Getting The Most Out Of Your Risk Analysis

Alfred Smith
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Abstract

After carefully assigning appropriate uncertainty and correlation throughout your ACE session, you must report results in a manner that tells the story of your estimate in a concise, understandable manner. Beginning with an ACE session that contains cost, schedule and technical uncertainties, this presentation explores ACE and POST reports to validate the model and find the key cost and risk drivers. The focus will be on a live demonstration of the key features and settings to generate useful reports in a logical sequence.

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Outline

- **Example ACE Model Overview**
  - WBS, date variables, technical variables
- **Using Help to guide RI$K modeling**
- **ACE RI$K Reports**
  - RI$K Statistics, Correlation, Phased Allocation
- **POST Charts**
  - Pareto, Tornado, Variance Analysis
  - Exploiting these charts to find the cost and variance drivers
- **Summary**

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ACE Session Overview

WBS

- Total
  - RDT&E
    - Concept Refinement
    - Technology Development
    - System Development and Dem
      - Development Engineering
        - Air Vehicle
          - Basic Structure
          - Navigation/Guidance
          - Propulsion
          - Air Vehicle Software
        - Ground Station
          - Procure OTS Parts
          - Design New Parts
          - Ground Systems Soft
        - Int & Assy
      - Prototype Manufacturing
        - Air Vehicle
        - Mobile Ground Station
      - SEPM
      - System Test & Eval
      - Industrial Facilities
      - Other Government Costs
  - Procurement
    - Manufacturing (Air Force)
      - Air Vehicle (AF)
      - Integration & Test (AF)
      - Ground Station LRIP Suppor
      - Transportation (AF)
      - Initial Operational Test & Ev
    - Manufacturing (Army)
      - Quality Control
      - SEPM
      - Program Office Costs

Date Variables

- Level Of Effort Factor
- Reference Date
- Duration to CE Start Date
- Concept Exploration Start Date
- Concept Exploration Duration (Mths)
- Concept Exploration End Date
- TechDevelopment Start Date
- TechDevelopment Duration (Mths)
- TechDevelopment End Date
- Development Engineering Start Date
- Development Engineering Duration (M
- Development Engineering End Date
- R&D Months
- Air Vehicle Software Development Sta
- Air Vehicle Software Development En
- Ground Dev Start Date
- Ground Development Duration (Month
- Ground Dev End Date
- Int & Assy Start
- Prototype Manufacturing Start Date
- Prototype Manufacturing End Date
- Procurement Start Date
- Procurement End Date
- AF First Year of Production
- Army First Year of Production
- Last Year of Total Production

Technical Variables

- *RDT&E Inputs
- Air Vehicle T1
  - Navigation / Guidance Weight (lbs)
  - Air Vehicle S/W Labor Hours
- Transportable Ground Stations (Army
  - Ground Station S/W Labor Hours
  - Software Labor Rate
  - Ground Station Unit Cost
  - Complexity Factor
  - Number of Ground Stations
- *Production Inputs
- Sub component Unit Costs
  - Propulsion Unit Cost
  - Transportation Unit Cost
- Block Buy Unit Cost Prices for Nav/Gu
  - Block Buy Quantity Limits
  - Block Buy Cost at Quantity Limits
- Buy Quantities
- Total Air Vehicle Buy Quantity
  - Army Transportable Ground Station Q
- Learning Inputs
  - Air Vehicle Learning Slope
- Cost Factors
  - Quality Control Factor
  - Adjustment Year Factor
  - Lag between procurement and deliver
- Ground Support Inputs
  - Number of People for GS Support
  - Pay Rate for GS Support
  - Ground Station Hardware Unit Cost
  - Ground Station Transportable Vehicle

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Use Help to Guide Risk Modeling

(Based on AFCAA CRUH)

ACE Help

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Contents | Index | Search | Glossary

- Getting Started
- Setting up the Estimate Structure
- Building the Estimate
- Entering Estimate Documentation
- Performing Uncertainty and Risk Analysis
  - Overview of Uncertainty and Risk Analysis
  - The Difference between Uncertainty and Ri
  - How to specify Uncertainty
  - How to Model and Run an Uncertainty Anal
  - How to develop a RI$K-Adjusted Estimate
  - How to use the Advanced Risk tab in the Inp
  - How to define Point Estimate Interpretation
  - How to adjust a CER distribution for Schedu
  - Apply Schedule/Technical Adjustment as a
  - How to view Risk Results
  - Generating S-Curve Data in POST
  - ACE Default Uncertainty Bounds Calculatio
  - How to implement Correlation
- Calculating Results
- Creating Reports
- Running Excursions
- Troubleshooting
- Reference

Previous | Next | Performing Risk

Overview of Uncert... | How to Model ... | How to specif... | How to view ... | How to develo... | Entering a Factor ... | How to adjust ... | Correlation and Fact... | Generating S-Curve ... | Correlation Overview | Correlati Guidelin

Results of RI$K analysis can be used in your ACE session to obtain overall costs adjusted to a specified confidence level. There are two ways to see risk results at a specified confidence level:

1. Use ACE Risk functions to see the effect of risk on a particular row or the entire estimate. To do this:
   - Set up the risk parameters for the ACE session
   - Calculate the session with RI$K.
   - Use the RISKFACTOR() function to select the adjustment value a specified cost item needs to be at a certain confidence level. In the example below, the Total with RI$K line is using the RISKFACTOR() function to develop a risk-adjusted estimate at the 70% confidence level. You can also use the RISKCOST() and RISKPERCENT() functions.

WBS /CES Description	Unique ID	Baseline	Equation/Throughput
Total with RI$K (70% Confidence Level)		6760.6*	Total * RISKFACTOR(@Total,70)
Total	Total	4588.6*	
Manufacturing	PMP	3349.4*	

2. Perform Risk allocation to see program costs with risk already included in each element. To do this,

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Modeling Date Uncertainty

	WBS/CES	ID	Point Estimate	Eq / Thruput	Dist	PE Pos	Low	High	L Perc	H Perc	Group	Strength
94	**Level Of Effort Factor**	LOEfact	1 (40%) *	R&DDur/RiskPoint(@R&DDur)								
95												
96	Reference Date	RefDate	01SEP2009 *	01Sep2009								
97	Duration to CE Start Date	RefDur	3 (20%) *	3	Triangular	Mode	1	11	0	100	Dur	.8
98												
99	Concept Exploration Start Date	ConExpStartDate	01DEC2009 (39%) *	DateAdd(RefDate, 0,RefDur,0)								
100	Concept Exploration Duration (I	ConExpDur	12 (50%) *	12	Triangular	Mode	6	18	0	100	Dur	.8
101	Concept Exploration End Date	ConExpEndDate	01DEC2010 (47%) *	DateAdd(ConExpStartDate, 0,ConExpDur,0)								
102												
103	TechDevelopment Start Date	TechDevStartDate	01FEB2011 (47%) *	DateAdd(ConExpEndDate, 0,2,0)								
104	TechDevelopment Duration (Mtl	TechDevDur	18 (33%) *	18	Triangular	Mode	12	30	0	100	Dur	.8
105	TechDevelopment End Date	TechDevEndDate	01AUG2012 (42%) *	DateAdd(TechDevStartDate, 0,TechDevDur,0)								
106												
107	Development Engineering Start	DevEngStartDate	01APR2012 (42%) *	DateAdd(TechDevStartDate,0,TechDevDur-4)								
108	Development Engineering Durat	DevEngDur	40 (33%) *	40	Triangular	Mode	30	60	0	100	Dur	.8
109	Development Engineering End I	DevEngEndDate	01AUG2015 (38%) *	DateAdd(DevEngStartDate, 0,DevEngDur,0)								
110												
111	R&D Months	R&DDur	68 (40%) *	DateMonthDiff(ConExpStartDate, DevEngEndDate)								
112												
113	Air Vehicle Software Developme	VSWDevStartDate	01JUN2012 (42%) *	DateAdd(DevEngStartDate, 0,2,0)								
114	Air Vehicle Software Developme	AVSWDevEndDate	01JUN2015 (38%) *	DateAdd(DevEngEndDate, 0,-2,0)								
115												
116	Ground Dev Start Date	GrndDevStartDate	01APR2013 (42%) *	DateAdd(DevEngStartDate, 0,12,0)								
117	Ground Development Duration (	GrndDevDur	30 (40%) *	30	Triangular	Mode	18	48	0	100	Dur	.8
118	Ground Dev End Date	GrndDevEndDate	01OCT2015 (42%) *	DateAdd(GrndDevStartDate, 0,GrndDevDur,0)								

- **Judicious use of DateAdd can introduce date linking and schedule uncertainty**
- **The LOEFact is used on rows where the cost is estimated at the total level**
  - Implicit assumption is that cost estimating method estimates a total cost, but for a point estimate duration. If duration changes, then the cost changes by the LOEFact

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Adjusting "Total" CERs for Schedule Uncertainty

	WBS/CES	ID	Point Estimate	Eq / Thruput	Dist	PE Pos	Spread	CV	L Perc	H Perc	Group	Strength
14	***Detail Estimate**	AIL_WBS										
15	Total		$ 530,935 (30%) *									
16	RDT&E	RDTE$	$ 67,470 (8%) *									
17	Concept Refinement		$ 1,020 (13%) *									
18	Contractor A		$ 510 (25%) *	500	Triangular	Mode	Medium				A	.9
19	Contractor B		$ 510 (25%) *	500	Triangular	Mode	Medium				B	.9
20	Technology Development		$ 4,270 (14%) *									
21	Contractor A		$ 2,135 (25%) *	2.0	Triangular	Mode	Medium				A	.9
22	Contractor B		$ 2,135 (25%) *	2.0	Triangular	Mode	Medium				B	.9
23	System Development and		$ 62,180 (10%) *									
24	Development Engineeri		$ 23,429 (20%) *									
25	Air Vehicle	AV$	$ 10,886 (24%) *									
26	Basic Structure		$ 4,826 (52%) *	Struc_T1$ * NRT1Ratio								
27	Navigation/Guidar		$ 1,228 (37%) *	(425.555+25.555*PCDWT) * LOEfact	Normal	Mean		0.22			UAVHW	0.707
28	Propulsion		$ 2,376 (40%) *	6000 * NREC_Prop_Cplx% * LOEfact	Normal	Mean				85	UAVHW	0.707
29	Air Vehicle Softw		$ 2,456 (14%) *	SWLab$ * AVSWHrs								
30	Ground Station	GS$	$ 9,487 (29%) *									
31	Procure OTS Par		$ 1,018 (17%) *	GSUC$ * NGndStat								
32	Design New Parts		$ 6,364 (36%) *	4500 * Complex * LOEfact	Normal	Mean	Low				undCosts	0.836
33	Ground Systems		$ 2,105 (45%) *	SWLab$ * GSSWHrs								
34	Int & Assy		$ 3,056 (30%) *	.15 * (AV$.FYTot + GS$.FYTot)	Normal	Mean	Medium				IA&T	0.707
35	Prototype Manufacturir		$ 3,558 (44%) *									
36	Air Vehicle		$ 3,180 (49%) *	1.5 * AV_T1$	Normal	Mean		0.25			)therR&D	.5
37	Mobile Ground Stati		$ 379 (28%) *	1.75 * TGS_T1$	Normal	Mean		0.3			)therR&D	.5

- **Note "LOEfact" used to adjust CER "total cost estimate" to account for schedule changes from "normal"**
  - Controversial because some postulate that the CER already captures some portion of schedule uncertainty
  - Use Judgment

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ACE RI$K Reports

Risk Statistics

- Also available in the IRV (preferred by the non-ancient ACE user)

	WBS/CES	Point Estimate	Mean	Std Dev	CV	5.0% Level	10.0% Level	15.0% Level	20.0% Level
2	Total	$ 530,935 (30%)	$ 580,549	$ 82,254	0.142	$ 462,442	$ 484,427	$ 498,666	$ 511,563
3	RDT&E	$ 67,470 (10%)	$ 84,175	$ 14,173	0.168	$ 63,363	$ 67,667	$ 70,164	$ 72,258
4	Concept Refinement	$ 1,020 (14%)	$ 1,228	$ 190	0.155	$ 946	$ 992	$ 1,025	$ 1,055
5	Contractor A	$ 510 (25%)	$ 614	$ 133	0.216	$ 424	$ 453	$ 475	$ 494
6	Contractor B	$ 510 (25%)	$ 614	$ 133	0.216	$ 424	$ 453	$ 475	$ 493
7	Technology Development	$ 4,270 (15%)	$ 5,141	$ 793	0.154	$ 3,943	$ 4,132	$ 4,283	$ 4,421
8	Contractor A	$ 2,135 (25%)	$ 2,571	$ 556	0.216	$ 1,774	$ 1,895	$ 1,987	$ 2,066
9	Contractor B	$ 2,135 (25%)	$ 2,571	$ 556	0.216	$ 1,773	$ 1,894	$ 1,987	$ 2,066
10	System Development and Demonstra	$ 62,180 (11%)	$ 77,806	$ 14,136	0.182	$ 57,277	$ 61,466	$ 63,763	$ 65,861

