Earned Schedule: Principles and Practice

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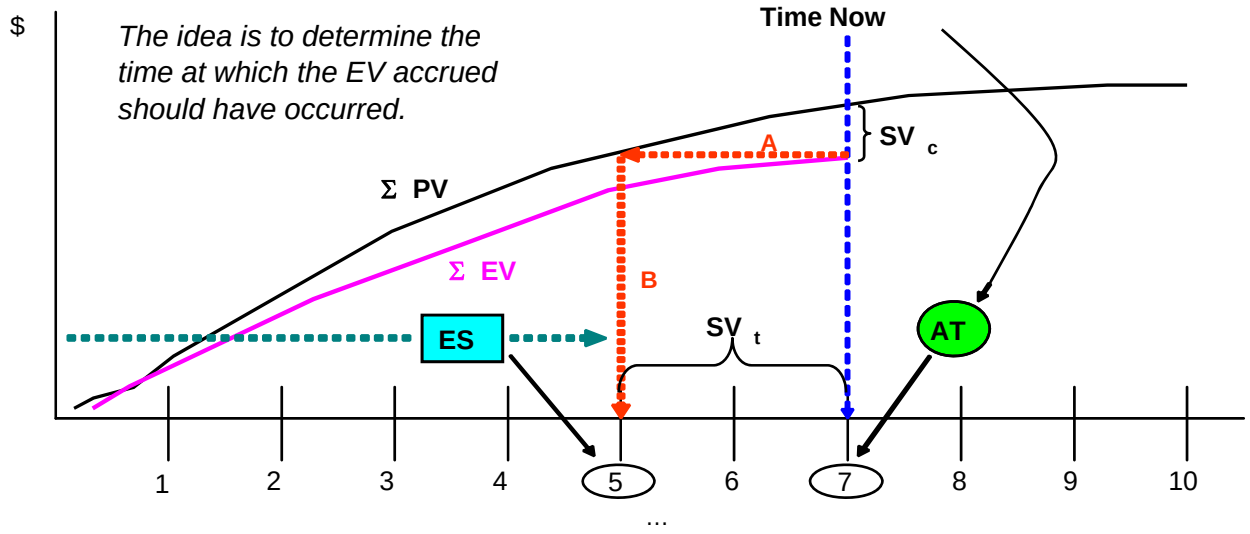


Introduction (1)

- What is Earned Schedule?
  - History and background
- What are the benefits of using Earned Schedule?
- How does Earned Schedule work?
- What are the similarities and differences between Earned Value and Earned Schedule?
- How can Earned Schedule be integrated with other Project Management techniques?
- Sanitised examples:
  - Design and development project
  - In-service (operations) project

Introduction (2) – learning points

- Earned Schedule – terminology & equations
- Practice the ES method – using sanitised data
- Review Management Action using ES
- Advantages/drawbacks of ‘manual’ and ‘computed’ calculations
- Review of existing/commercially available ES software
- ES Confidence Limits: comparison with Risk confidence models
- Use of sanitised data to compare ES and confidence models
- Prolongation – or ‘cost of delay’ with Risk MR and ES
- Introduction to schedule adherence – plus some practice
- Introduction to benefits tracking

Introduction (3)

- Plenty of breaks during the day
- Loos
- Buffet Lunch at approx 12:00
- No practice/tests of fire alarms
- Finish before 16:00 hrs
- …and most importantly
- It’s an interactive session!

Playing Devil's Advocate

- Why do I need another project management tool?
- I've already got a link between cost and schedule!
- Does this technique REALLY provide better decision making?
- I've heard this technique is used on development projects…but does it work for ongoing operations?
- Are you saying that Earned Value doesn't work!?

So what's wrong with Earned Value, then?

- It's good as a Project management technique

  …however…

  - Schedule indicators are flawed for late projects
  - Extremely limited for schedule performance analysis
  - EVM practitioners pay attention to Cost – not schedule
  - EVM has, in some areas, become focused in financial management
  - Indicators are not directly connected to deliverables
  - EV is not required to be synchronous with the schedule
  - EVM offers limited management guidance for project and schedule control

Earned Schedule – a brief history

- The original phrase “Time is money” was first posed by Antiphon
  - Greek writer and educator
  - Around 430 BC
  - “The most costly outlay is time”
- This statement was ahead of its time!
- In 2006, Dr. Steve Gumley, CEO Defence Materiel Organisation (Australia) stated…

  “We need to maintain our attention on schedule delivery. Data tells us that since July 2003, real cost increase in projects accounted for less than 3 percent of the total cost growth. …*Therefore, our problem is not cost, it is SCHEDULE*.”

Earned Schedule – a brief history

- Earned Schedule papers first published in USA – in 2003
- “Schedule is different”, Measurable News
- Concept was verified with actual project data
- Continued development from 2003 to present

Benefits of using Earned Schedule (1)

- Converting money into time
- Connects EVM to the project schedule
- Project Managers have a schedule analysis tool that improves the confidence in forecasting delivery dates
- Improves decision making
- Adds to trend analysis
- Integrates and supports risk management activities
- You need PV, EV and AT to perform calculations!

Benefits of using Earned Schedule (2)

- ES can be applied to any level of the WBS, to include task groupings such as the Critical Path
  - Requires creating PMB for the area of interest
  - EV for the area of interest is used to determine its ES
- Enables comparison of forecasts, total project duration (TP) to Critical Path (CP) duration
  - Desired result: forecasts are equal
  - When TP forecast > CP forecast, CP has changed
  - When CP > TP, possibility of future problems

