

The background features a light blue constellation of stars and a prominent pink diagonal line crossing the center. The stars are arranged in a pattern that resembles a constellation, with some stars being larger than others. The pink line is a solid, slightly curved diagonal stroke.

PHASING OF RECURRING PROCUREMENT ITEMS

ACEIT User Conference

CONSTELLATION



Abstract



Phasing of Recurring Procurement Items

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In many situations, analysts need to phase recurring costs (e.g., hardware procurement lot costs) over multiple years. Until version 7.1, ACEIT has only allowed users to multi-year spread recurring costs by creating separate summaries and using multiple FYCVL equations. In ACEIT 7.1 the lead/Lag capability was enhanced to allow leading or lagging multiple portions of inputs over multiple years. Variables can be used in the specification of Years (to Lead/Lag) and Fraction of the Input to shift. This paper will show how this new feature is used to support phasing of NASA procurement activities as well as explore other potential uses.



Overview



- **Background**
- **Multi-Year Lead/Lag Implementation Detail**
 - 7.0 Method
 - 7.1 Method
- **Additional Uses of 7.1 Lead/Lag Feature**
- **Summary**

The Problem



- ACE can easily estimate Recurring Lot Costs by either:
 - Learning (Qty, Slope, Reference Cost)
 - Qty * Cost
- Costs appear 100% in the year of the Qtys

	Total	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Annual Lot Cost	\$ 600								\$ 100	\$ 100	\$ 200	\$ 200
Qty	6								1	1	2	2
Unit Cost	\$ 100											

How can an analyst spread the annual lot costs over multiple years?



What is Multi-Year Phasing?



- In many situations Recurring Costs need to be lead in advance of the Qty stream
 - Quantities may represent launches and need to phase cost earlier due to full-funding requirements
 - Long-lead items need to be procured prior to the full-funding year and may be required over multiple years
 - Organizations may wish to develop estimates based on incremental funding that is tied to actual expenditures (typical of NASA, and DoD R&D and O&S)

	Total	LY-4	LY-3	LY-2	LY-1	Launch Year	LY+1	LY+2	LY+3
Annual Lot Cost	\$ 100					\$ 100			
Full Funding (1 year Prior to Launch)					\$ 100				
Multi-Year Phasing	\$ 100	\$ 15	\$ 25	\$ 35	\$ 25				
Launch Qty	1					1			
Unit Cost	\$ 100								
3 Years Prior to Full Fund Year	15%								
2 Years Prior to Full Fund Year	25%								
1 Year Prior to Full Fund Year	35%								
Full Fund Year	25%								



ACE Implementation



7.0 Implementation



- **Implemented via three separate sections**
 - Section 1: Quantity
 - Section 2: Calculated annual lot costs
 - Reference section 1
 - Calculates total lot cost per year
 - Section 3: Multi-year phased result
 - Reference section 2 (Lot Cost)
 - Uses multiple FYCVAL(@LotCost, FYYR + lead) equations
 - Number of FYCVAL equations dependent on number of years to phase the result

- **Implementation issues**
 - Requires multiple rows, makes sessions larger due to replication
 - Equations can get complicated
 - Cumbersome to modify to accommodate a change in the number of years to spread the results
 - Difficult to review