Correlation Report

- Use category columns to tag rows of interest

R&D →

	WBS/CES	Concept Refinement	Technology Development	System Development and
1	Concept Refinement	1.000	0.799	0.009
2	Technology Development		1.000	0.004
3	System Development and Demonstration			1.000

AF Procurement →

	WBS/CES	Basic Structure (AF)	Navigation /Guidance (AF)	Propulsio n (AF)	Integratio n & Test (AF)	Ground Station LRIP	Transport ation (AF)	Initial Operation al Test &
1	Basic Structure (AF)	1.000	0.007	0.014	0.076	-0.010	-0.006	0.021
2	Navigation/Guidance (AF)		1.000	0.468	0.194	-0.036	0.483	-0.002
3	Propulsion (AF)			1.000	0.400	-0.031	0.489	-0.020
4	Integration & Test (AF)				1.000	0.006	0.180	-0.015
5	Ground Station LRIP Support (AF)					1.000	-0.026	0.045
6	Transportation (AF)						1.000	-0.017
7	Initial Operational Test & Eval (AF)							1.000

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Phased RI$K Allocation Report

- **Why do we need a phased risk allocation report?**
  - RI$K Statistics report only shows total costs
  - Specific confidence level results do not sum
- **Phased report with RI$K Allocation shows phased RI$K results at a specific confidence level that sum properly**

ACE 7.1a - [AUCHowToRiskExample12Jan09.aceit - BY Phased (FY2009 $K, Time Phased, Case: Point Estimate, 70% CL allocated at Level 2)]

File Edit View Calc Window Help

	Cost Element	Approp	Total	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY
2	Total		$ 620,849 (~71%)	$ 1,299	$ 1,860	$ 6,788	$ 13,594	$ 23,123	$ 33,744	$ 32,229	$ 27,888	$
3	RDT&E		$ 90,382 (70%)	$ 1,299	$ 1,860	$ 6,788	$ 13,594	$ 23,123	$ 33,744	$ 9,974		
4	Concept Refinement		$ 1,318 (69%)	$ 1,296	$ 22							
5	Technology Development		$ 5,529 (70%)		$ 1,835	$ 3,694						
6	System Development and D		$ 83,535 (69%)	$ 3	$ 3	$ 3,094	$ 13,594	$ 23,123	$ 33,744	$ 9,974		
7												
8	Procurement		$ 530,466 (70%)							$ 22,255	$ 27,888	$
9	Manufacturing (Air Force)		$ 240,742 (68%)							$ 2,628	$ 8,155	$

- **But what if I don't agree with the way (see Help and backup slide for details) ACE automatically allocates RI$K?**
  - Build a summary section and make use of RiskCost() functions to add sufficient RI$K dollars to reach the confidence level of interest

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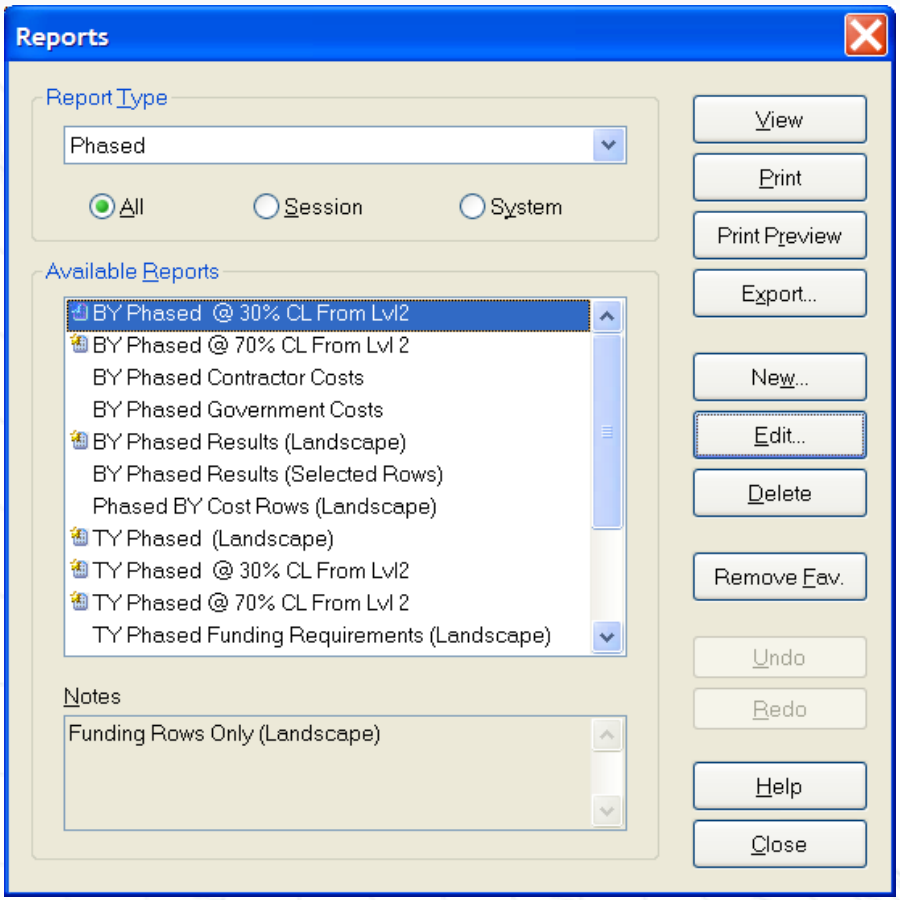
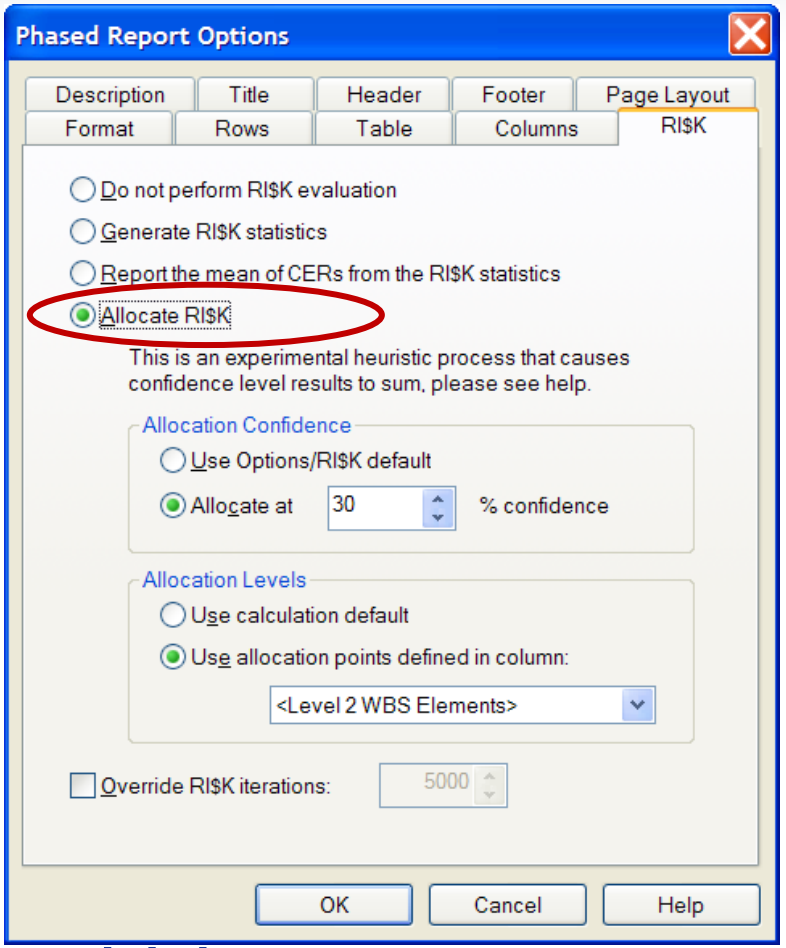
Creating a RI$K Allocated Phased Report





- **Use "Allocate RI$K" to use allocate cost risk (non-cost rows ignored)**
  - Select confidence level to report
  - Select WBS level where risk is managed

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Compare Phased Results

ACE 7.1a - [AUCHowToRiskExample12Jan09.aceit - BY Phased Costs (FY2009 $K, Time Phased, Case: Point Estimate, with Risk)]

File Edit View Calc Window Help

Point Estimate

	Cost Element	Approp	Total	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	FY
15	Total		$ 530,935 (30%)	$ 1,005	$ 1,437	$ 5,217	$ 10,124	$ 16,860	$ 25,319	$ 25,937	$ 22,003	$ 22,464	$
16	RDT&E		$ 67,470 (10%)	$ 1,005	$ 1,437	$ 5,217	$ 10,124	$ 16,860	$ 25,319	$ 7,509			
17	Concept Refinement		$ 1,020 (14%)	$ 1,003	$ 17								
18	Technology Development		$ 4,270 (15%)		$ 1,417	$ 2,853							
19	System Development and D		$ 62,180 (11%)	$ 2	$ 2	$ 2,364	$ 10,124	$ 16,860	$ 25,319	$ 7,509			
20													
21	Procurement		$ 463,465 (37%)							$ 18,428	$ 22,003	$ 22,464	$
22	Manufacturing (Air Force)		$ 218,803 (41%)							$ 2,438	$ 5,914	$ 4,129	

ACE 7.1a - [AUCHowToRiskExample12Jan09.aceit - BY Phased (FY2009 $K, Time Phased, Case: Point Estimate, 70% CL allocated at Level 1)]

File Edit View Calc Window Help

70% Allocated from the 1st level

	Cost Element	Approp	Total	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2
15	Total		$ 617,044 (70%)	$ 1,292	$ 1,850	$ 6,749	$ 13,515	$ 22,978	$ 33,523	$ 31,956	$ 27,649	$ 27
16	RDT&E		$ 89,805 (69%)	$ 1,292	$ 1,850	$ 6,749	$ 13,515	$ 22,978	$ 33,523	$ 9,898		
17	Concept Refinement		$ 1,311 (68%)	$ 1,289	$ 22							
18	Technology Development		$ 5,499 (68%)		$ 1,825	$ 3,674						
19	System Development and D		$ 82,996 (68%)	$ 3	$ 3	$ 3,076	$ 13,515	$ 22,978	$ 33,523	$ 9,898		
20												
21	Procurement		$ 527,239 (68%)							$ 22,058	$ 27,649	$ 27
22	Manufacturing (Air Force)		$ 239,591 (66%)							$ 2,617	$ 8,103	$ 5

ACE 7.1a - [AUCHowToRiskExample12Jan09.aceit - BY Phased (FY2009 $K, Time Phased, Case: Point Estimate, 70% CL allocated at Level 2)]

File Edit View Calc Window Help

70% Allocated from the 2nd level

	Cost Element	Approp	Total	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY
2	Total		$ 620,849 (~71%)	$ 1,299	$ 1,860	$ 6,788	$ 13,594	$ 23,123	$ 33,744	$ 32,229	$ 27,888	$
3	RDT&E		$ 90,382 (70%)	$ 1,299	$ 1,860	$ 6,788	$ 13,594	$ 23,123	$ 33,744	$ 9,974		
4	Concept Refinement		$ 1,318 (69%)	$ 1,296	$ 22							
5	Technology Development		$ 5,529 (70%)		$ 1,835	$ 3,694						
6	System Development and D		$ 83,535 (69%)	$ 3	$ 3	$ 3,094	$ 13,594	$ 23,123	$ 33,744	$ 9,974		
7												
8	Procurement		$ 530,466 (70%)							$ 22,255	$ 27,888	$
9	Manufacturing (Air Force)		$ 240,742 (68%)							$ 2,628	$ 8,155	$

Allocating from further down the WBS causes Total to Increase!