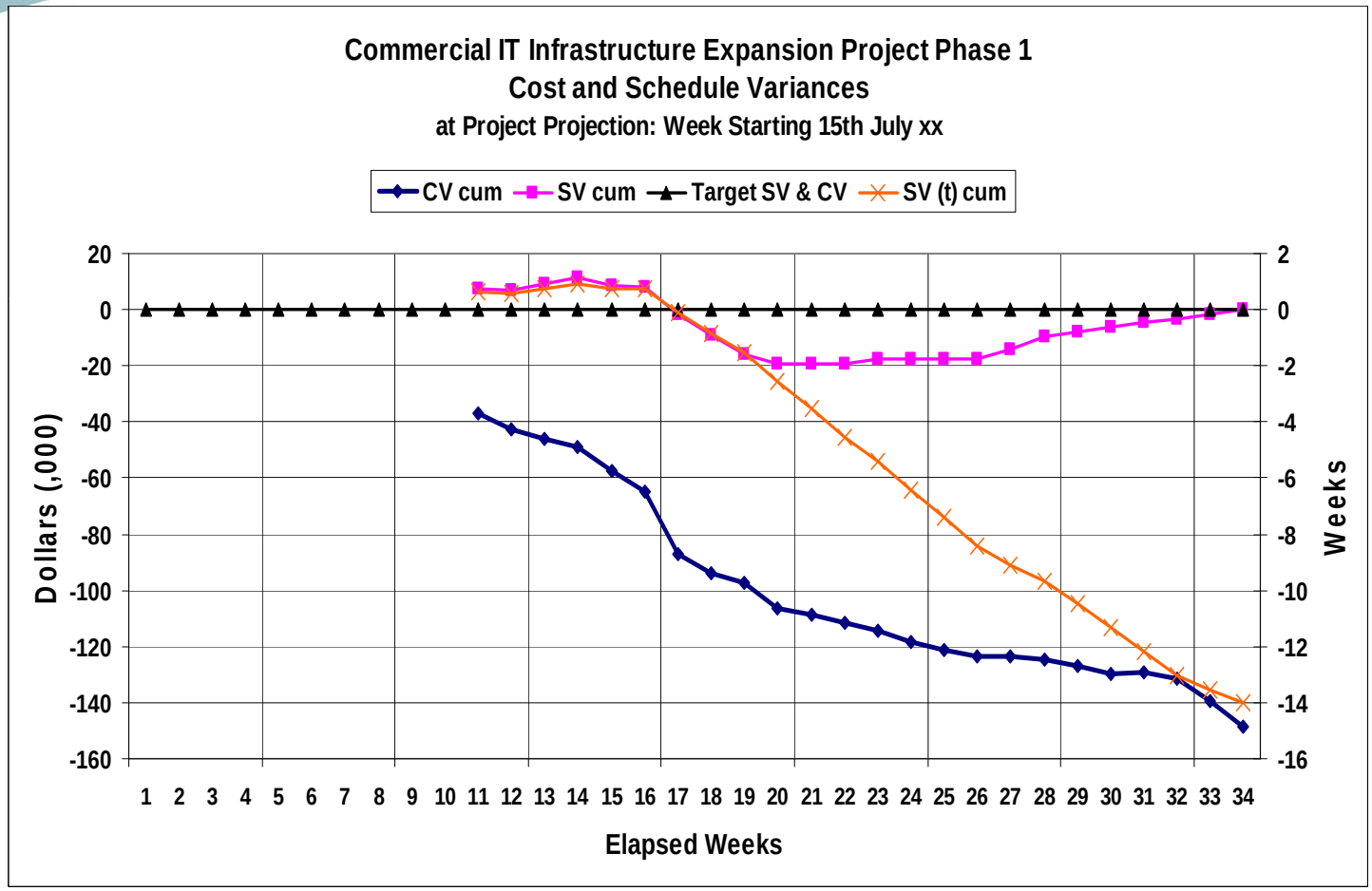
Benefits of using Earned Schedule (3)

- Earned Schedule works!
- How do we know?
- Evidence from a number of projects
- IEAC(t) & SPI(t) studies by K. Henderson, Dr. Vanhoucke & S. Vandevoorde (2003 – present)
  - Henderson & Vandevoorde validated ES concept with real data
  - Using simulation Vanhoucke & Vandevoorde showed ES to be a better schedule predictor than other EVM-based methods
- *"The results ..confirm ..that the ES method outperforms, on average, the other forecasting methods"* - Vanhoucke & Vandevoorde
- Takes Earned Value Management into a new dimension

Why use Earned Schedule?

- Schedule Variance (SV) and Schedule Performance Indicator (SPI) behave erratically – especially for projects behind schedule
- SPI improves and concludes at 1.00 at end of project
- Why is this?
- EV=BAC at completion
- PV=BAC at completion
- Hence SPI(£)=1 and SV(£) = 0
- Classical Schedule Variance is measured in money – not time!

Comparison of Schedule Variances



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Earned Schedule Calculation

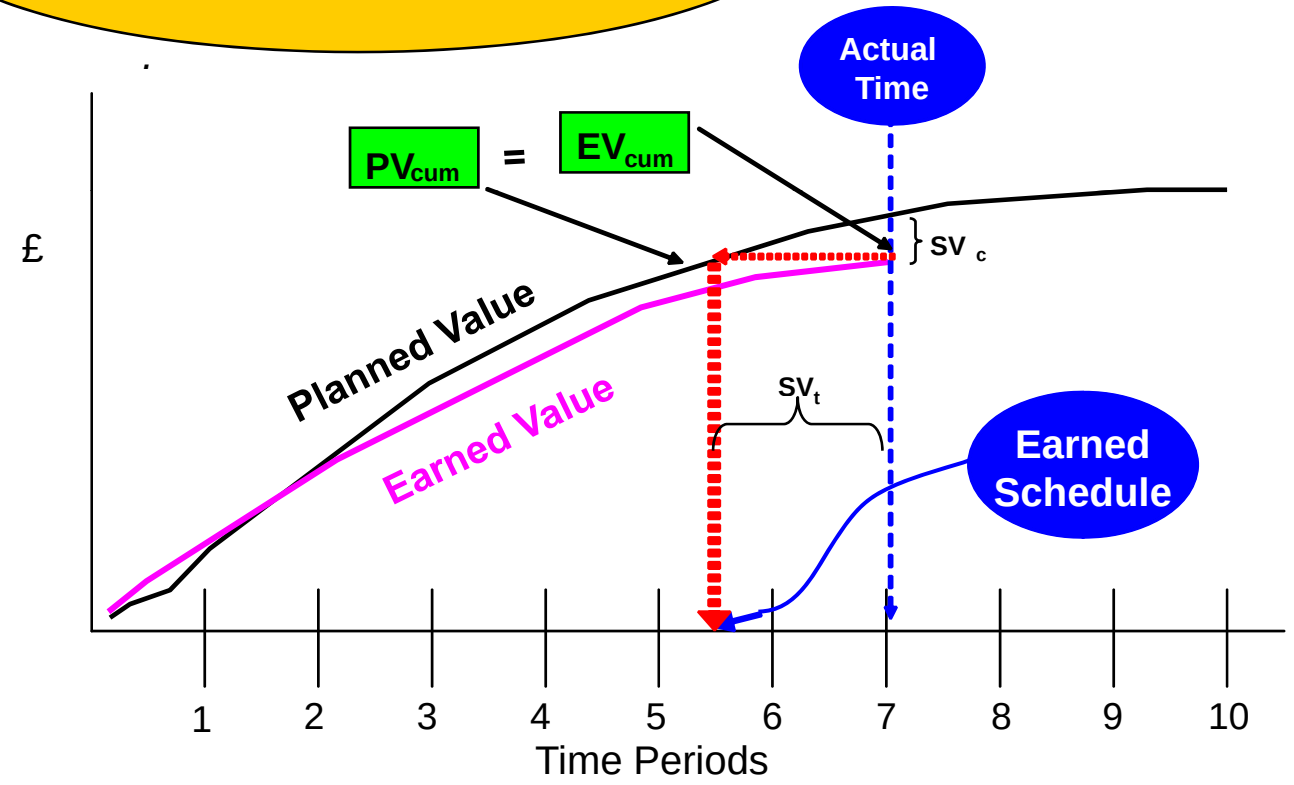
- ES (cumulative) is the:
  Number of complete PV time increments EV equals or exceeds PV + the fraction of the incomplete PV increment

- ES = C + I where:
  C = number of time increments for EV ≥ PV (BCWP ≥ BCWS)