7.0 Implementation – ACE View



Equation to spread costs over four years

WBS/CES Description	Approp	Unique ID	Point Estimate	Equation	Throughput	Phasing Method	Fiscal Year	Units	Prior Qty	Buy Qty	Curve Slope	Theory	Reference Cost Type
*Multi-Year Phased Estimate		*Estimate											
Multi-Year Phased Result			\$ 23.440 *	$(FYCVAl(@LotCost, FYR+3) * Fund3yrPrior\%) + (FYCVAl(@LotCost, FYR+2) * Fund2yrPrior\%) + (FYCVAl(@LotCost, FYR+1) * Fund1yrPrior\%) + (FYCVAl(@LotCost, FYR) * FullFund\%)$		F							
* Annual Lot Costs		*LotCosts											
Recurring Annual Lot Costs	2031	LotCost	\$ 23.440 *		Unit\$	R			0	BQty	85	U	UC1
*INPUT VARIABLES		*IN_VAR											
Field Qty		FldQty	6.000 *		[Input Throughput]	IS							
Buy Qty		BQty	6.000 *		FYCVAl(@FldQty, FYR + 1)	F							
Unit Cost	2031	Unit\$	\$ 5.000 *		5	C	2007	\$M					
Phasing of Lot Costs			1.000 *										
Full Fund Year		FullFund%	0.250 *		0.25								
1 Year Prior to Full Fund Year		Fund1yrPrior%	0.350 *		0.35								
2 Years Prior to Full Fund Year		Fund2yrPrior%	0.250 *		0.25								
3 Years Prior to Full Fund Year		Fund3yrPrior%	0.150 *		0.15								

Cost Element	Approp	Total	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
*Multi-Year Phased Estimate													
Multi-Year Phased Result		\$ 23.440			\$ 0.750	\$ 1.888	\$ 3.934	\$ 5.614	\$ 5.358	\$ 4.219	\$ 1.678		
* Annual Lot Costs													
Recurring Annual Lot Costs	2031	\$ 23.440						\$ 5.000	\$ 4.250	\$ 7.477	\$ 6.713		