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POST Reports

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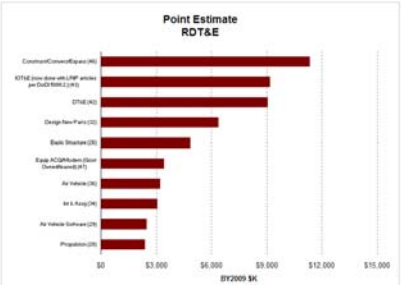
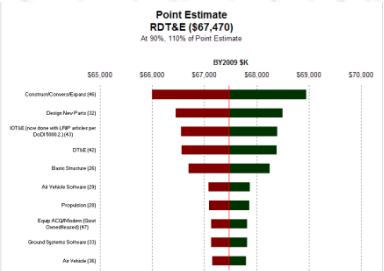
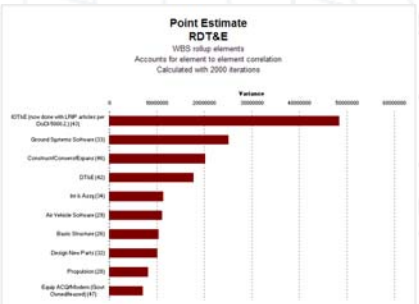
POST Reports







- **Pareto**: Identify the top "cost" elements, i.e., "cost drivers"
- **Tornado**: Find the variables that "drive" the <u>total cost</u>
- **Variance Analysis**: Find the elements that contribute most to <u>total uncertainty</u>

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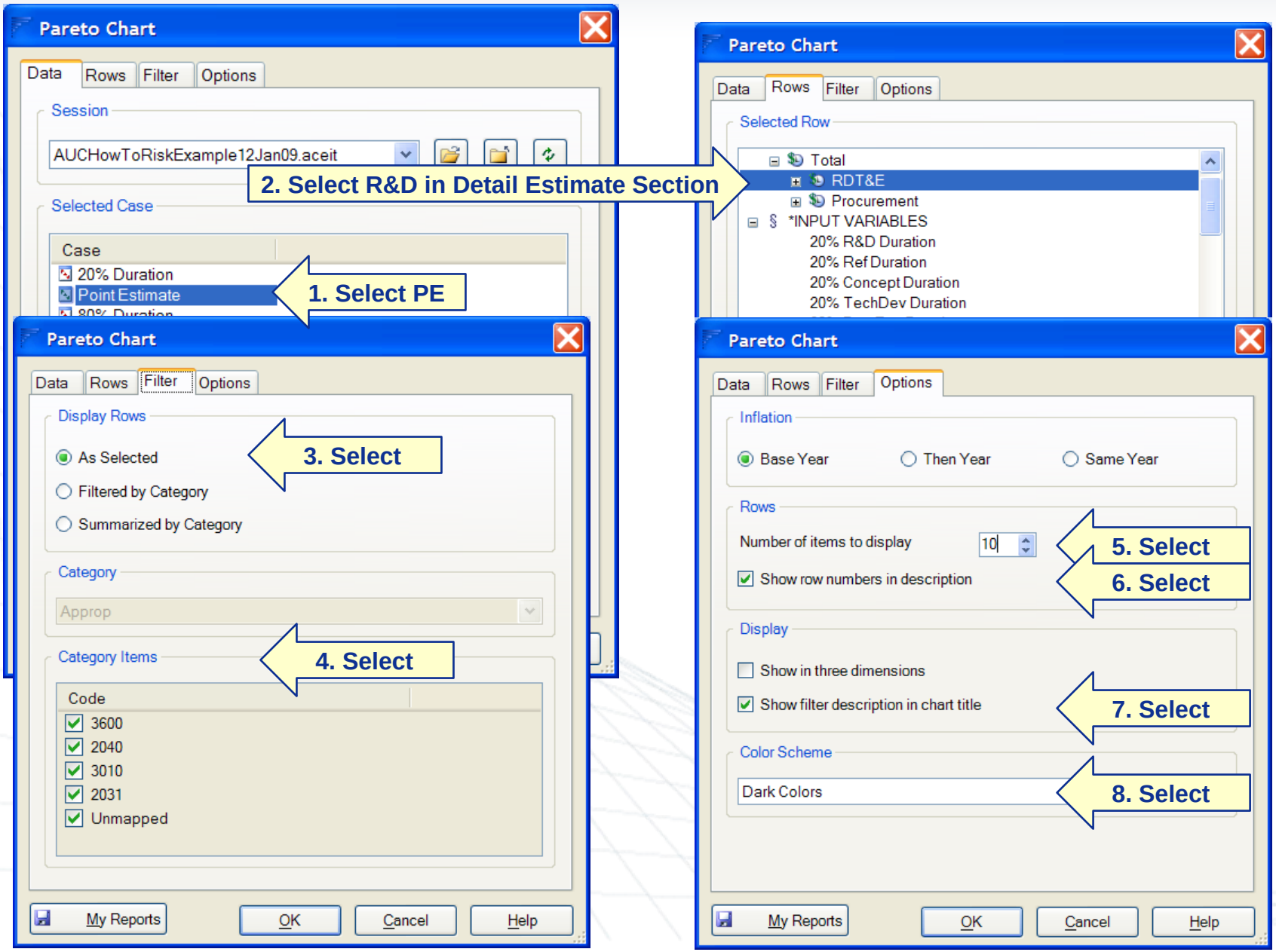
Create R&D Pareto



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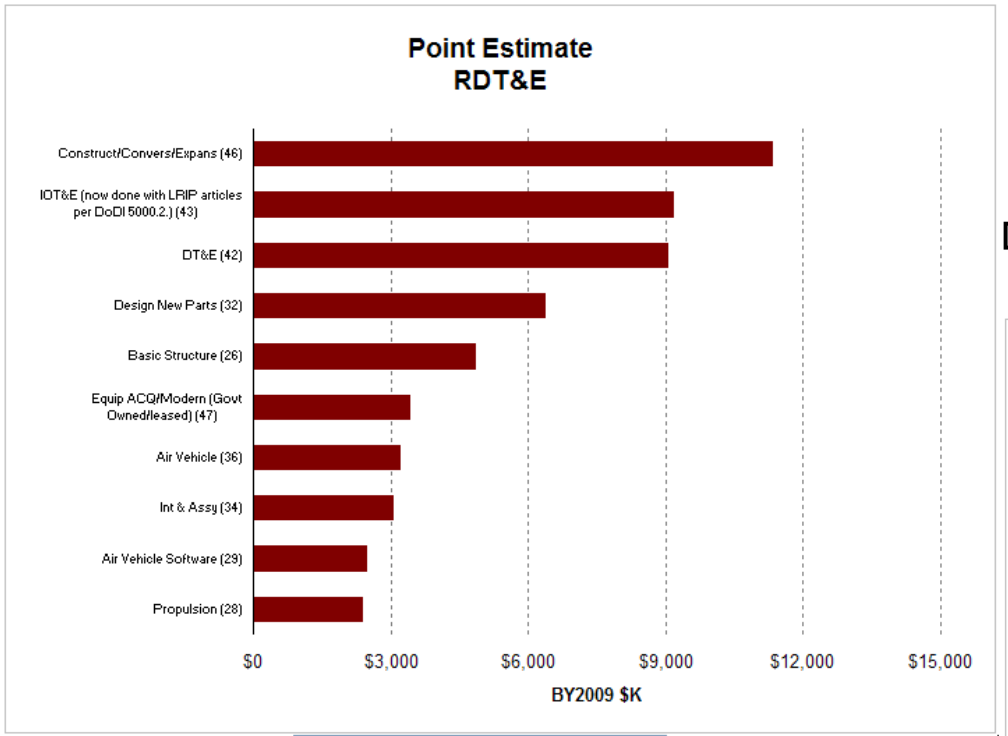
Pareto Charts