  $I = (EV - PV_C) / (PV_{C+1} - PV_C)$

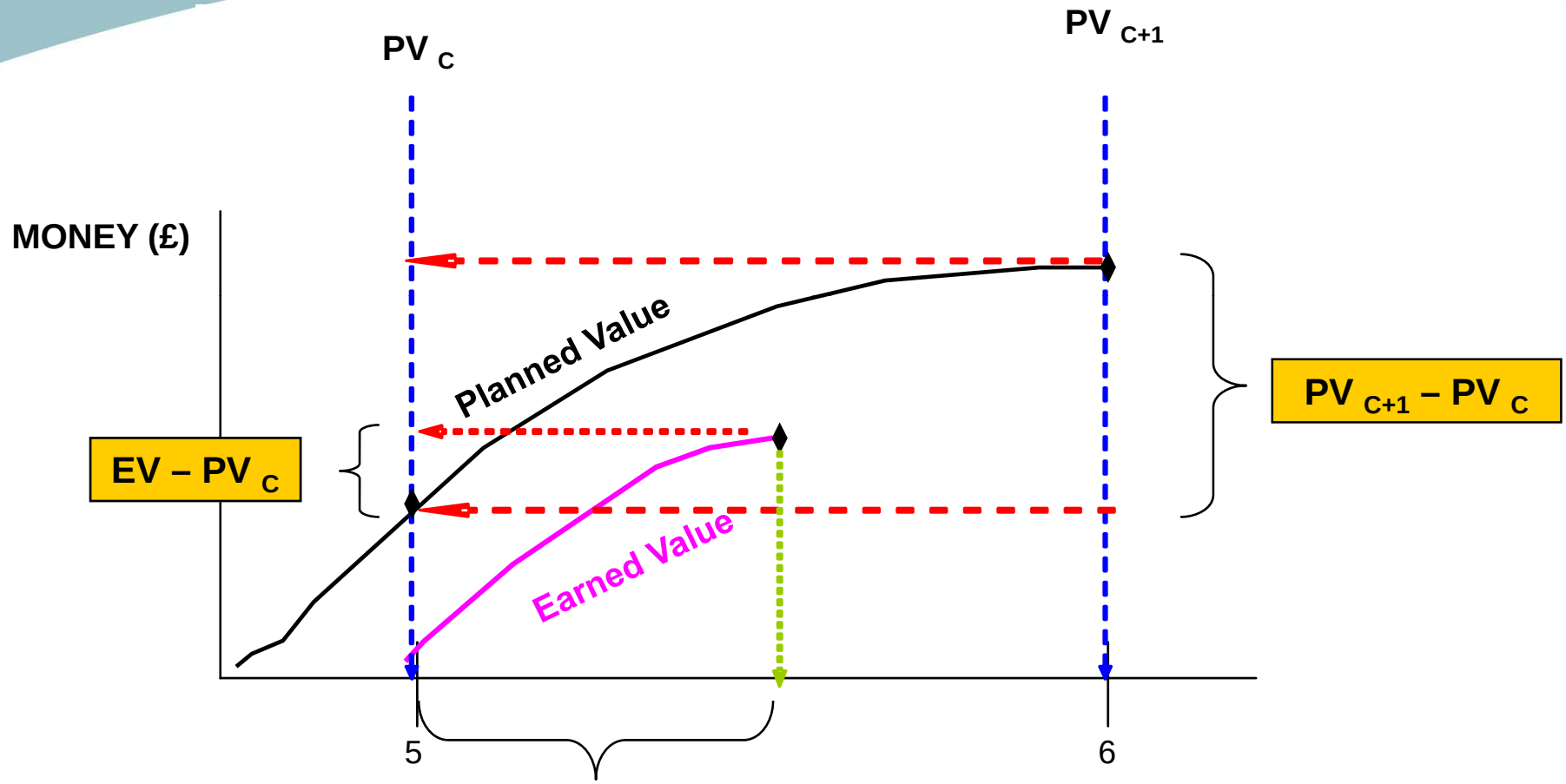
EVM & ES Duration Forecasting

The ES idea is to determine the time at which the EV accrued should have occurred



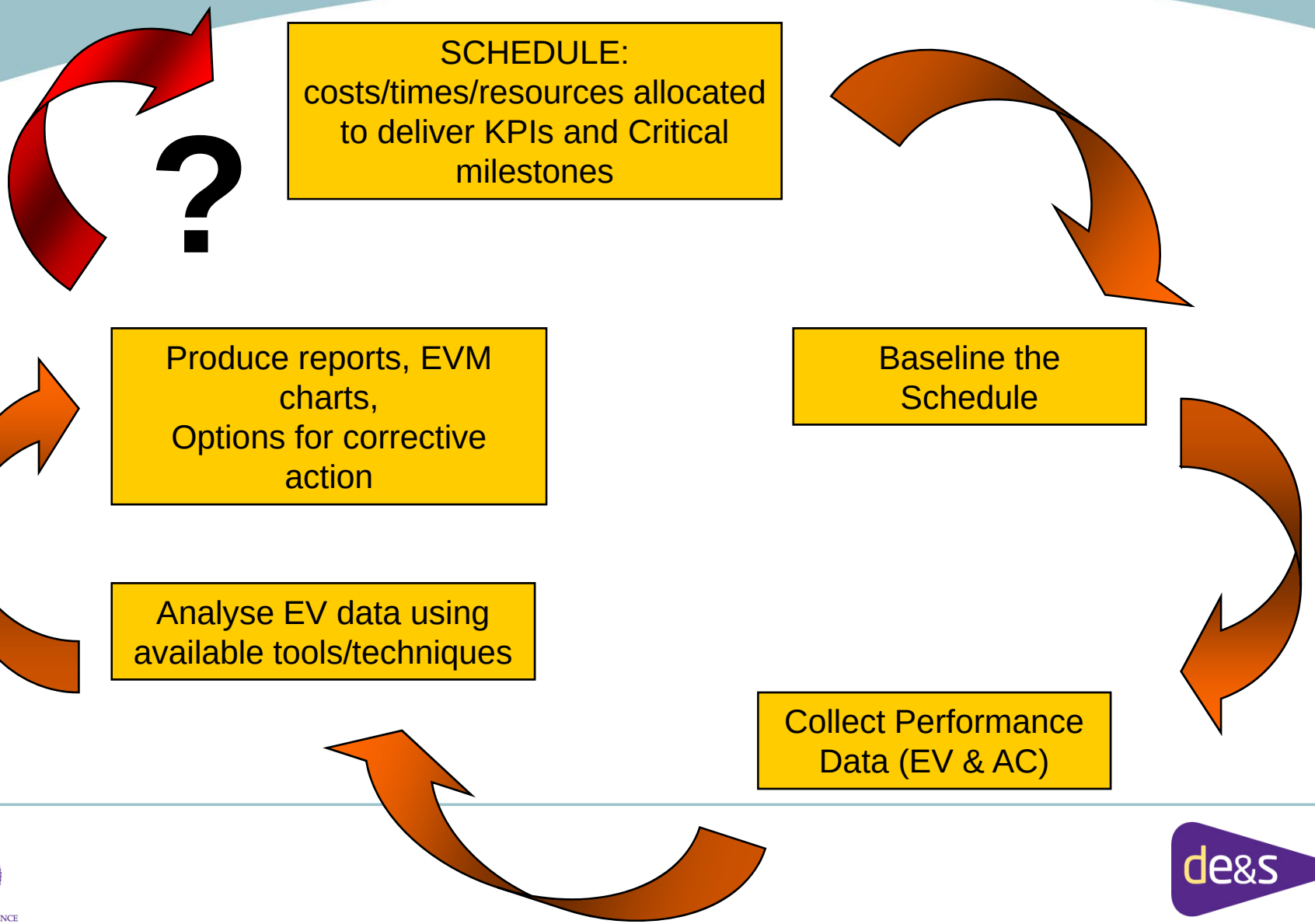
Time based schedule performance efficiency: SPI(t) = ES / AT