7.0 Implementation – a 1 year Look

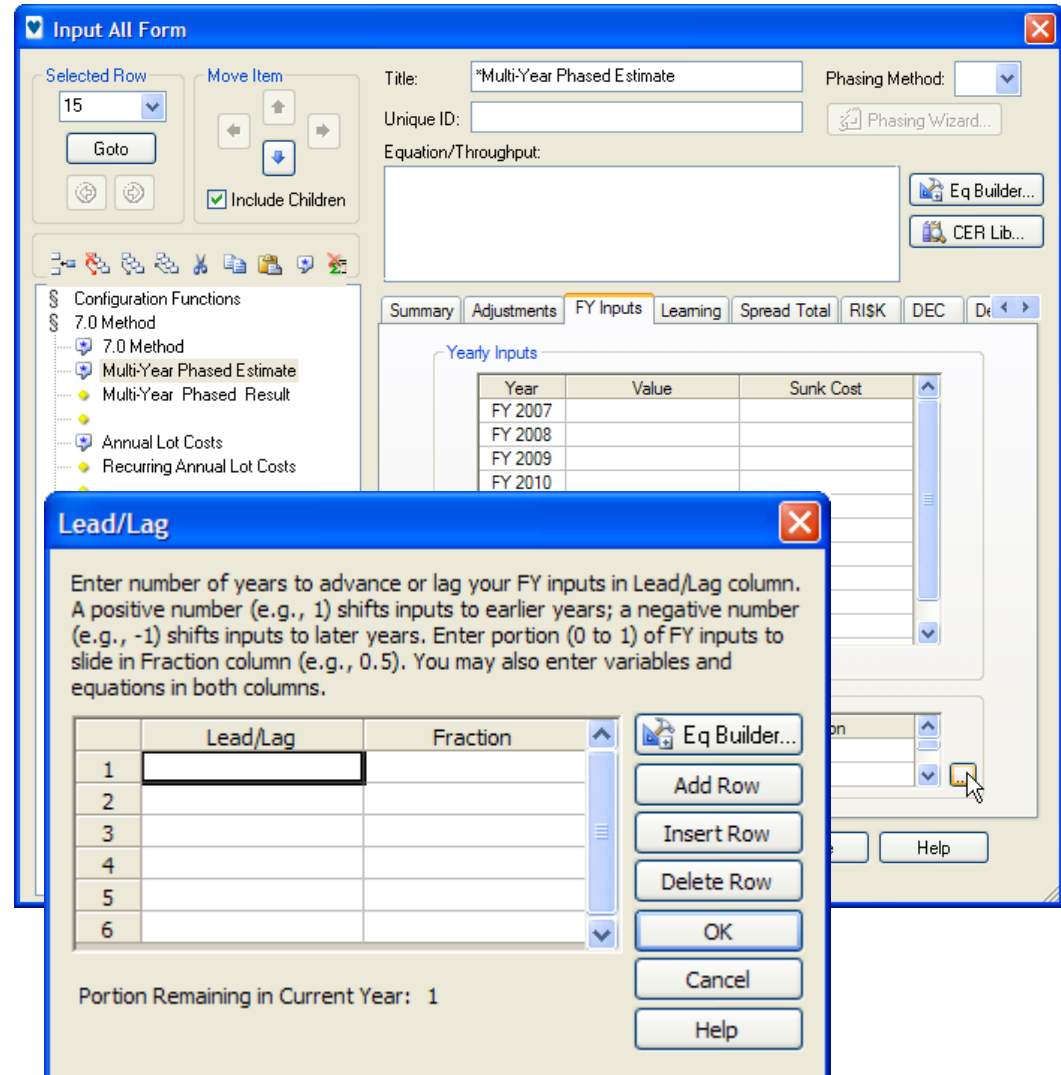


Cost Element	Approp	Total	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
*Multi-Year Phased Estimate									
Multi-Year Phased Result		\$ 5.000			\$ 0.750	\$ 1.250	\$ 1.750	\$ 1.250	
* Annual Lot Costs									
Recurring Annual Lot Costs	2031	\$ 5.000						\$ 5.000	
*INPUT VARIABLES									
Field Qty		1.000							
Buy Qty		1.000						1.000	
Unit Cost	2031	\$ 5.000							1.000
Phasing of Lot Costs		1.000							
Full Fund Year		0.250							
1 Year Prior to Full Fund Year		0.350							
2 Years Prior to Full Fund Year		0.250							
3 Years Prior to Full Fund Year		0.150							

New 7.1 Lead/Lag Feature



- ACEIT 7.1 expanded functionality of existing lead/lag field
- Simplifies multi-year spreading
- Allows use of variables and equations
- No constraint on number of years, only depends on 500 max character length
- Eliminates need for using FY functions to accomplish multi-year spreading
- Can calculate and phase all on one row



The screenshot displays the 'Input All Form' window with the 'FY Inputs' tab selected. The 'Yearly Inputs' table is visible, showing columns for Year, Value, and Sunk Cost, with rows for FY 2007 through FY 2010. Overlaid on this is the 'Lead/Lag' dialog box, which provides instructions on how to use the Lead/Lag and Fraction columns to shift and phase inputs.

Lead/Lag Dialog Instructions:
 Enter number of years to advance or lag your FY inputs in Lead/Lag column. A positive number (e.g., 1) shifts inputs to earlier years; a negative number (e.g., -1) shifts inputs to later years. Enter portion (0 to 1) of FY inputs to slide in Fraction column (e.g., 0.5). You may also enter variables and equations in both columns.

	Lead/Lag	Fraction
1		
2		
3		
4		
5		
6		

Buttons: Eq Builder..., Add Row, Insert Row, Delete Row, OK, Cancel, Help

Portion Remaining in Current Year: 1

7.1 Implementation



- **Implemented via two sections**
 - Section 1: Quantity Data
 - Section 2: Calculated Lot Costs and Multi-Year Phased Results
 - References Section 1
 - Calculates Total Lot Cost per Year
 - Phases over Multi-Years via Lead/Lag field and shows results

Lead/Lag ✕

Enter number of years to advance or lag your FY inputs in Lead/Lag column. A positive number (e.g., 1) shifts inputs to earlier years; a negative number (e.g., -1) shifts inputs to later years. Enter portion (0 to 1) of FY inputs to slide in Fraction column (e.g., 0.5). You may also enter variables and equations in both columns.

	Lead/Lag	Fraction
1	0	0.25
2	1	0.35
3	2	0.25
4	3	0.15
5		
6		

Eq Builder...