Pareto Chart for Point Estimate in AUCHowToRiskExample12Jan09.aceit

Costs in BY2009 $K, 2000 iterations

Tuesday, 13 January 2009, 11:26 pm

Pareto Chart



Row | Filter | ▲ Parent | RDT&E | - Decrease | Increase Visibility +

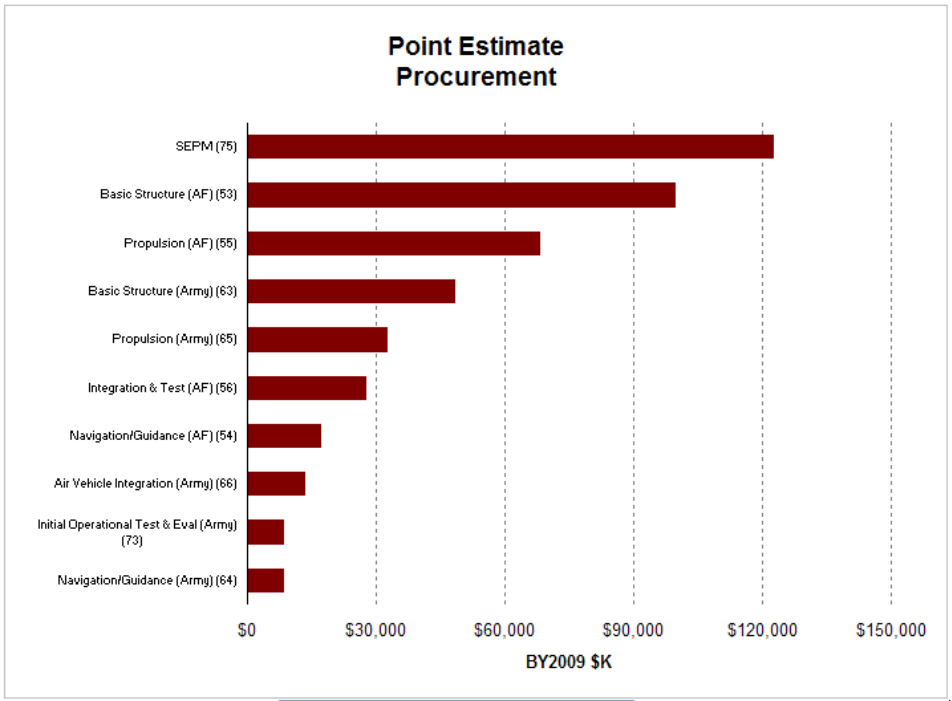
BaseYear | Case

Pareto Chart for Point Estimate in TornadoAndVarianceAnalysisExampleNov08.aceit

Costs in BY2009 $K

Monday, 17 November 2008, 12:59 pm

Pareto Chart



Row | Filter | ▲ Parent | Procurement | - Decrease | Increase Visibility +

BaseYear | Case

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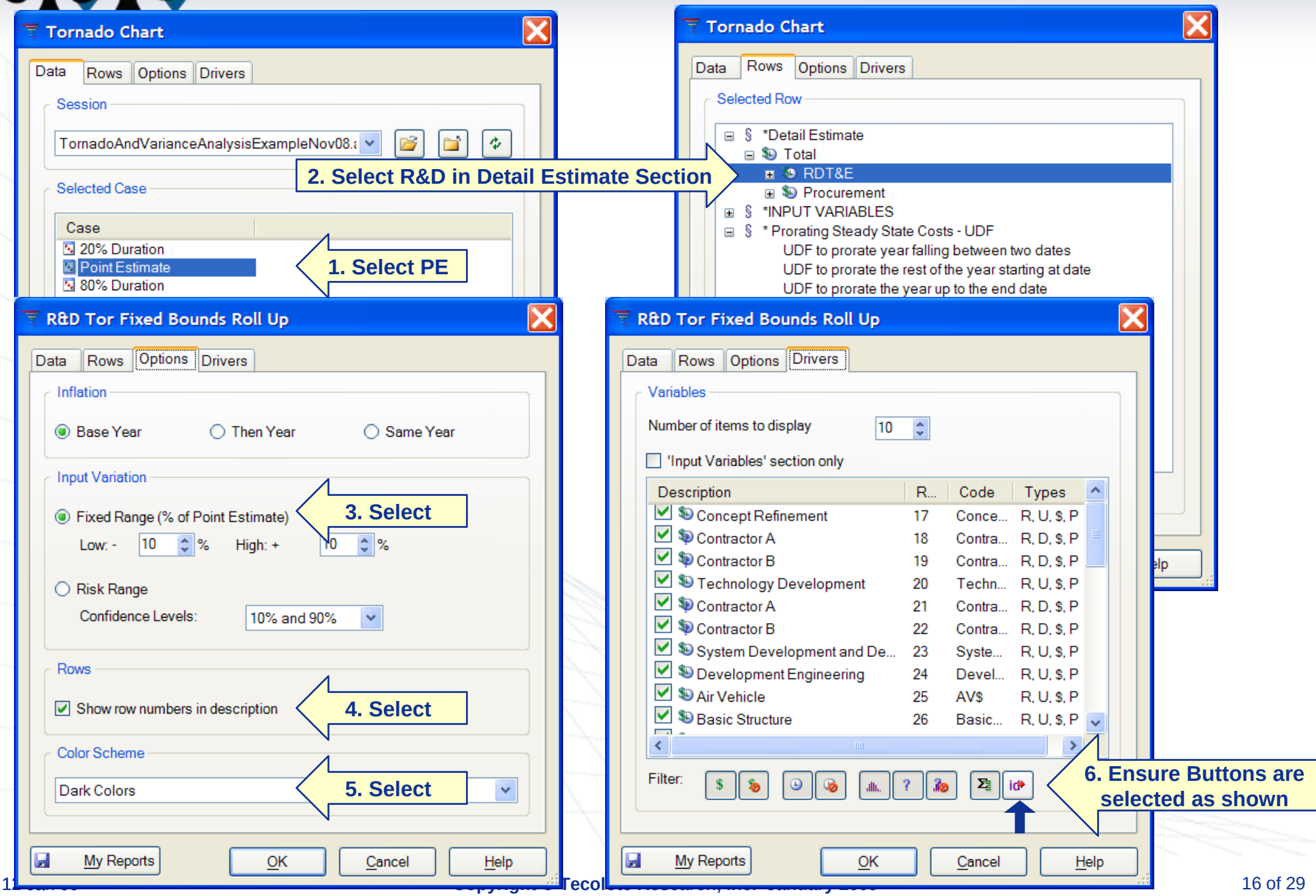
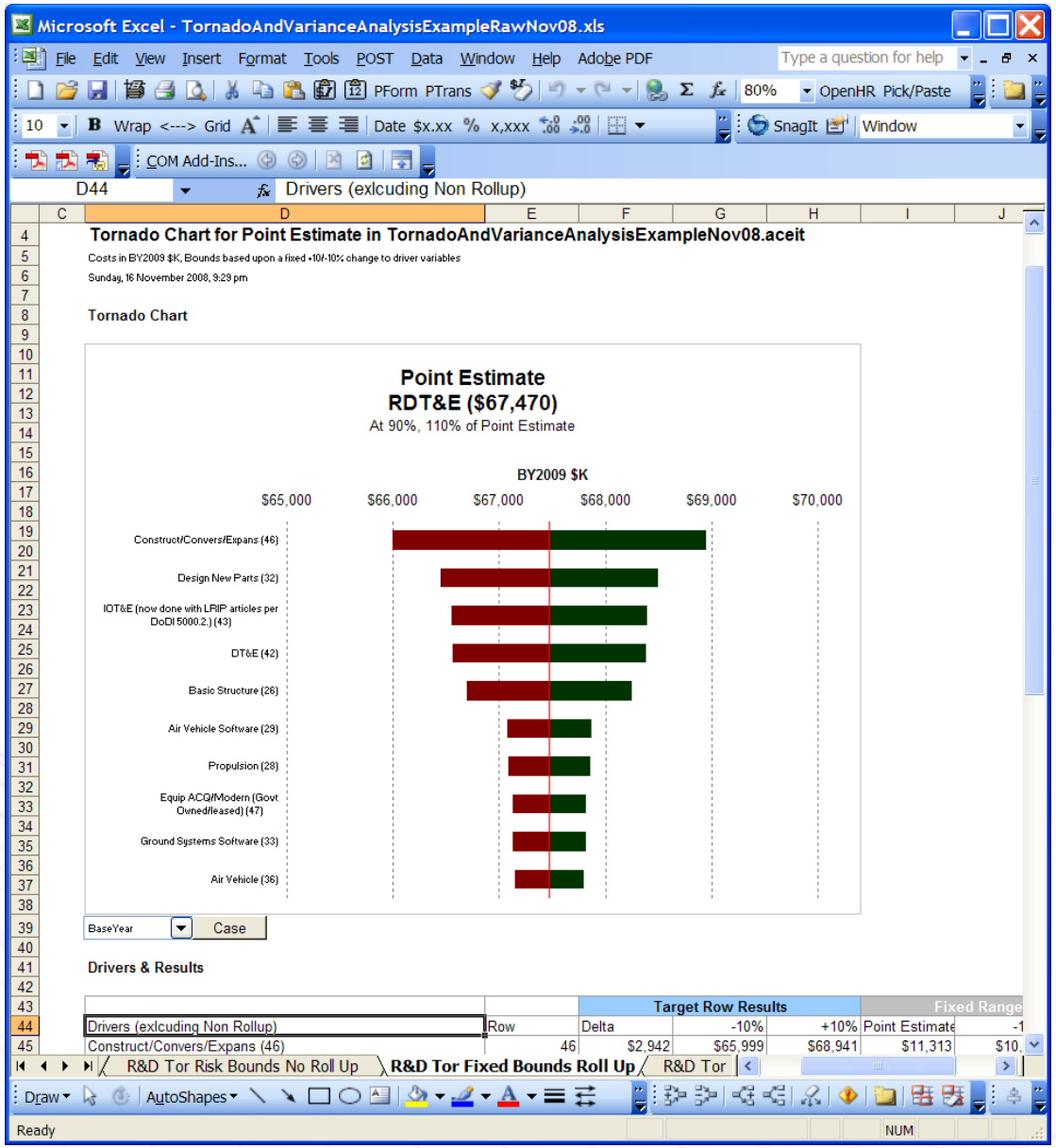
R&D RollUp "Fixed Range" Tornado



WBS Only "Fixed Range" Tornado

- "Roll Up" <u>means only the WBS is considered</u>
- Row numbers in the chart and Cell D44 confirms settings are correct
- If "<u>exclude Non Rollup</u>" does not appear in D44, then use POST>Reports>Edit and go to the "Drivers" tab and set the buttons as per the previous slide



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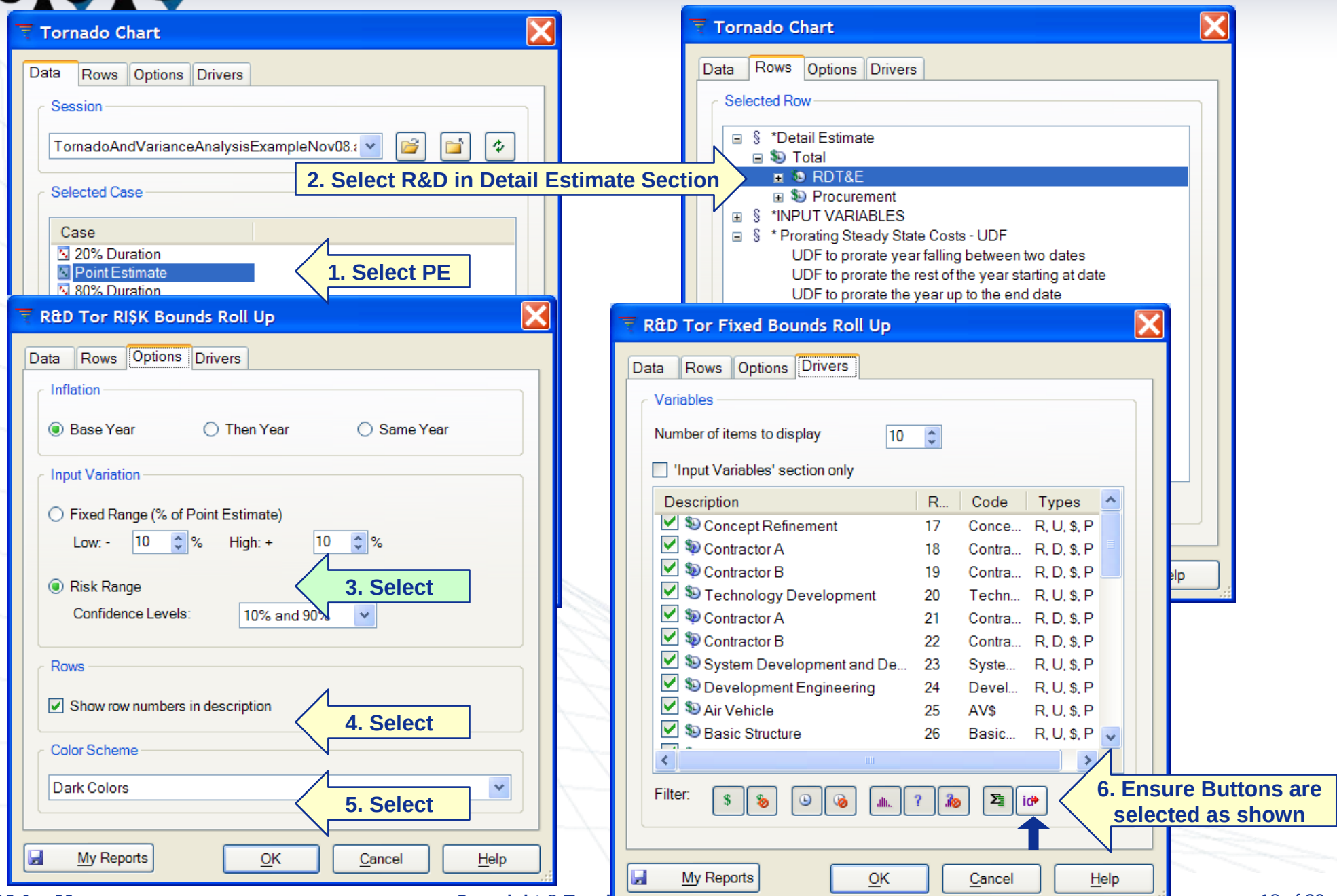
R&D RollUp "Risk Range" Tornado



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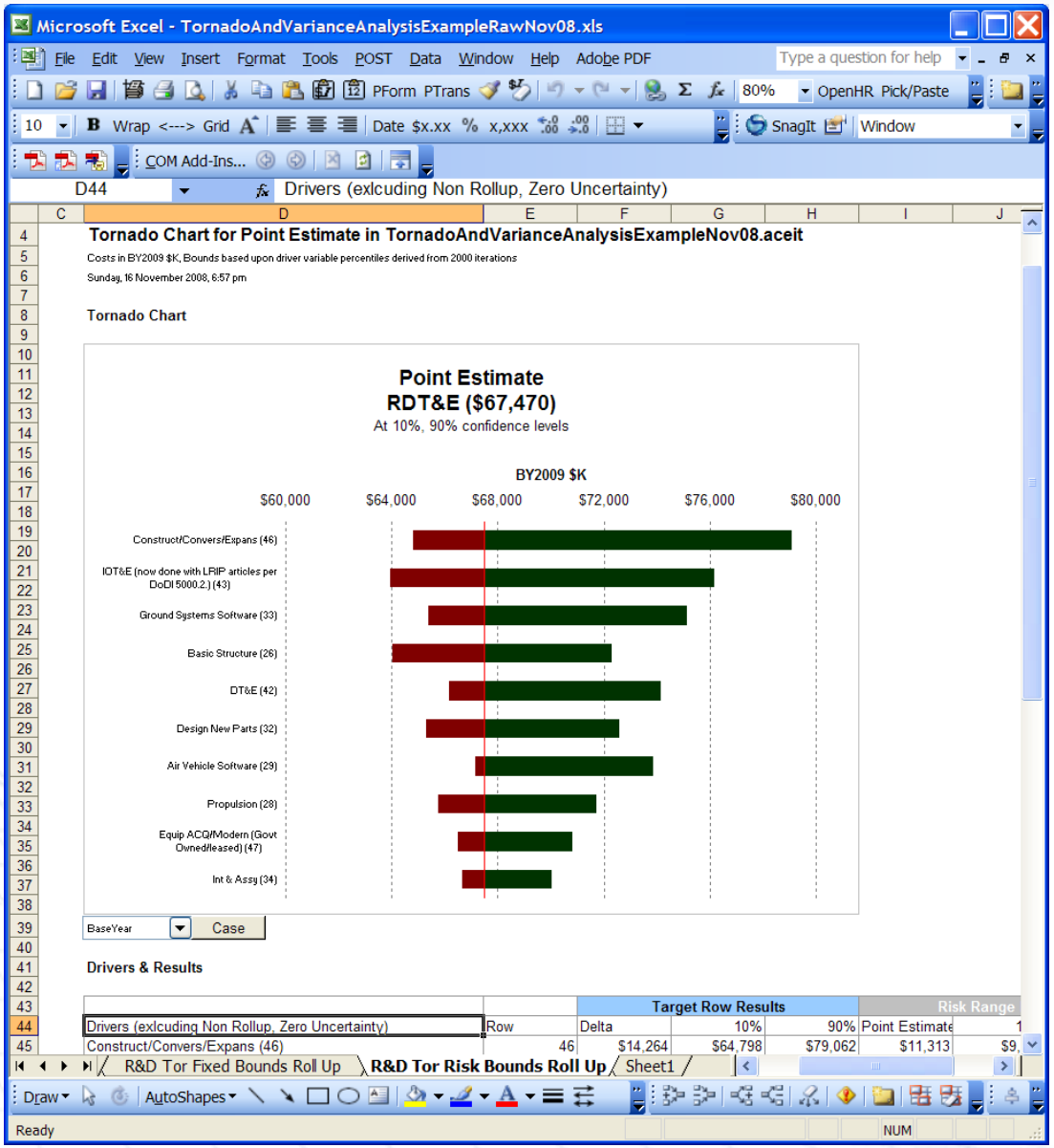
WBS Only "Risk Range" Tornado

- "Roll Up" means only the WBS is considered
- Row numbers in the chart and Cell D44 confirms settings are correct
- If "exclude Non Rollup" does not appear in D44, then use POST>Reports>Edit and go to the "Drivers" tab and set the buttons as per the previous slide
- Excluding Zero Uncertainty will always show up on this chart. This chart only considers elements that have uncertainty on them