Calculating the Increment I



I - expressed as a fraction of time

EVM and Earned Schedule – the Missing Link



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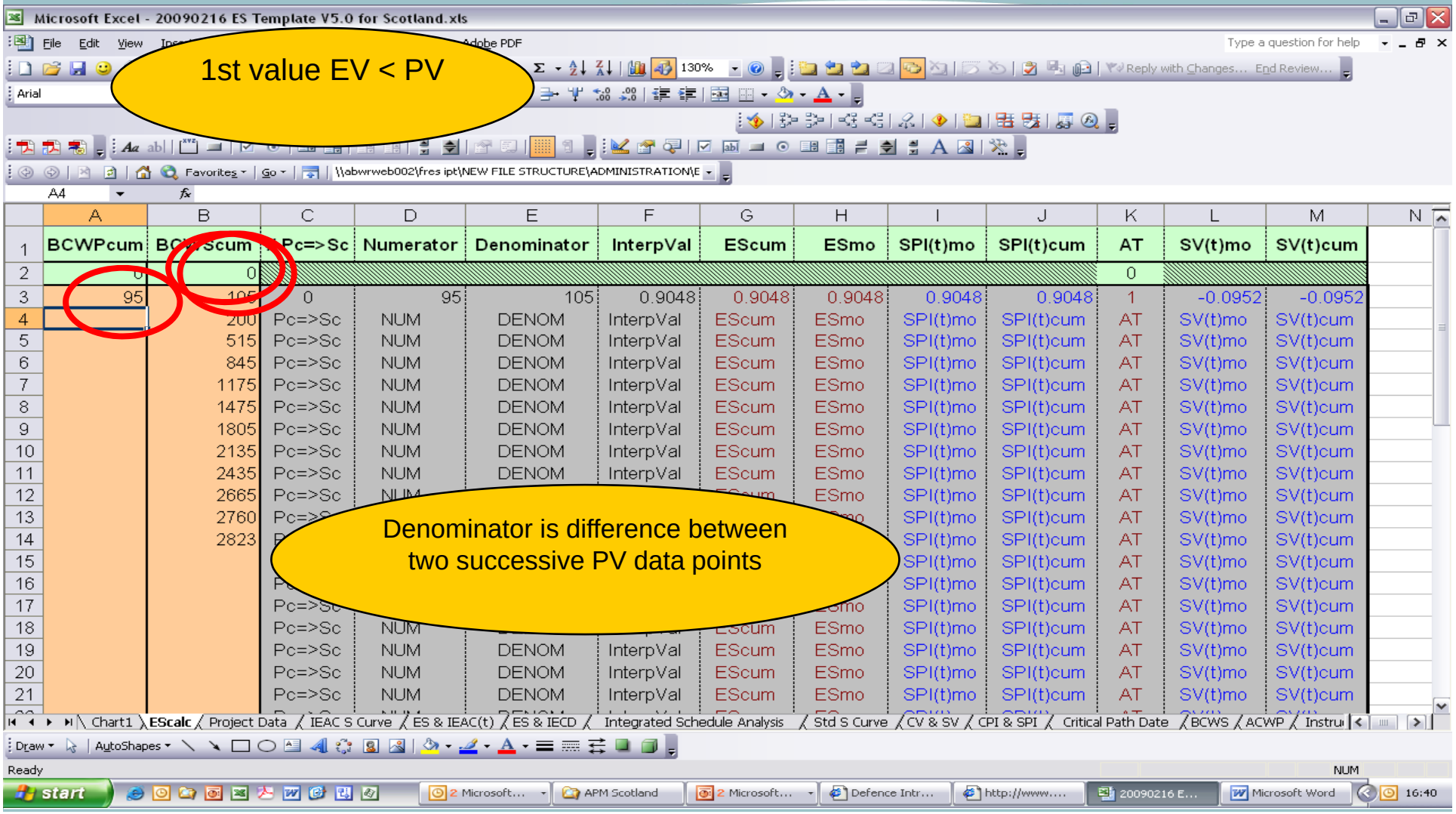
Calculating Earned Schedule (1)



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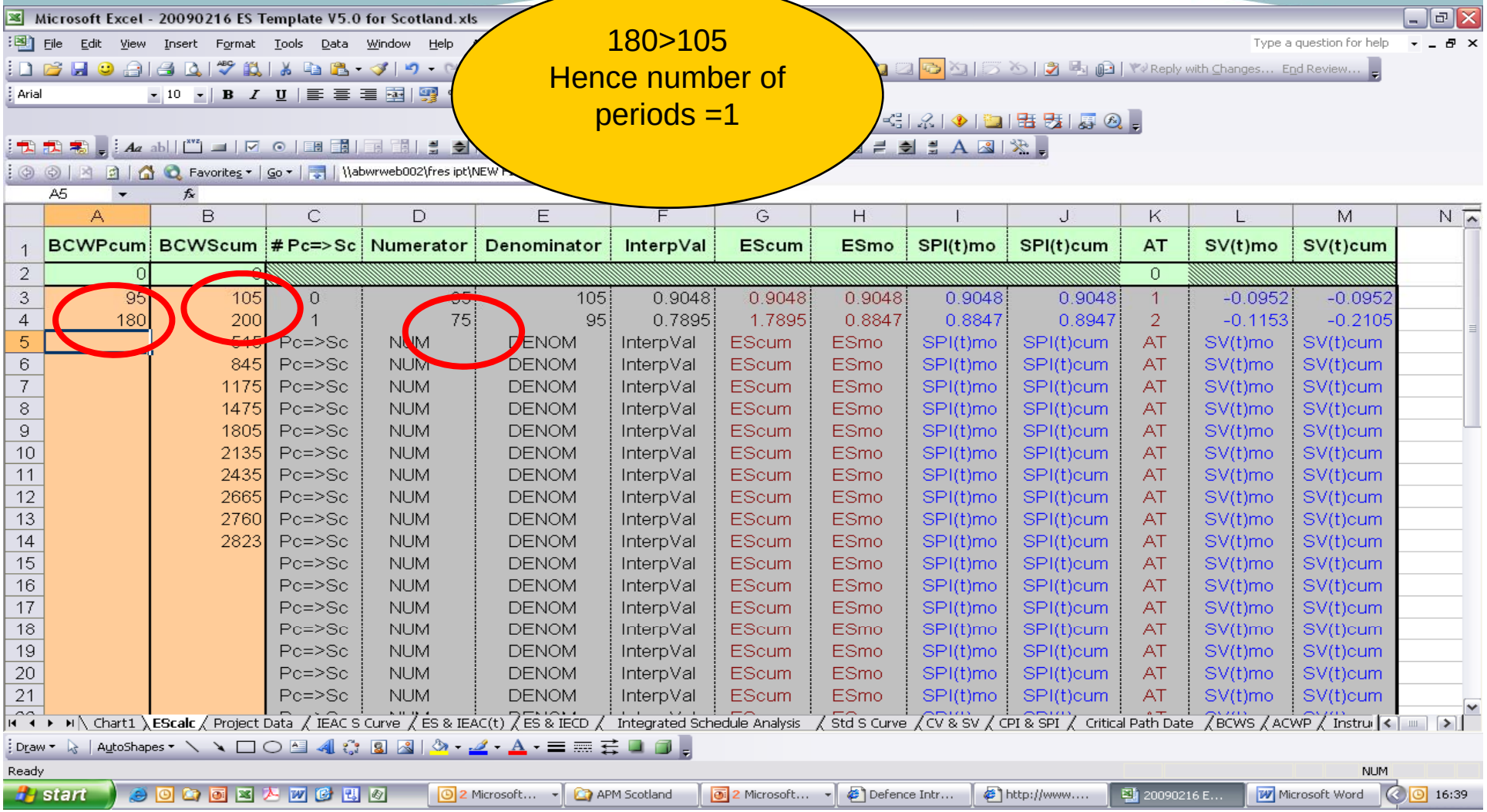
Calculating Earned Schedule (2)