Add Row

Insert Row

Delete Row

OK

Cancel

Help

Portion Remaining in Current Year: 0.00



7.1 Implementation – ACE View



WBS/CES Description	Approp	Unique ID	Point Estimate	Equation / Throughput	Phasing Method	Fiscal Year	Units	Prior Qty	Buy Qty	Curve Slope	Theory	Reference Cost Type	Lead/Lag
* 7.1 Method - Off Buy Qty		*Method70											
*Multi-Year Phased Estimate													
Multi-Year Phased Result	2031			Unit\$	R			0	BQty	85	U	UC1	0,FullFund%, 1,Fund1yrPrior%, 2,Fund2yrPrior%, 3,Fund3yrPrior%
*INPUT VARIABLES													
		*IN_VAR											
Field Qty		FldQty	6.000 *	[Input Throughput]	IS								
Buy Qty		BQty	6.000 *	FYCVAl(@FldQty,FYYR + 1)	F								
Unit Cost	2031	Unit\$	\$ 5.000 *			5	C	2007	\$M				
Phasing of Lot Costs			1.000 *										
Full Fund Year		FullFund%	0.250 *			0.25							
1 Year Prior to Full Fund Year		Fund1yrPrior%	0.350 *			0.35							
2 Years Prior to Full Fund Year		Fund2yrPrior%	0.250 *			0.25							
3 Years Prior to Full Fund Year		Fund3yrPrior%	0.150 *			0.15							

Buy Qty Row

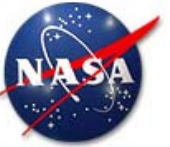
Multi-Year Phasing with Variables

Cost Element	Approp	Total	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
* 7.1 Method													
*Multi-Year Phased Estimate													
Multi-Year Phased Result	2031	\$ 23.440			\$ 0.750	\$ 1.888	\$ 3.934	\$ 5.614	\$ 5.358	\$ 4.219	\$ 1.678		

Same Results as 7.0 method



7.1 Implementation – Direct on Field Qty



WBS/CES Description	Approp	Unique ID	Point Estimate	Equation / Throughput	Phasing Method	Fiscal Year	Units	Prior Qty	Buy Qty	Curve Slope	Theory	Reference Cost Type	Lead/Lag
* 7.1 Method		*Method70											
*Multi-Year Phased Estimate													
Multi-Year Phased Result	2031		\$ 23.440 *	Unit\$	R			0	FYCVAL(@FldQty, FYR+1)	85	U	UC1	0,FullFund%,1,Fund1yrPrior%,2,Fund2yrPrior%,3,Fund3yrPrior%
*INPUT VARIABLES		*IN_VAR											
Field Qty		FldQty	6.000 *	[Input Throughput]	IS								
Buy Qty		BQty	6.000 *	FYCVAL(@FldQty, FYR + 1)	F								
Unit Cost	2031	Unit\$	\$ 5.000 *	5	C	2007	\$M						
Phasing of Lot Costs			1.000 *										
Full Fund Year		FullFund%	0.250 *	0.25									
1 Year Prior to Full Fund Year		Fund1yrPrior%	0.350 *	0.35									
2 Years Prior to Full Fund Year		Fund2yrPrior%	0.250 *	0.25									
3 Years Prior to Full Fund Year		Fund3yrPrior%	0.150 *	0.15									

No Need for Buy Qty Row

Cost Element	Approp	Total	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
* 7.1 Method													
*Multi-Year Phased Estimate													
Multi-Year Phased Result	2031	\$ 23.440			\$ 0.750	\$ 1.888	\$ 3.934	\$ 5.614	\$ 5.358	\$ 4.219	\$ 1.678		

Same Results

Benefits of new Method



- **Simplifies Models**
 - Reduces Number of Rows
 - Removes Complicated Equations
 - All Data Can Now be Stored and Calculated on a Single Row
- **Lead / Lag Fields Allows Variables and Equations**
 - Provides Phasing What-If Capability
 - Allows for implementation of Beta Curves to be used to Phase Recurring Costs via a Row Lookup (Phasing Percentages in Yearly Columns)

Lead/Lag

Enter number of years to advance or lag your FY inputs in Lead/Lag column. A positive number (e.g., 1) shifts inputs to earlier years; a negative number (e.g., -1) shifts inputs to later years. Enter portion (0 to 1) of FY inputs to slide in Fraction column (e.g., 0.5). You may also enter variables and equations in both columns.