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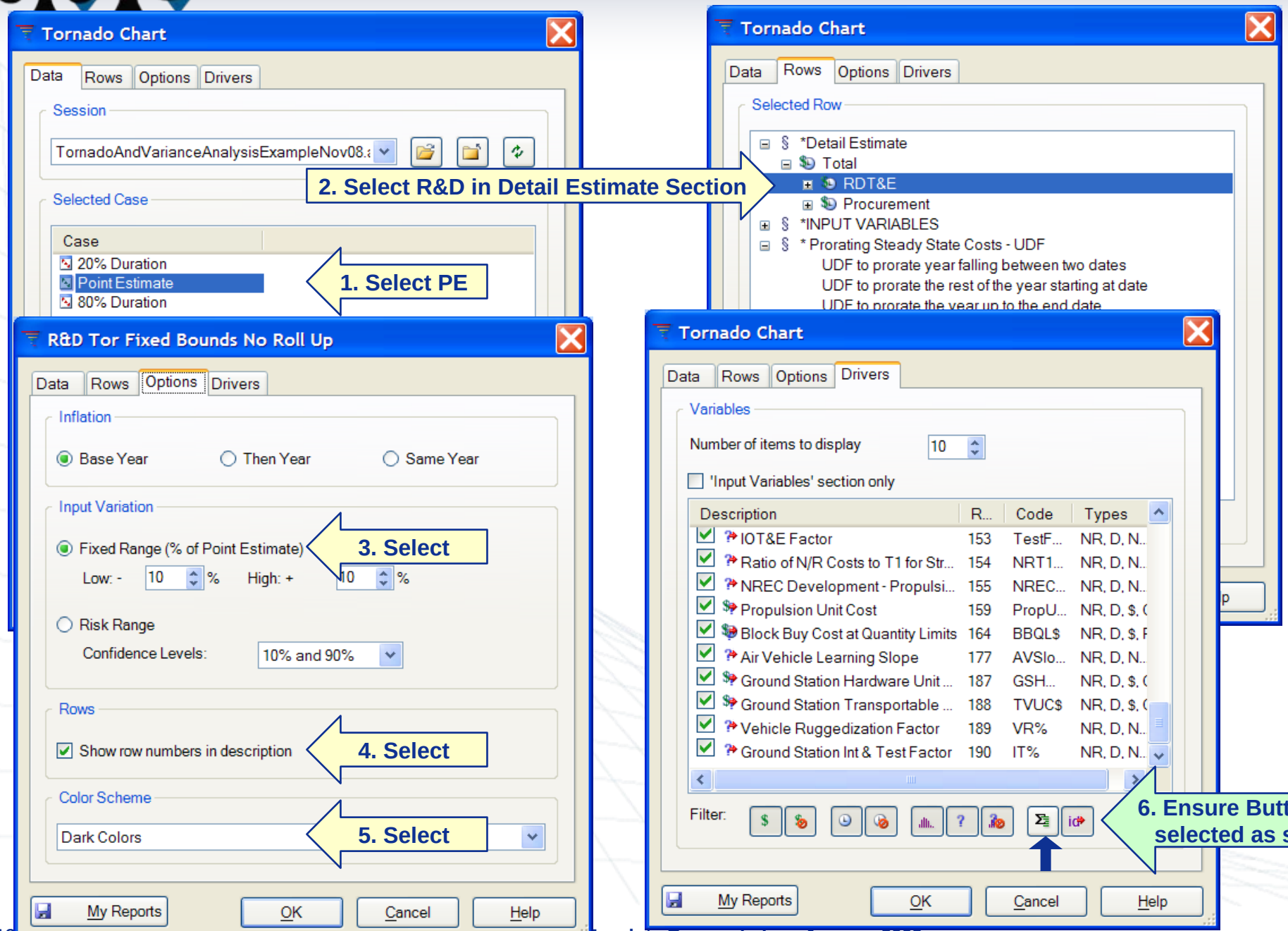
Non Rollup R&D "Fixed Range" Tornado



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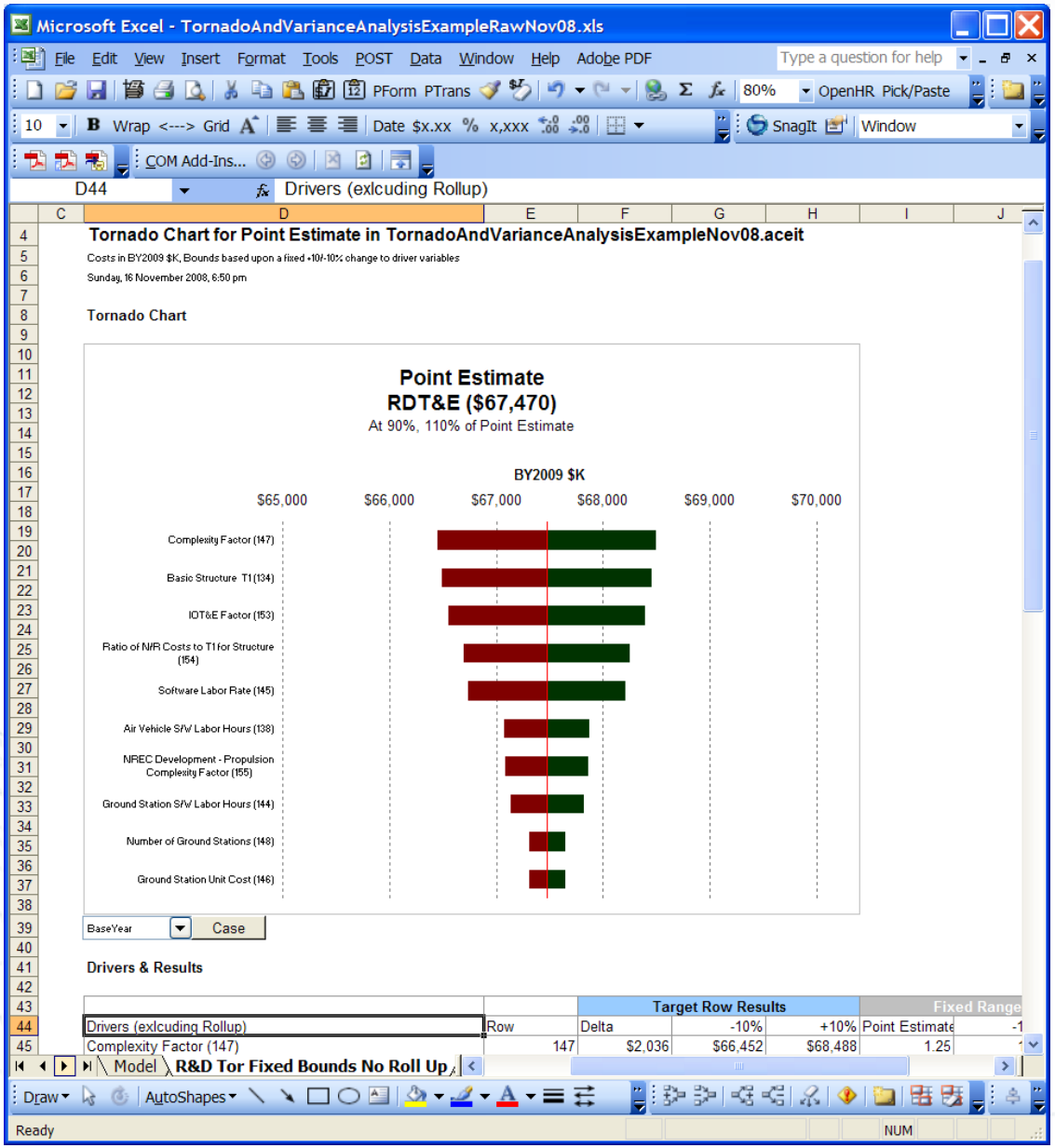
Variable "Fixed Range" Tornado

- "No Roll Up" means the WBS elements are not considered
- Row numbers in the chart and Cell D44 confirms settings are correct
- If "exclude Rollup" does not appear in D44, then use POST>Reports>Edit and go to the "Drivers" tab and set the buttons as per the previous slide



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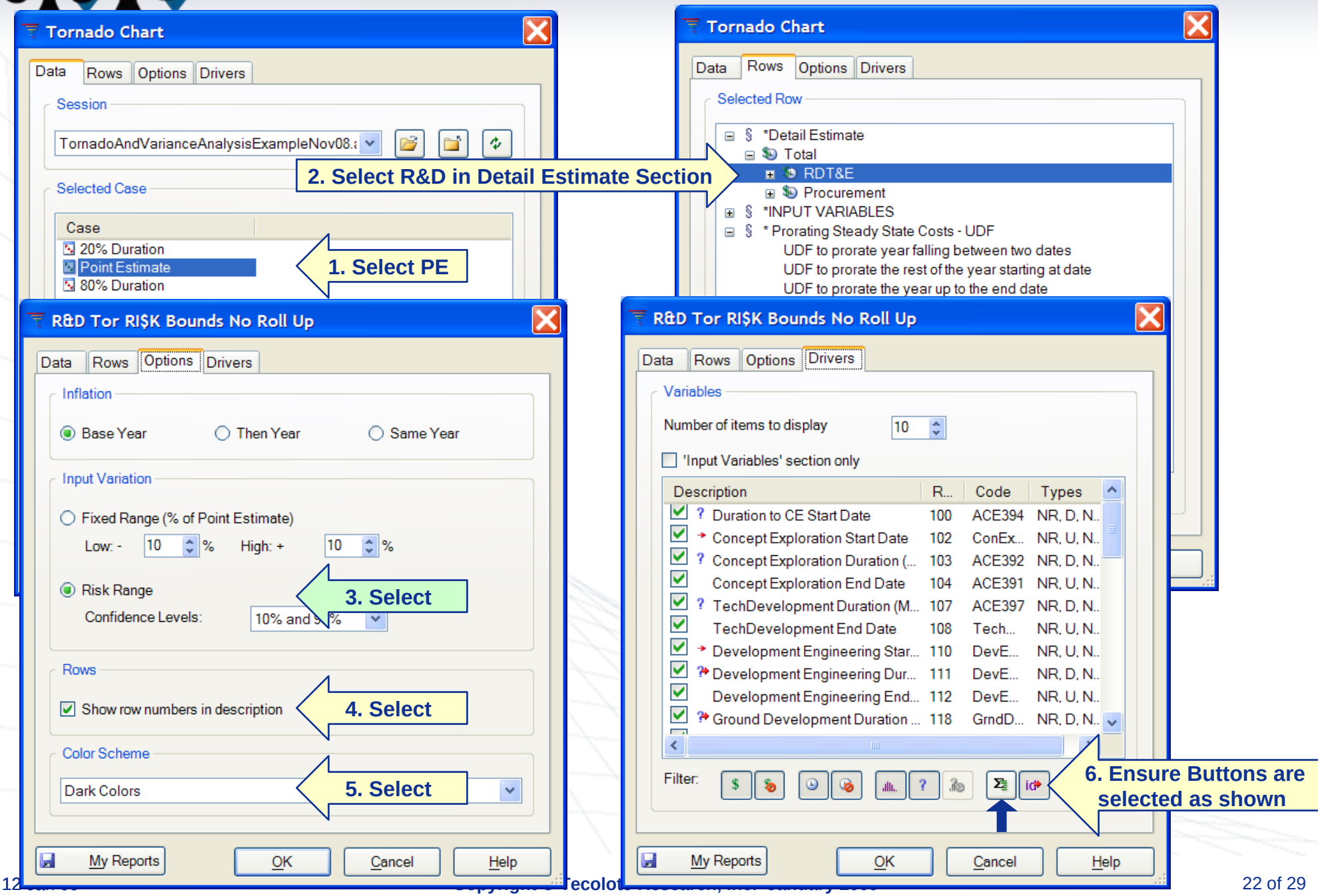
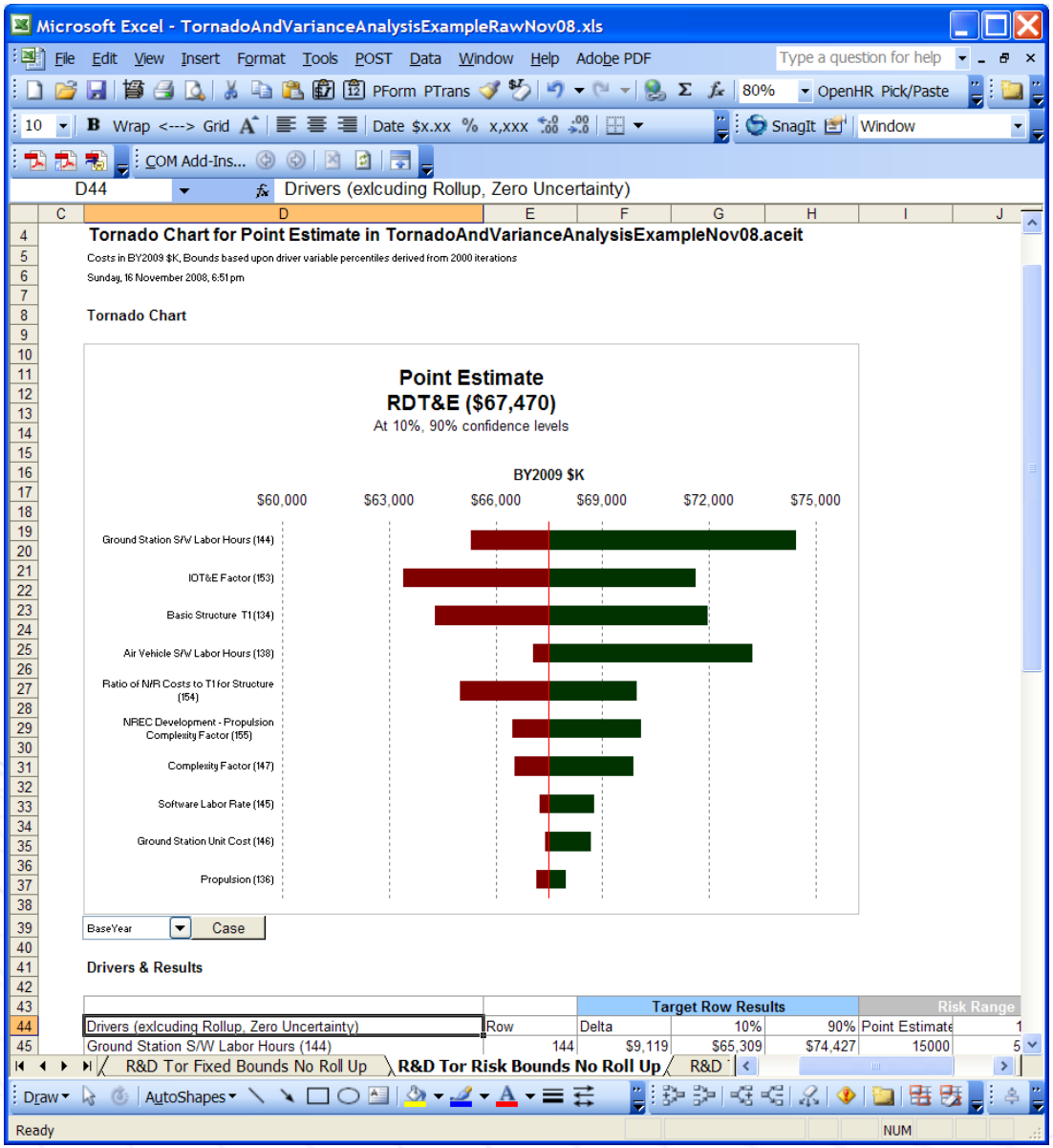
Non Rollup R&D "Risk Range" Tornado