180>105
Hence number of periods =1



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	BCWPcum	BCWScum	# Pc=>Sc	Numerator	Denominator	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
2	0	0									0		
3	95	105	0	30	105	0.9048	0.9048	0.9048	0.9048	0.9048	1	-0.0952	-0.0952
4	180	200	1	75	95	0.7895	1.7895	0.8847	0.8847	0.8947	2	-0.1153	-0.2105
5		515	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
6		845	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
7		1175	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
8		1475	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
9		1805	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
10		2135	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
11		2435	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
12		2665	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
13		2760	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
14		2823	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
15			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
16			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
17			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
18			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
19			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
20			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
21			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum

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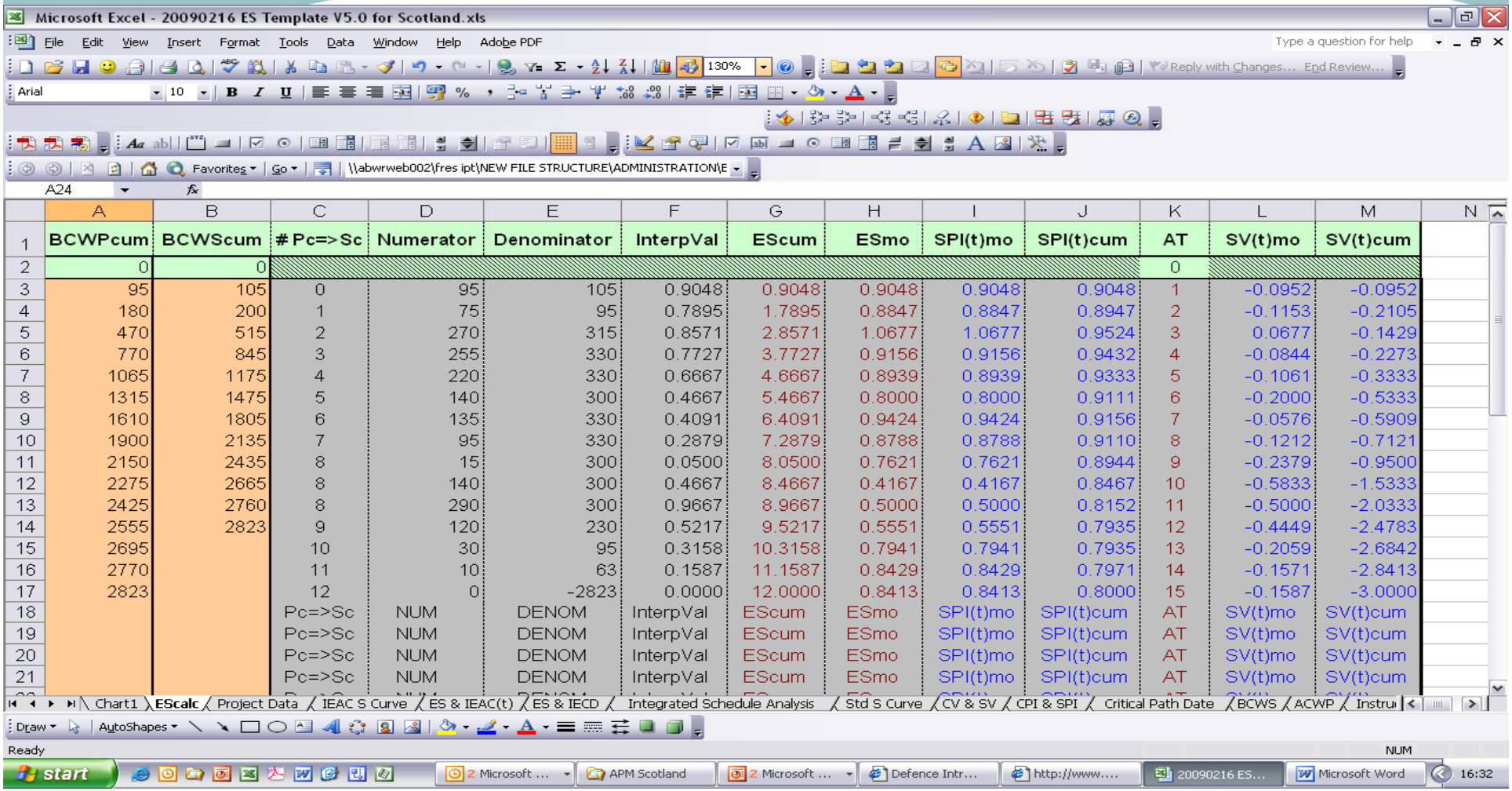
Calculating Earned Schedule (3)

Microsoft Excel - 20090216 ES Template V5.0 for Scotland.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	BCWPcum	BCWScum	# Pc=>Sc	Numerator	Denominator	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
2	0	0									0		
3	95	105	0	95	105	0.9048	0.9048	0.9048	0.9048	0.9048	1	-0.0952	-0.0952
4	180	200	1	75	95	0.7895	1.7895	0.8847	0.8847	0.8947	2	-0.1153	-0.2105
5	470	515	2	270	315	0.8571	2.8571	1.0677	1.0677	0.9524	3	0.0677	-0.1429
6		845	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
7		1175	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
8		1475	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
9		1805	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
10		2135	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
11		2435	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
12		2665	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
13		2760	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
14		2823	Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
15			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
16			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
17			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
18			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
19			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
20			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum
21			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum

