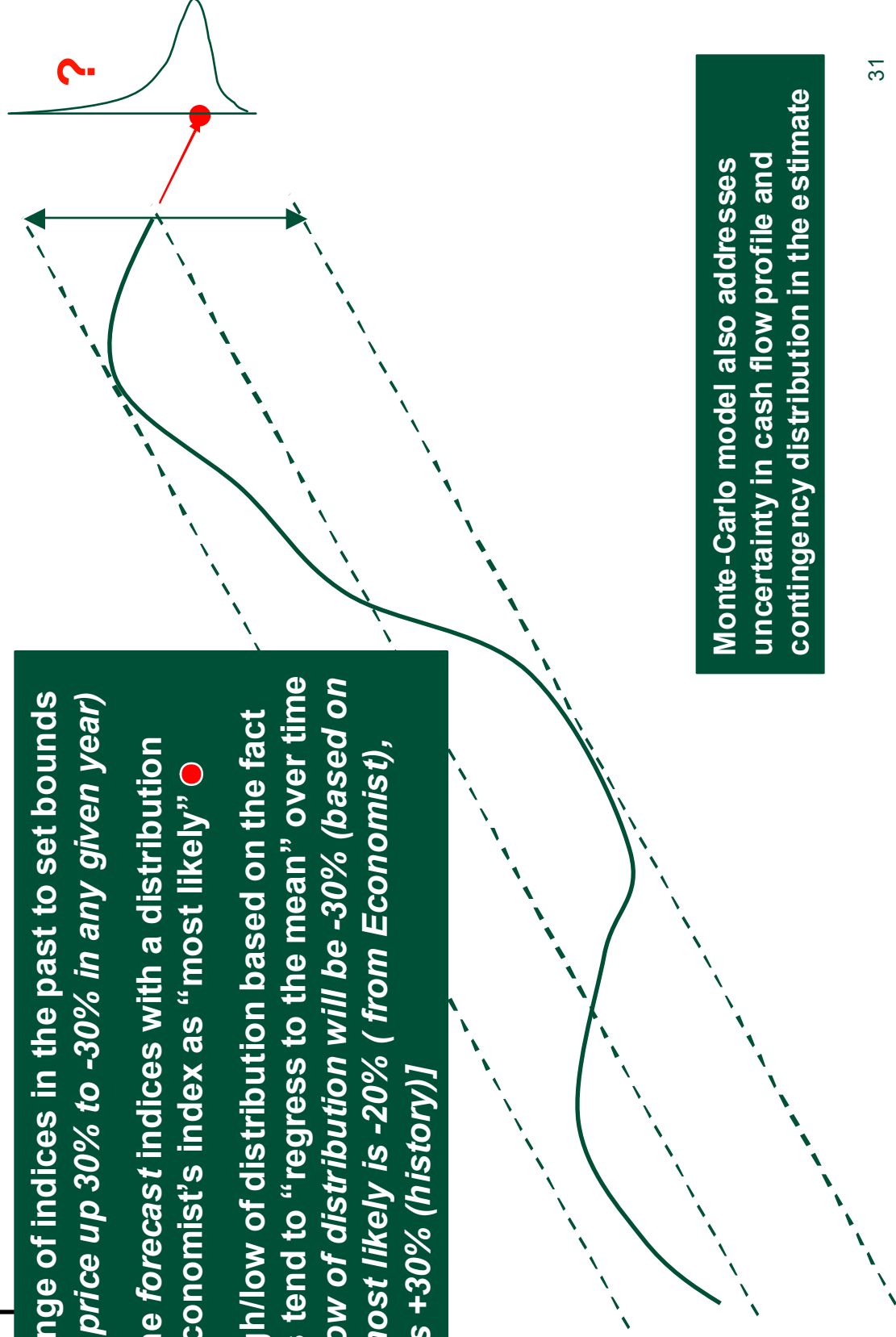
Addressing Uncertainty With Monte Carlo



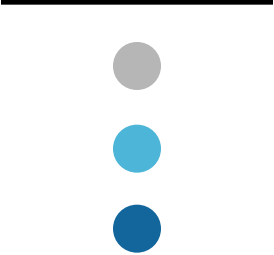
Use the range of indices in the past to set bounds (e.g., item price up 30% to -30% in any given year)

Replace the forecast indices with a distribution with the Economist's index as "most likely" ●

Set the high/low of distribution based on the fact that prices tend to "regress to the mean" over time [e.g., the low of distribution will be -30% (based on history), most likely is -20% (from Economist), and high is +30% (history)]



Monte-Carlo model also addresses uncertainty in cash flow profile and contingency distribution in the estimate



Using Scenarios

“...On average, they (economists) expect the downturn to end in October.....“Economists also see nearly a **one-in-six** chance that the U.S. will fall into a depression”

Wall Street Journal, March 10, 2009

- While economists rarely forecast sharp turns as their “most likely” case (their models tend to “regress to the mean”), they will provide probable scenarios to let you play “what-ifs”
 - i.e., “**stress test**” your business assumptions



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Escalation Estimating Lessons Learned

1. Few are using best practices
2. Most published index sources still don't track well
3. Evidence that the capex-adjusted method works
4. You need to invest in relationship with economists
5. Few using probabilistic methods for escalation

**From 2008 AACE Paper*



Discussion

- ▶ **Questions on industry observations?**
- ▶ **Questions on capex-adjusted method?**
- ▶ **Questions on probabilistic methods?**



Contact

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➤ **Presentation References:**

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