Variable "Risk Range" Tornado

- "No Roll Up" means the WBS is not considered
- Row numbers in the chart and Cell D44 confirms settings are correct
- If "exclude Rollup" does not appear in D44, then use POST>Reports>Edit and go to the "Drivers" tab and set the buttons as per the previous slide
- Excluding Zero Uncertainty will always show up on this chart. This chart only considers elements that have uncertainty on them



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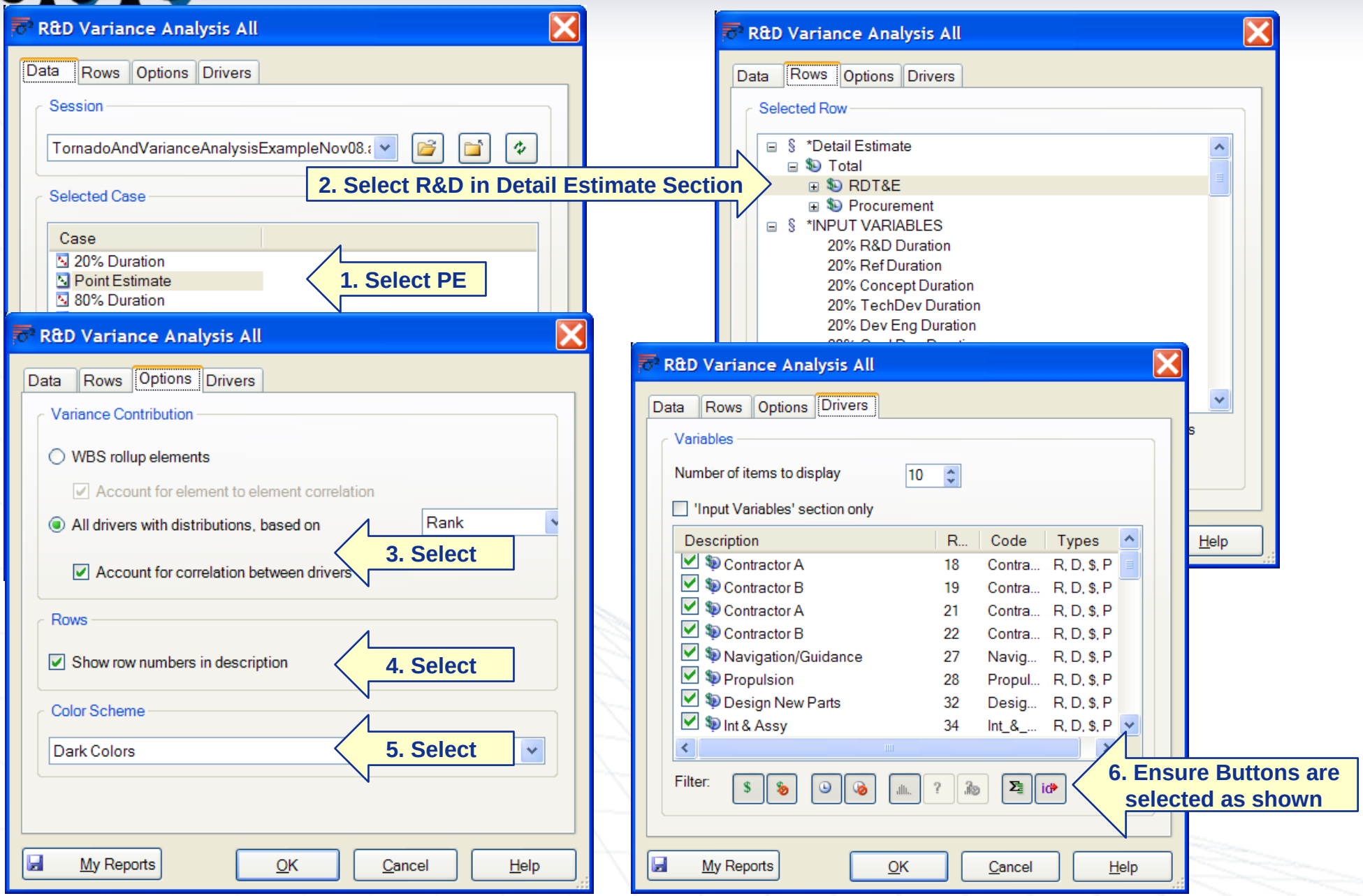
R&D Variance Analysis All



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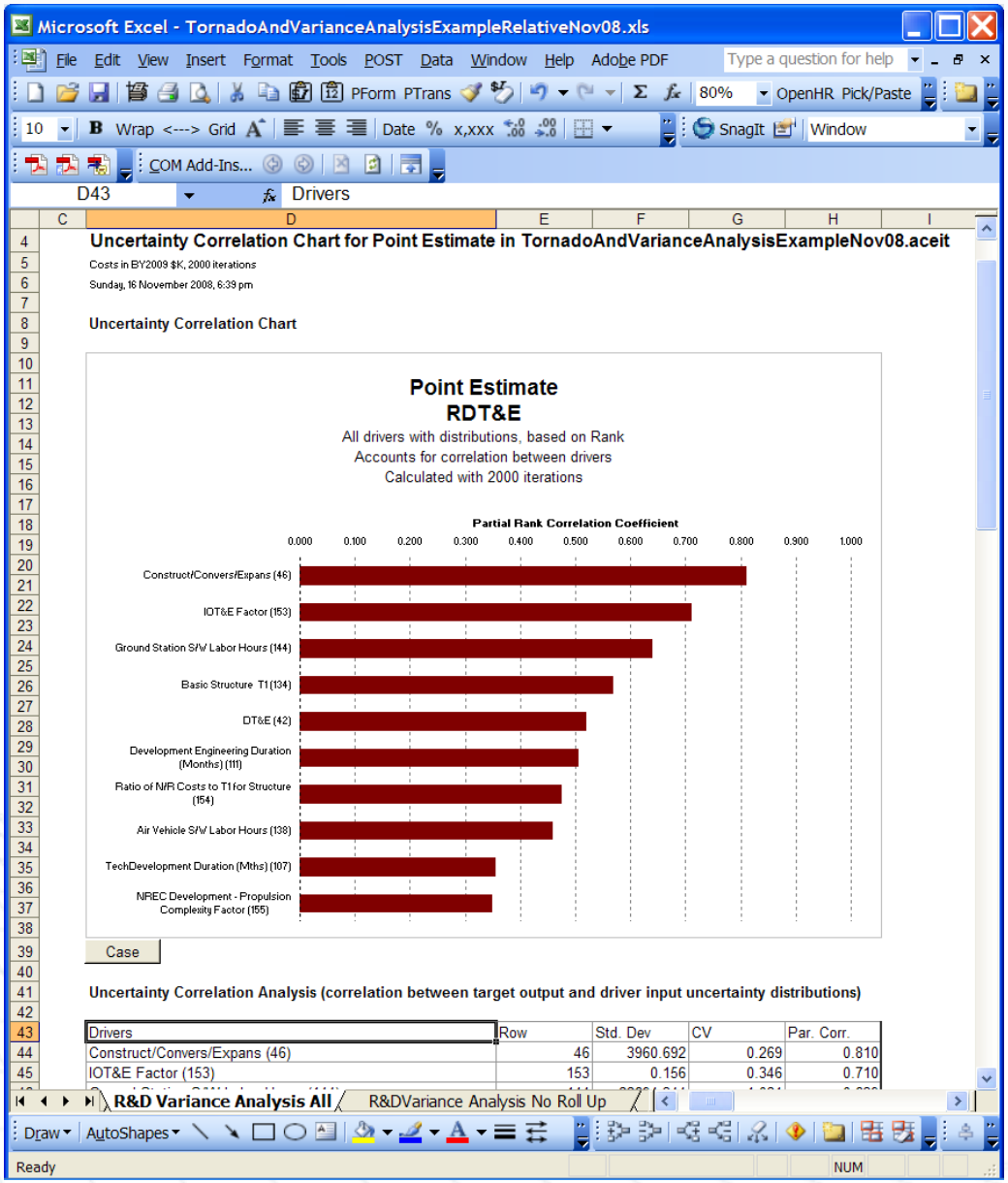
Analyze all Distributions in the Model

- This Variance Analysis chart is called “Uncertainty Correlation”
- Finds the uncertainty distributions that contribute the most to the target row’s variance.
- Measures correlation between each defined distribution and the target output distribution
- Analyzes every distribution specified in the model



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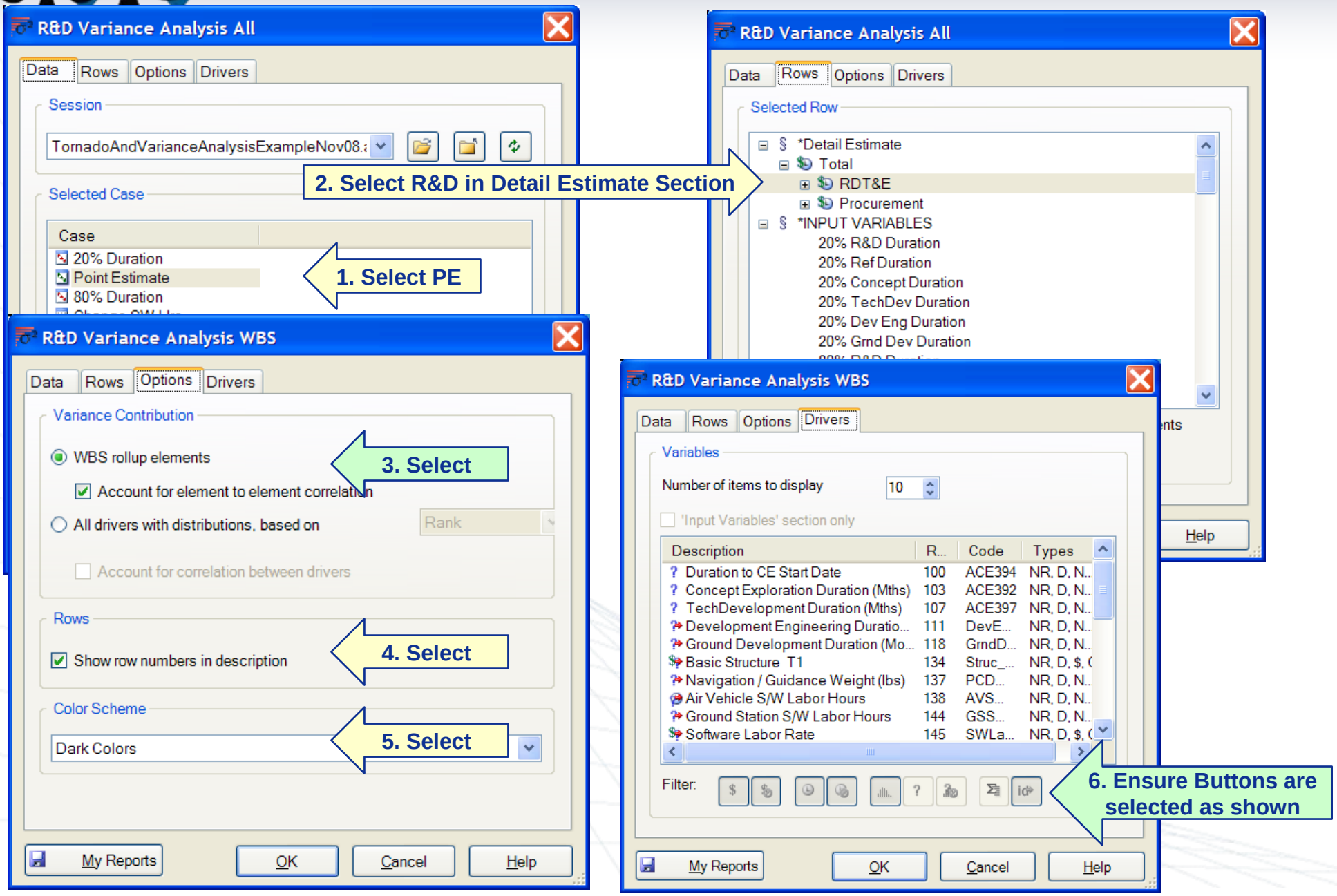
R&D WBS Variance Analysis