Calculating Earned Schedule (4)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	BCWPcum	BCWScum	# Pc=>Sc	Numerator	Denominator	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum	
2	0	0									0			
3	95	105	0	95	105	0.9048	0.9048	0.9048	0.9048	0.9048	1	-0.0952	-0.0952	
4	180	200	1	75	95	0.7895	1.7895	0.8847	0.8847	0.8947	2	-0.1153	-0.2105	
5	470	515	2	270	315	0.8571	2.8571	1.0677	1.0677	0.9524	3	0.0677	-0.1429	
6	770	845	3	255	330	0.7727	3.7727	0.9156	0.9156	0.9432	4	-0.0844	-0.2273	
7	1065	1175	4	220	330	0.6667	4.6667	0.8939	0.8939	0.9333	5	-0.1061	-0.3333	
8	1315	1475	5	140	300	0.4667	5.4667	0.8000	0.8000	0.9111	6	-0.2000	-0.5333	
9	1610	1805	6	135	330	0.4091	6.4091	0.9424	0.9424	0.9156	7	-0.0576	-0.5909	
10	1900	2135	7	95	330	0.2879	7.2879	0.8788	0.8788	0.9110	8	-0.1212	-0.7121	
11	2150	2435	8	15	300	0.0500	8.0500	0.7621	0.7621	0.8944	9	-0.2379	-0.9500	
12	2275	2665	8	140	300	0.4667	8.4667	0.4167	0.4167	0.8467	10	-0.5833	-1.5333	
13	2425	2760	8	290	300	0.9667	8.9667	0.5000	0.5000	0.8152	11	-0.5000	-2.0333	
14	2555	2823	9	120	230	0.5217	9.5217	0.5551	0.5551	0.7935	12	-0.4449	-2.4783	
15	2695		10	30	95	0.3158	10.3158	0.7941	0.7941	0.7935	13	-0.2059	-2.6842	
16	2770		11	10	63	0.1587	11.1587	0.8429	0.8429	0.7971	14	-0.1571	-2.8413	
17	2823		12	0	-2823	0.0000	12.0000	0.8413	0.8413	0.8000	15	-0.1587	-3.0000	
18			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum	
19			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum	
20			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum	
21			Pc=>Sc	NUM	DENOM	InterpVal	EScum	ESmo	SPI(t)mo	SPI(t)cum	AT	SV(t)mo	SV(t)cum	

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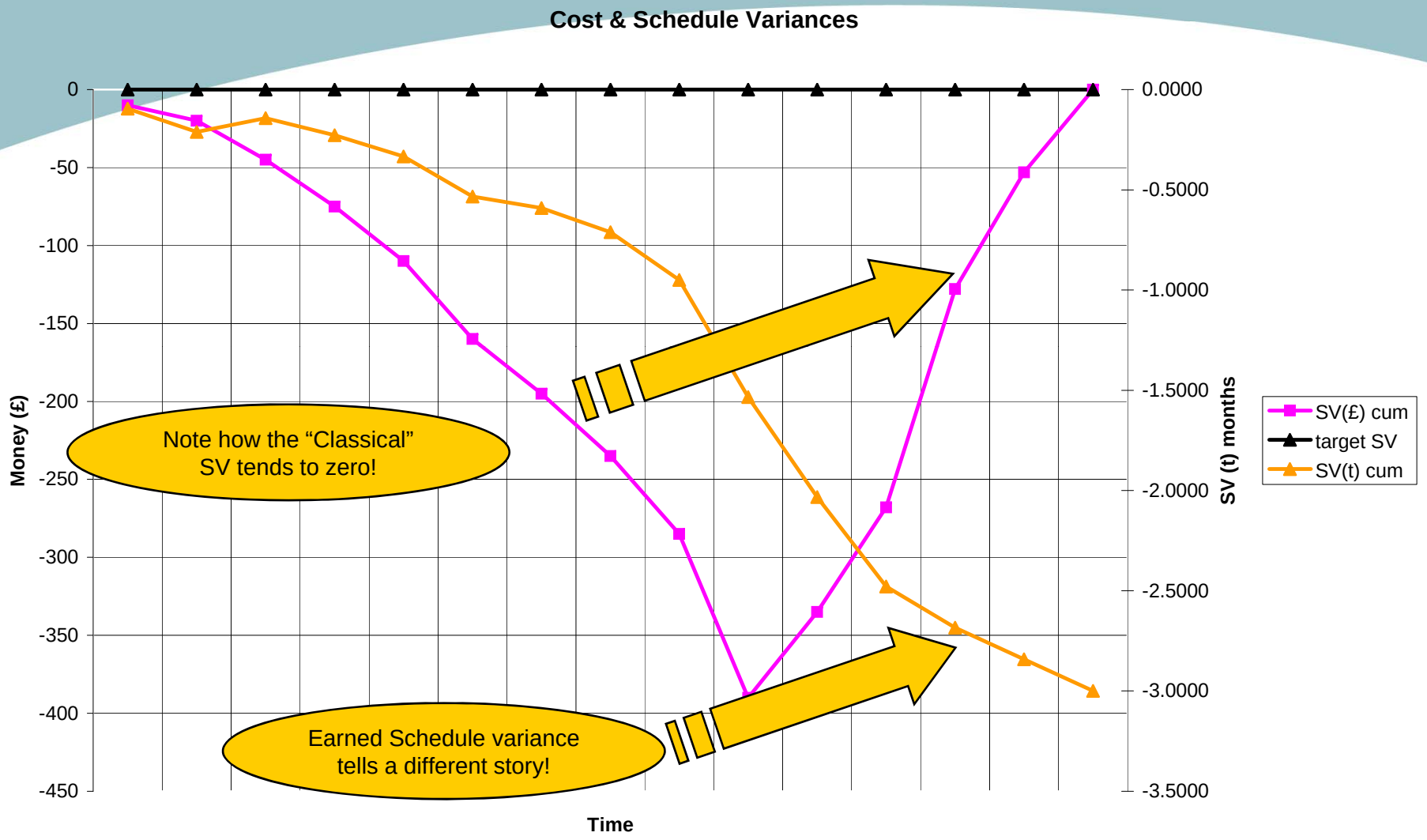
Variances – which would you believe?