	Lead/Lag	Fraction
1	0	FullFund%
2	1	Fund1yrPrior%
3	2	Fund2yrPrior%
4	3	Fund3yrPrior%
5		
6		

Portion Remaining in Current Year: 1.00

Lead/Lag

Enter number of years to advance or lag your FY inputs in Lead/Lag column. A positive number (e.g., 1) shifts inputs to earlier years; a negative number (e.g., -1) shifts inputs to later years. Enter portion (0 to 1) of FY inputs to slide in Fraction column (e.g., 0.5). You may also enter variables and equations in both columns.

	Lead/Lag	Fraction
1	0	FYCVAL(@Row,FYFIRST+3)
2	1	FYCVAL(@Row,FYFIRST+2)
3	2	FYCVAL(@Row,FYFIRST+1)
4	3	FYCVAL(@Row,FYFIRST)
5		
6		

Portion Remaining in Current Year: 1.00



Additional Uses



New Feature Can Reduce Use of FCVAL() Equations



- **FYCVL() Function Commonly Used to:**
 - Shift results into a different year (lead or lag)
 - Phase annual results over multiple years
- **Lead/Lag Feature Now Does the Same Thing**
 - Anywhere you were using a FYCVL(@ID, FYR + n) can now be eliminated

WBS/CES Description	Approp	Unique ID	Point Estimate	Equation / Throughput	Phasing Method	Lead/Lag
* Additional Uses						
Lead Qty 2 Years Prior (FYCVL Method)				FYCVL(@FldQty,FYR+2)		
Lead Qty 2 years Prior (Lead/Lag Method)				FldQty		2,1



BACKUP

Summary



- **New Lead/Lag Feature Simplifies a Cost Model**
 - Reduces number of rows
 - Removes tedious equations
- **NASA Able to Use Feature to Solve Multi-Year Recurring Phasing Problem**
- **Feature Has Benefit to General User in Ability to Remove Many $FYCVAl(@ID, FYR + n)$ equations**