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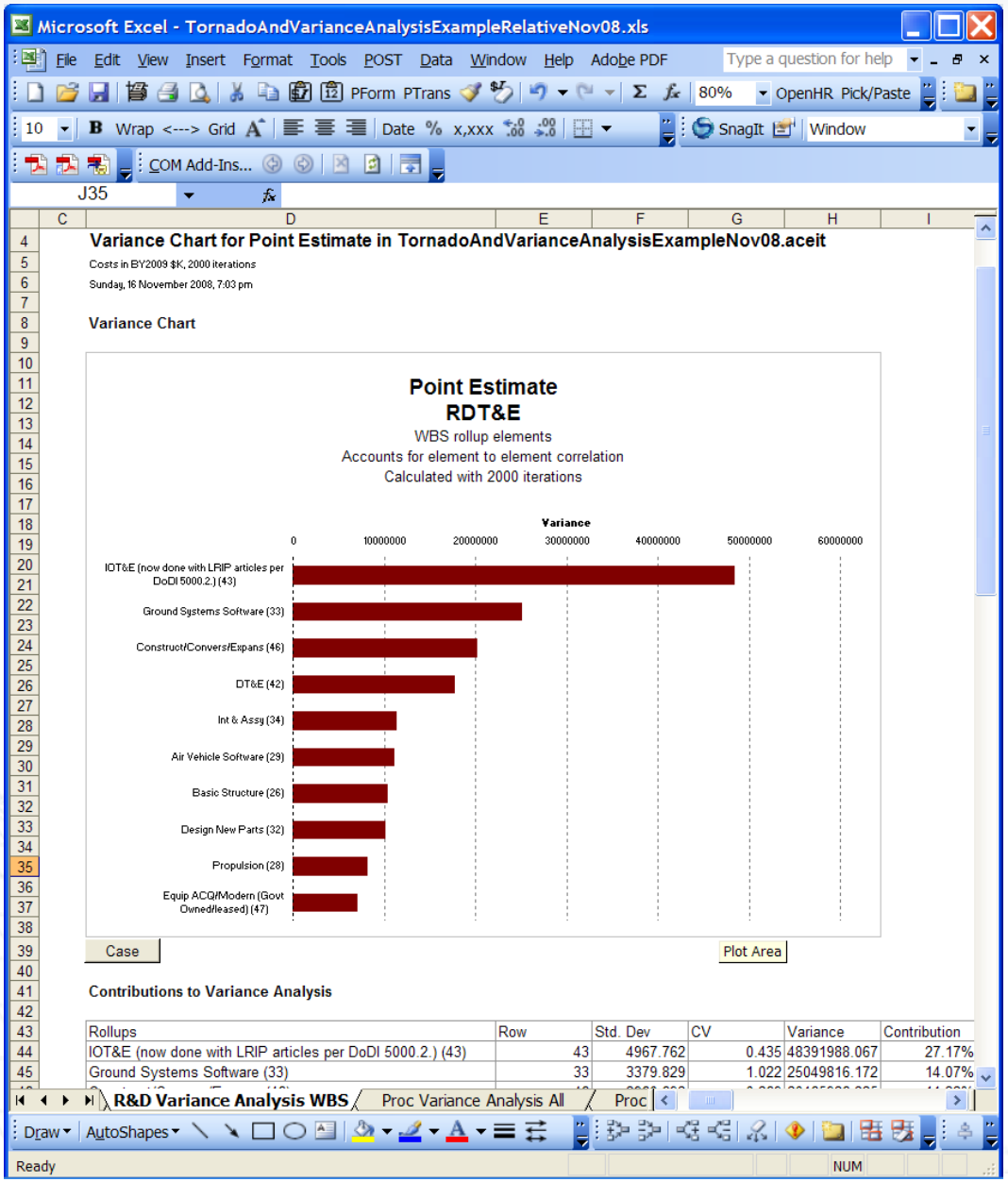
Find the WBS Variance Drivers

- This Variance Chart finds the WBS elements that contribute the most to the target row's uncertainty.
- Every WBS element that contains risk (explicit or inherited) is considered
- Only looks at WBS elements. The variance contribution is only correct if correlation is accounted for correctly.



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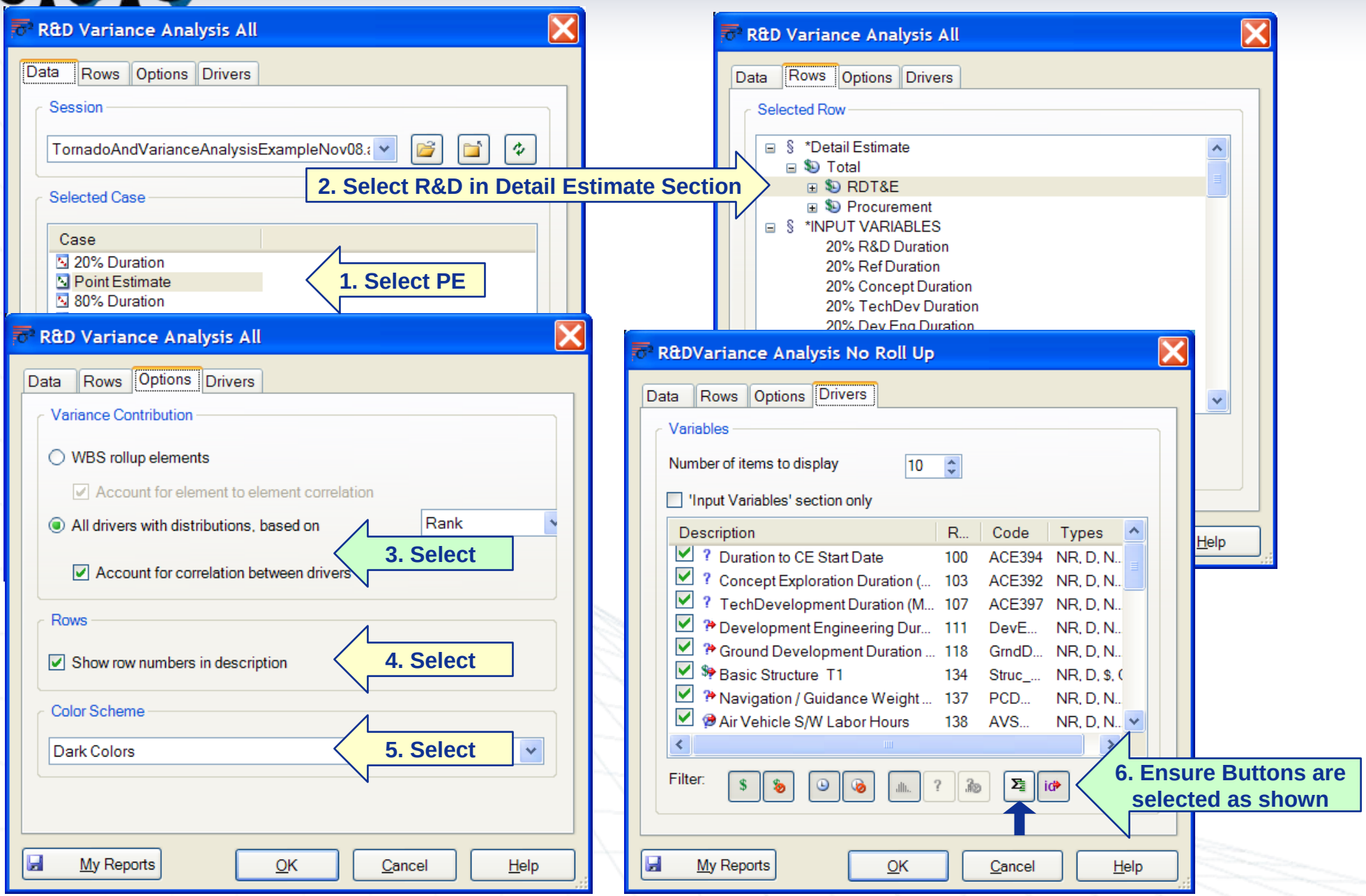
R&D Variance Analysis No Roll Up



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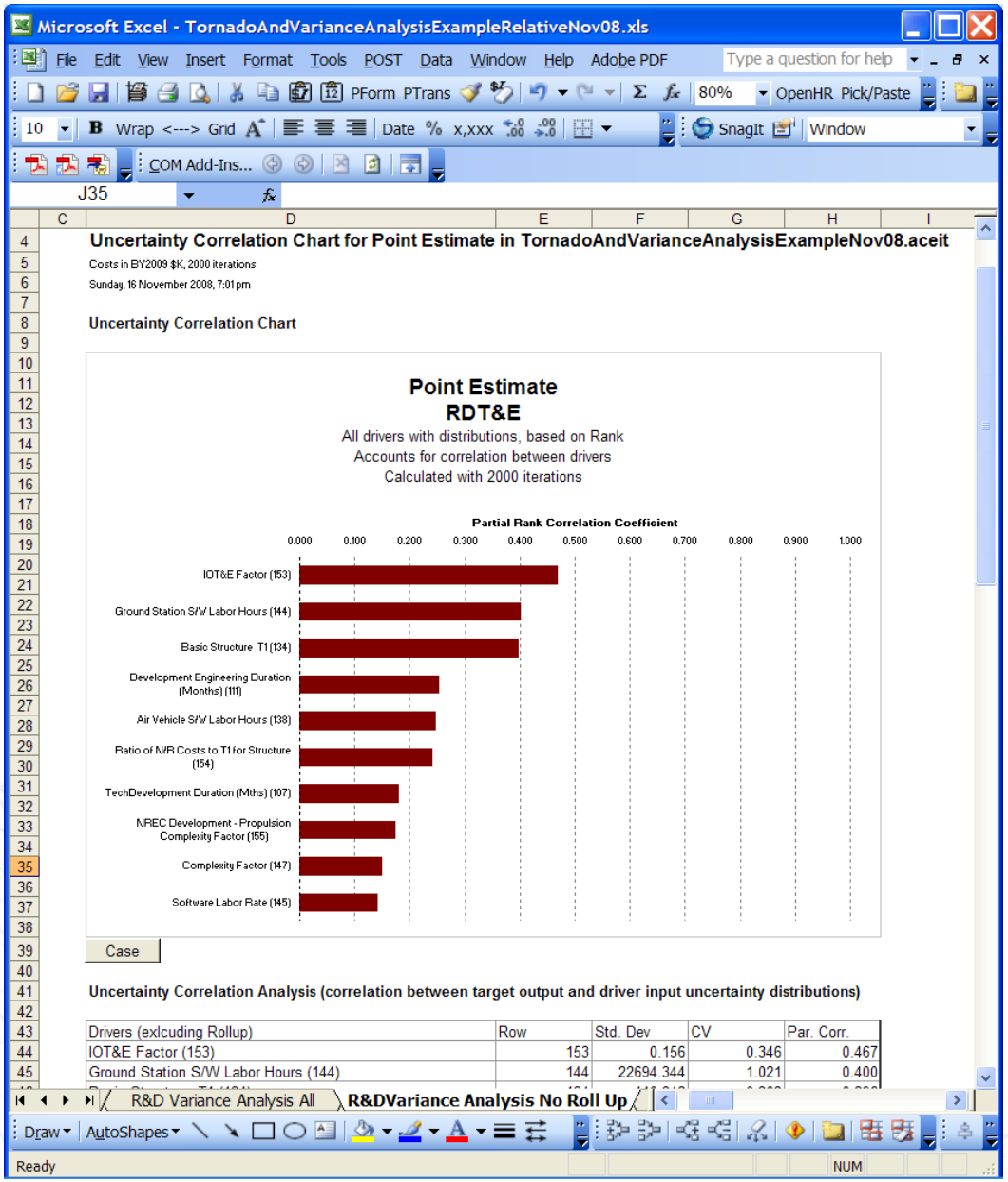
Variance Analysis of "Non Roll Up" Distributions

- This Variance Analysis chart is called "Uncertainty Correlation"
- Finds the uncertainty distributions <u>that are not defined in the WBS</u> that contribute the most to the target row's variance.
- Measures correlation between each defined distribution and the target output distribution
- Analyzes distributions everywhere in the model, except those assigned in a WBS.