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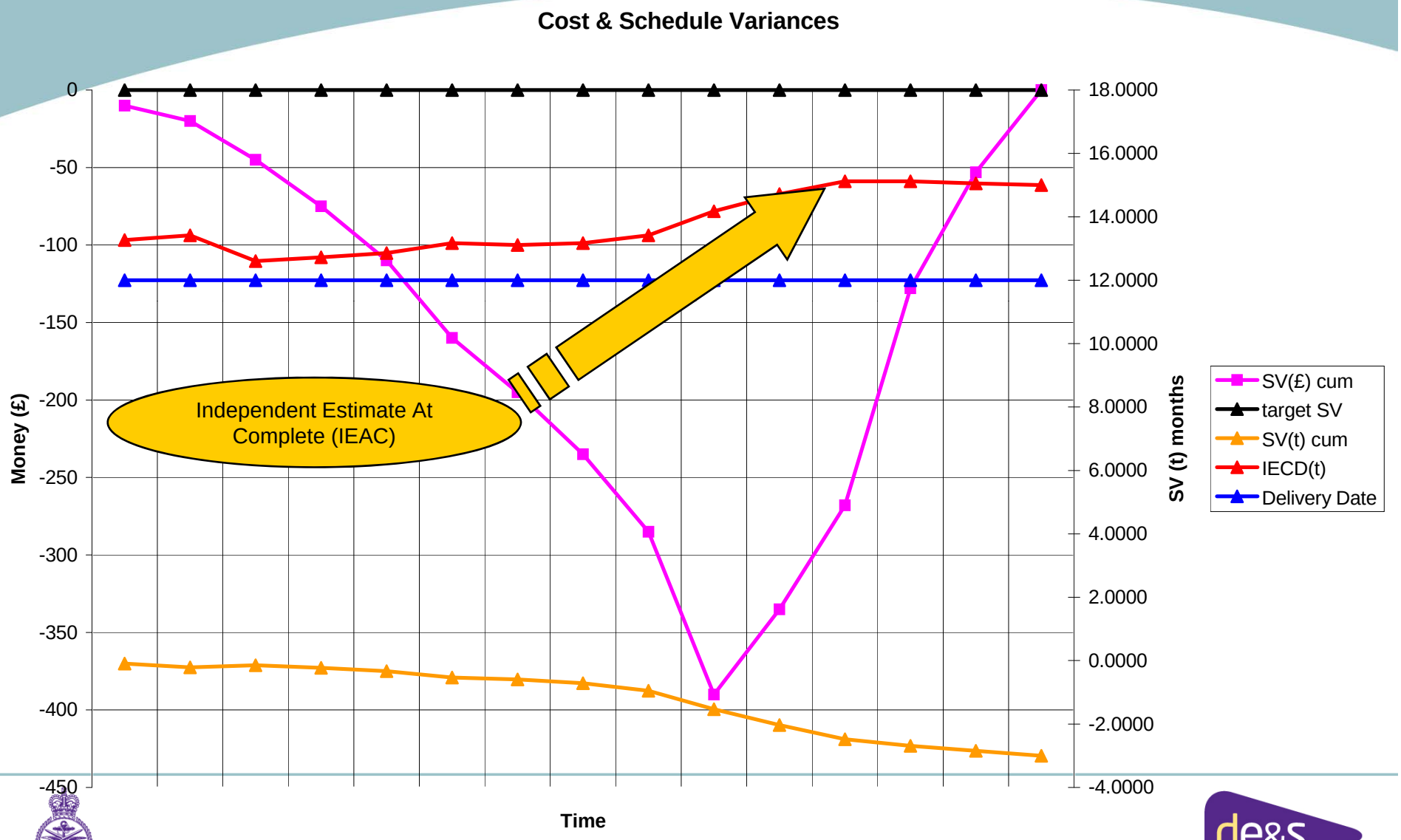
Variances – which would you believe?



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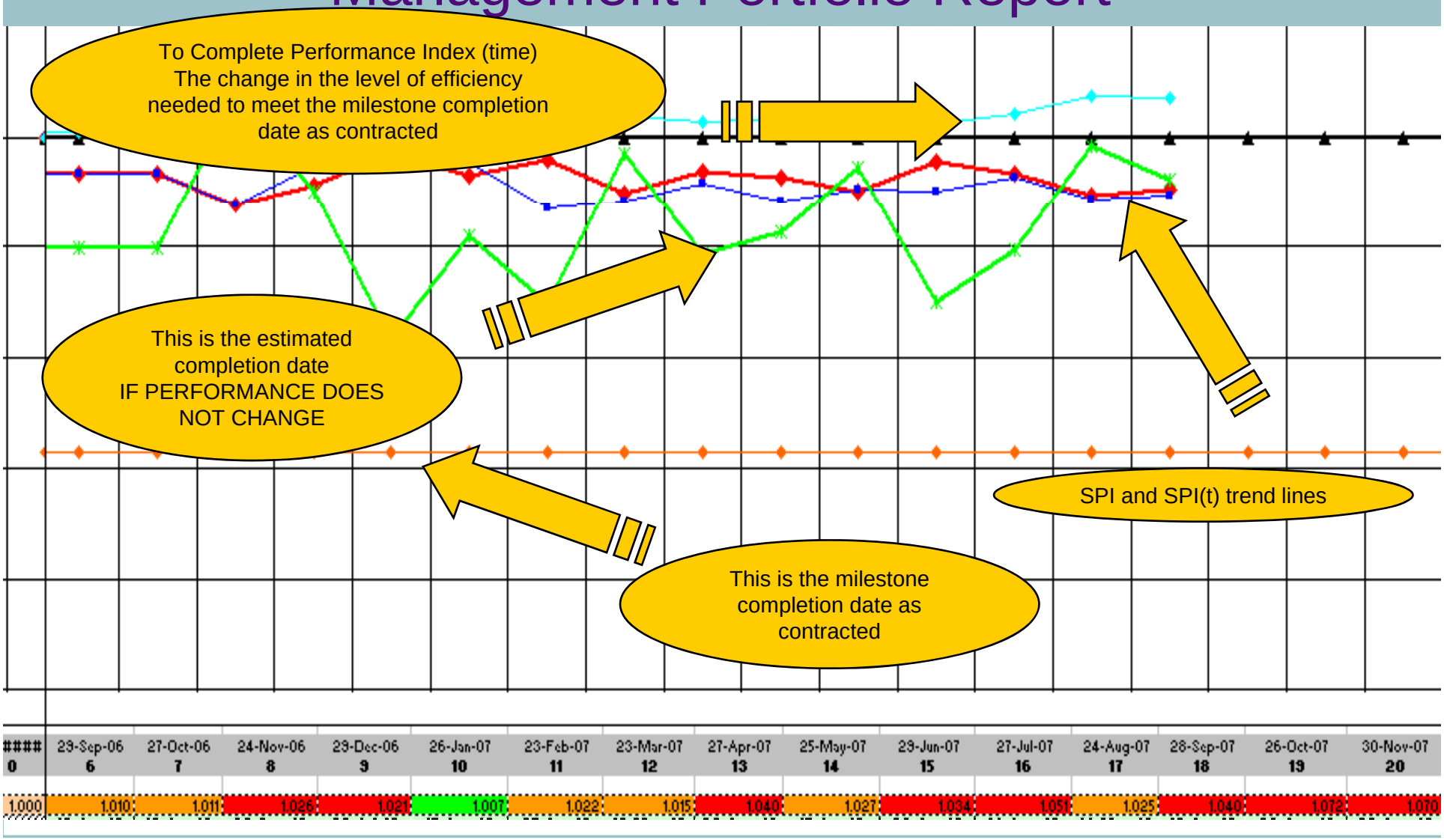
Management Portfolio Report