Lead/Lag Enhancement

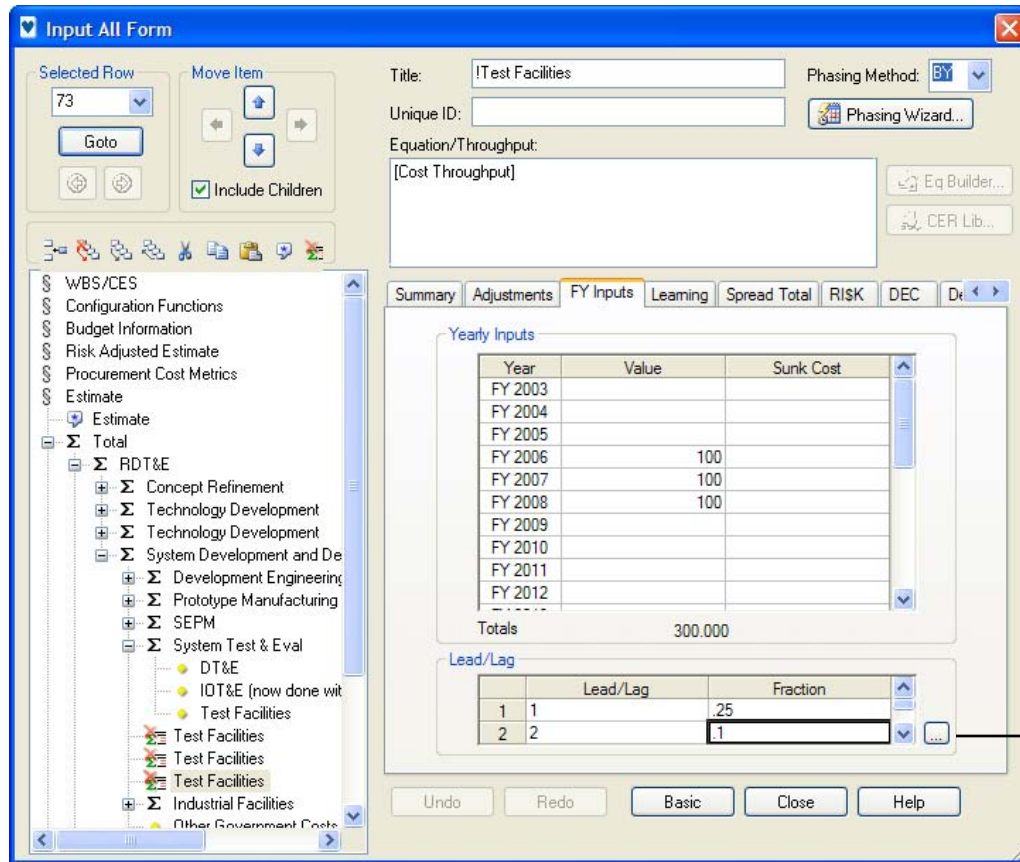
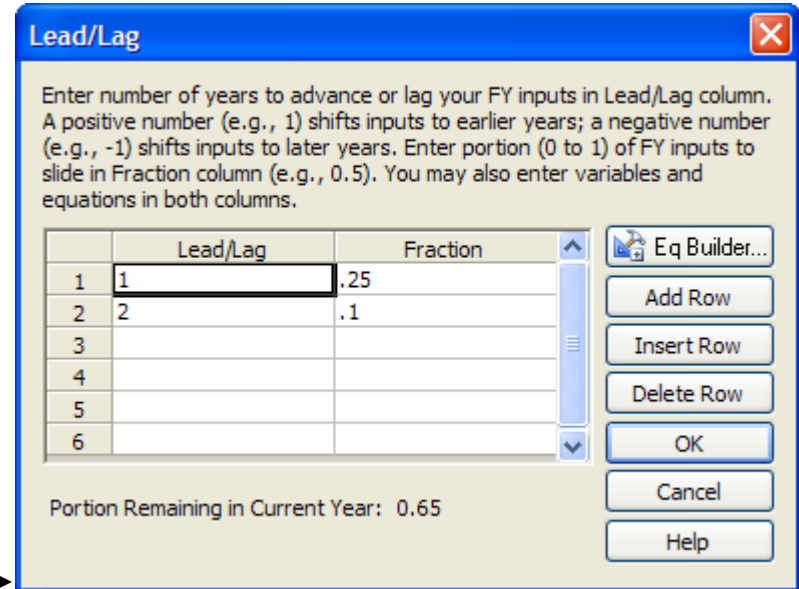


- In ACE 7.0 and prior, you could only Lead or Lag a single portion of the annual costs or inputs
- The enhancement supports multiple lead/lag year, buy fraction pairs
- Variables and equations can be used to define number of years to lead/lag and the fraction (*new in 7.1*)
- Enhanced capability allows specification of partial years for lead/lag

	2003	2004	2005	2006	2007	2008
Yearly Values				100	100	100
<u>Lead/Lag Year, Fraction</u>						
1, 1			100	100	100	
1, 0.25			25	75 + 25=100	75 + 25=100	75
2, 0.10		10	10	90 + 10=100	90	90
1, 0.25, 2, 0.10		10	25 + 10=35	65 + 25 + 10=100	65 + 25=90	65

Enhanced Lead/Lag Capability

Note that lead/lag years and fractions can be specified with variables.

WBS/CES Description	Total	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Test Facilities	\$ 300.000				\$ 100.000	\$ 100.000	\$ 100.000
! Test Facilities - Lead 25% 1 year	\$ 300.000			\$ 25.000	\$ 100.000	\$ 100.000	\$ 75.000
! Test Facilities - Lead 10% 2 years	\$ 300.000		\$ 10.000	\$ 10.000	\$ 100.000	\$ 90.000	\$ 90.000
! Test Facilities - Lead 25% 1 year and 10% 2 years	\$ 300.000		\$ 10.000	\$ 35.000	\$ 100.000	\$ 90.000	\$ 65.000