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Summary

- **Refer to ACE Help for guidance that follows AFCAA CRUH**
- **ACE Reports:**
  - RI$K Statistics - allows you to view RI$K analysis results
  - RI$K Correlation - allows you to see the resulting correlation of items in an ACE session
  - Phased with RI$K Allocation – lets you control how to allocate RI$K costs at the level in the WBS where risk is managed such that the WBS sums at the desired confidence level

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Summary

- **POST reports:**
  - **Pareto**: Identify the top "cost" elements, i.e., cost drivers
  - **Tornado**: Find the variables that drive the **total cost**
    - **Fixed range** – use when there is little or no uncertainty in the model
    - **Risk Range** – use when risk bounds have been specified in the model. Ensures that the variable range is consistent with your model inputs.
  - **Variance Analysis**: Find the elements that contribute most to **total uncertainty**
    - **Rollup** - identifies the WBS elements that drive the uncertainty. This report is in terms of "variance", but be sure to "include correlation between elements" otherwise the result can be misleading.
    - **Non-rollup** - identifies the variables that drive uncertainty. This report is in terms of "input uncertainty" correlation with the target "output correlation". ACE may be the only tool that performs this analysis with correlation between the variables considered.
- **ACEIT contains the all the reports you need to tell your story!**

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BACKUP

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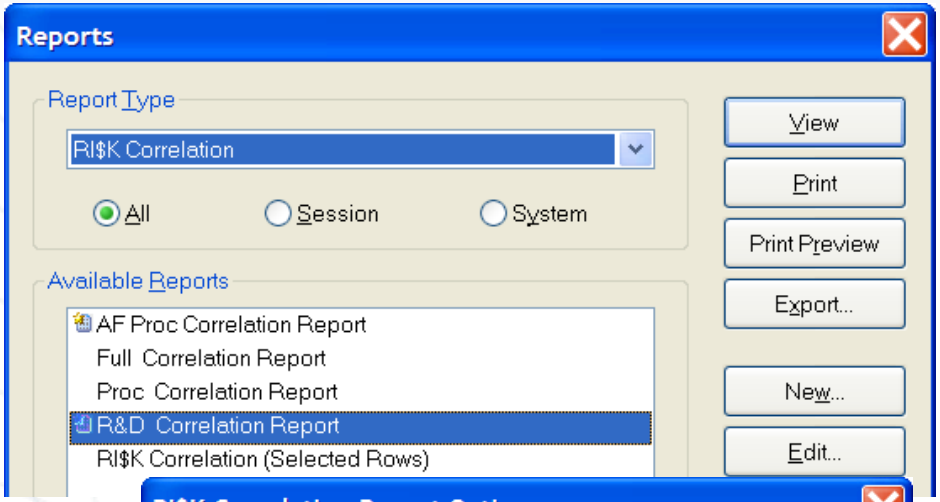
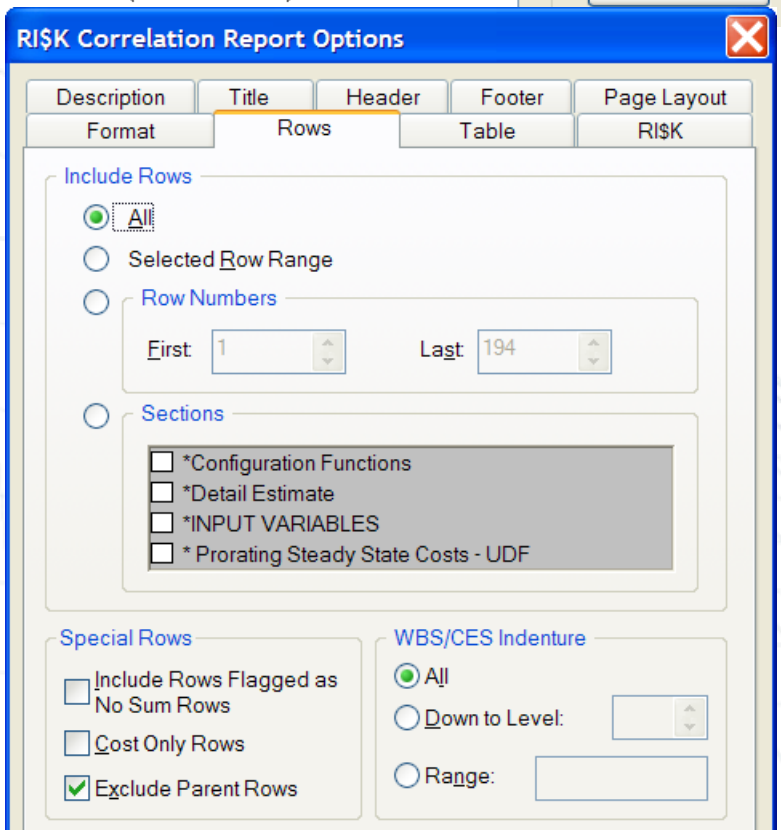
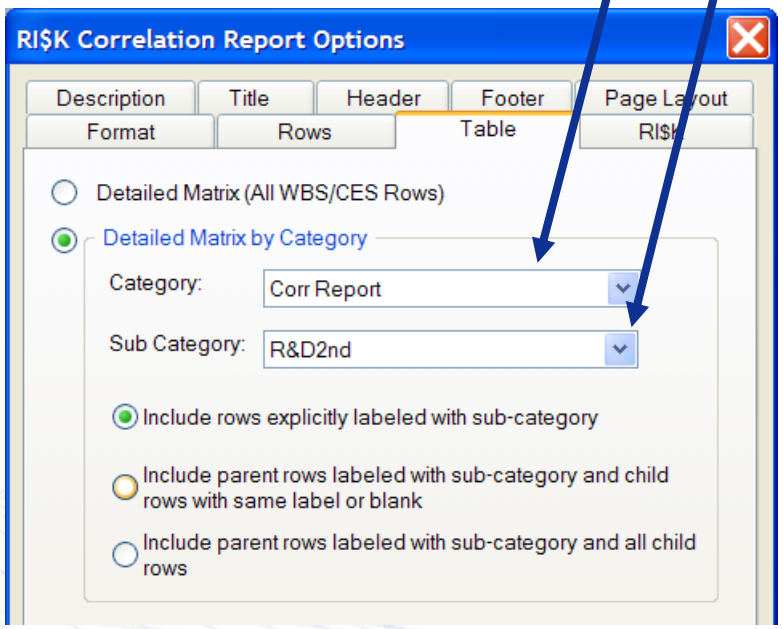
Filtered Correlation Report





	WBS/CES	ID	Point Estimate	Eq / Thruput	Corr Report
15	Total		$ 530,935 (29%) *		
16	RDT&E	RDTE$	$ 67,470 (10%) *		
17	Concept Refinement		$ 1,020 (14%) *		R&D2nd
18	Contractor A		$ 510 (25%) *	500	
19	Contractor B		$ 510 (25%) *	500	
20	Technology Development		$ 4,270 (14%) *		R&D2nd
21	Contractor A		$ 2,135 (25%) *	2.0	
22	Contractor B		$ 2,135 (25%) *	2.0	
23	System Development and		$ 62,180 (12%) *		R&D2nd
24	Development Engineeri		$ 23,429 (21%) *		
25	Air Vehicle	AV$	$ 10,886 (24%) *		



Introducing "RI$K Allocation"

ACE Help

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Allocating RI$K

A consequence of the risk analysis process is that the lower level WBS element results do not sum to the parent result. While this is the mathematically correct way to display risk analysis results, users of ACE often make their own adjustments to ACE risk results in order to force WBS elements to sum for budgeting and other reasons. In ACE 5.0 an allocation scheme was introduced that allocated risk costs (the difference from the point estimate and the confidence level risk result) at a selected level in the WBS to all the other elements such that the WBS elements sum. In version 5.0a the algorithm was improved to propagate the allocation down from the selected WBS level (rather than up from the very bottom of the WBS) to capture the effects of Grouping (correlation).

In ACE 5.0 and 5.0a, the RI$K allocation algorithm was based on adjusting the point estimate. In ACE 5.1 we changed the RI$K allocation algorithm to improve the stability of the adjustment process. Rather than adjusting the point estimates, ACE now made an adjustment directly to the mathematically correct risk results at the selected confidence level. Consequently, the adjustments are smaller and allocated results tend to be closer to the correct risk statistical results. The heuristic was changed again in ACE 6.0. The new process follows these steps:

1. Calculate the case in BY money.
2. Generate the risk statistics in BY money.
3. Allocate risk in BY money. From the risk statistics for a selected confidence level, sum the children risk and compare it to the risk at the total level. Spread the necessary adjustment (to make the children add to the "correct" parent result) to the children based upon the child standard deviation.
4. Re-sum the parents.
5. Replace the engine's BY results with the new allocated BY results.
6. Perform Standard Then Year calculation: Inflate cost rows, recalculate non-cost rows that refer to cost rows (summary sections), and re-sum parents. (For BY results, the inflation step is skipped.)

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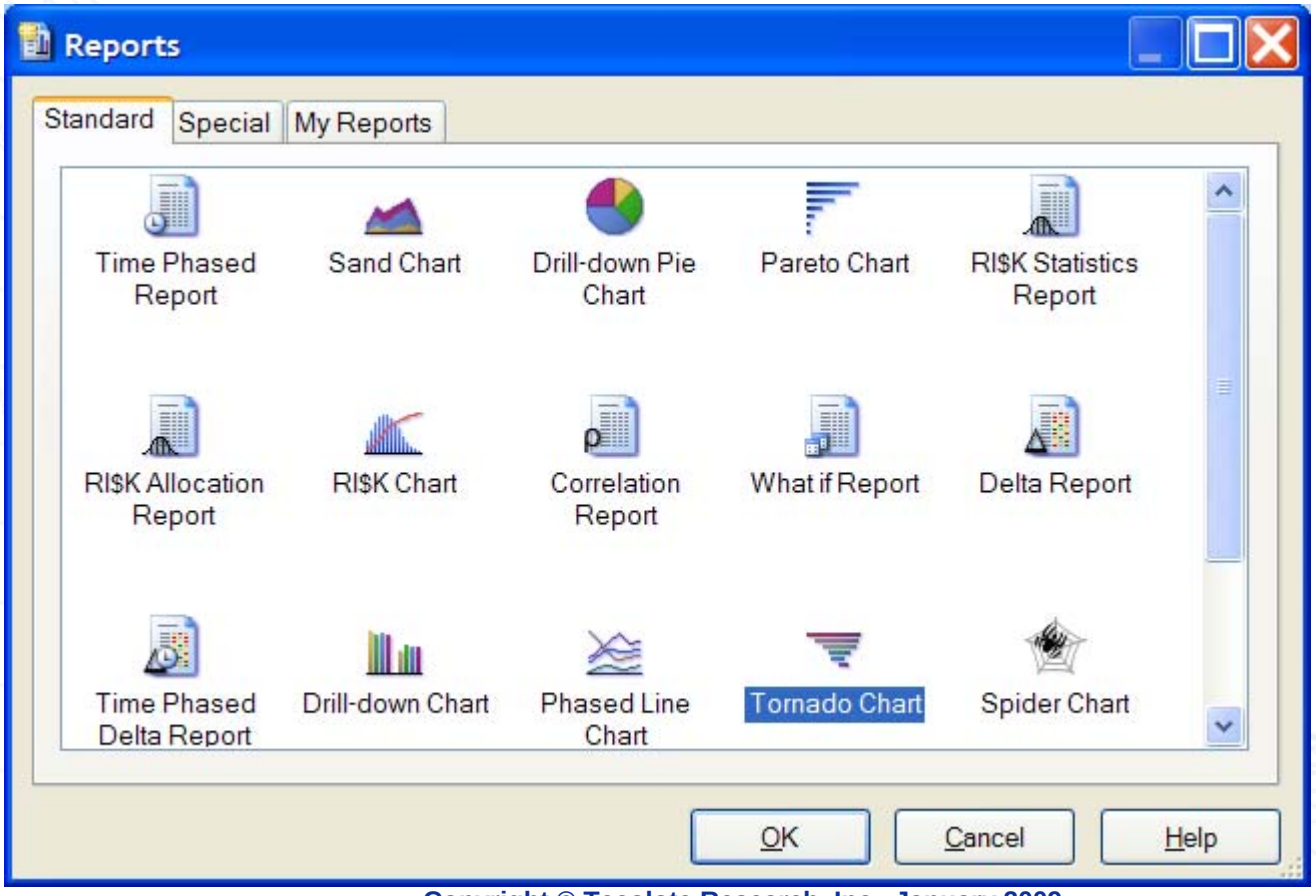
Create a Tornado

- Open POST and then open POST/Open Session
- This opens your session in the Input/Results Viewer
- Click “Reports”, select “Tornado Chart” then “Ok”



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