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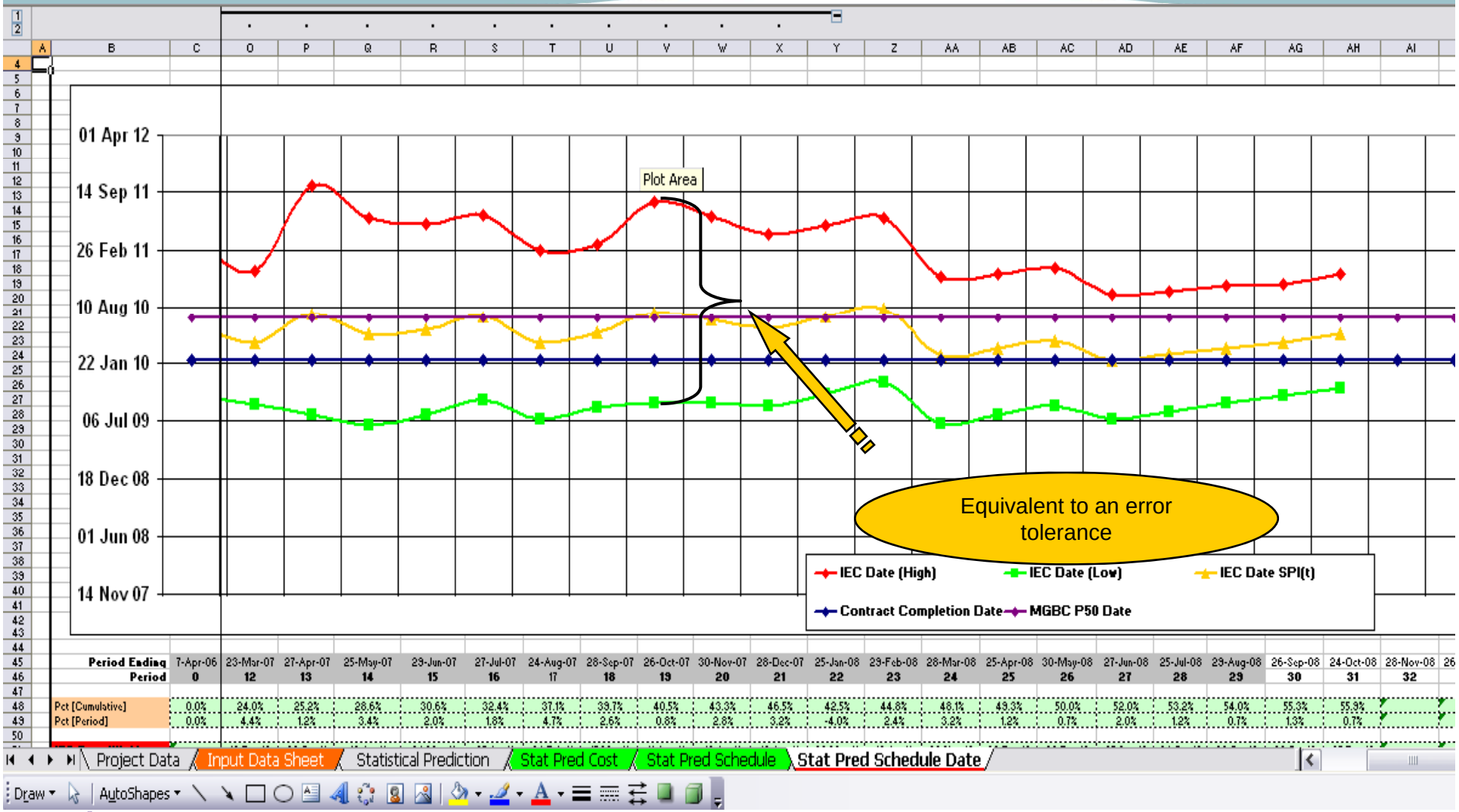
Prediction of Project Completion (1)



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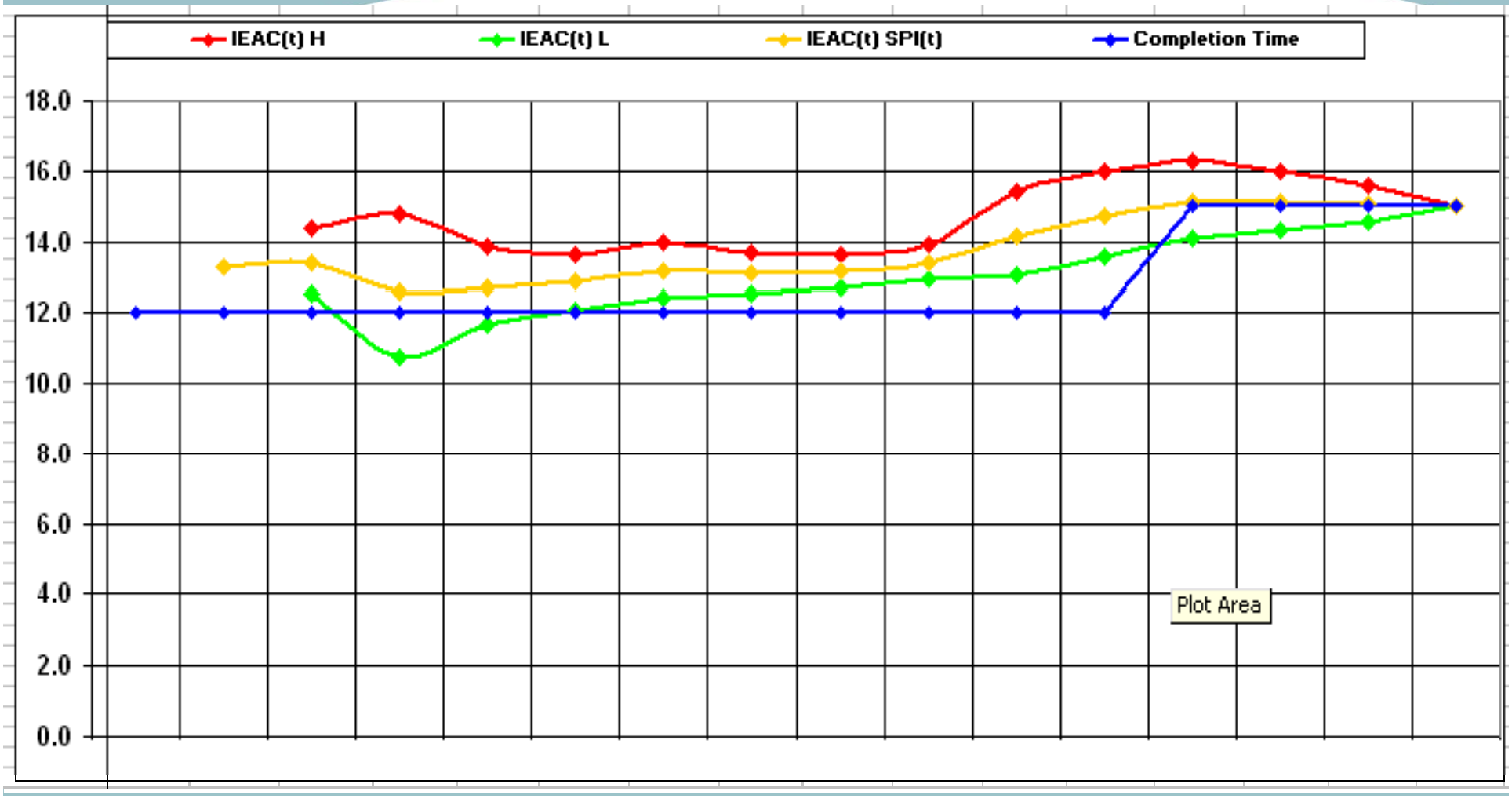
ES – Confidence Limits & Predicting Completion Date



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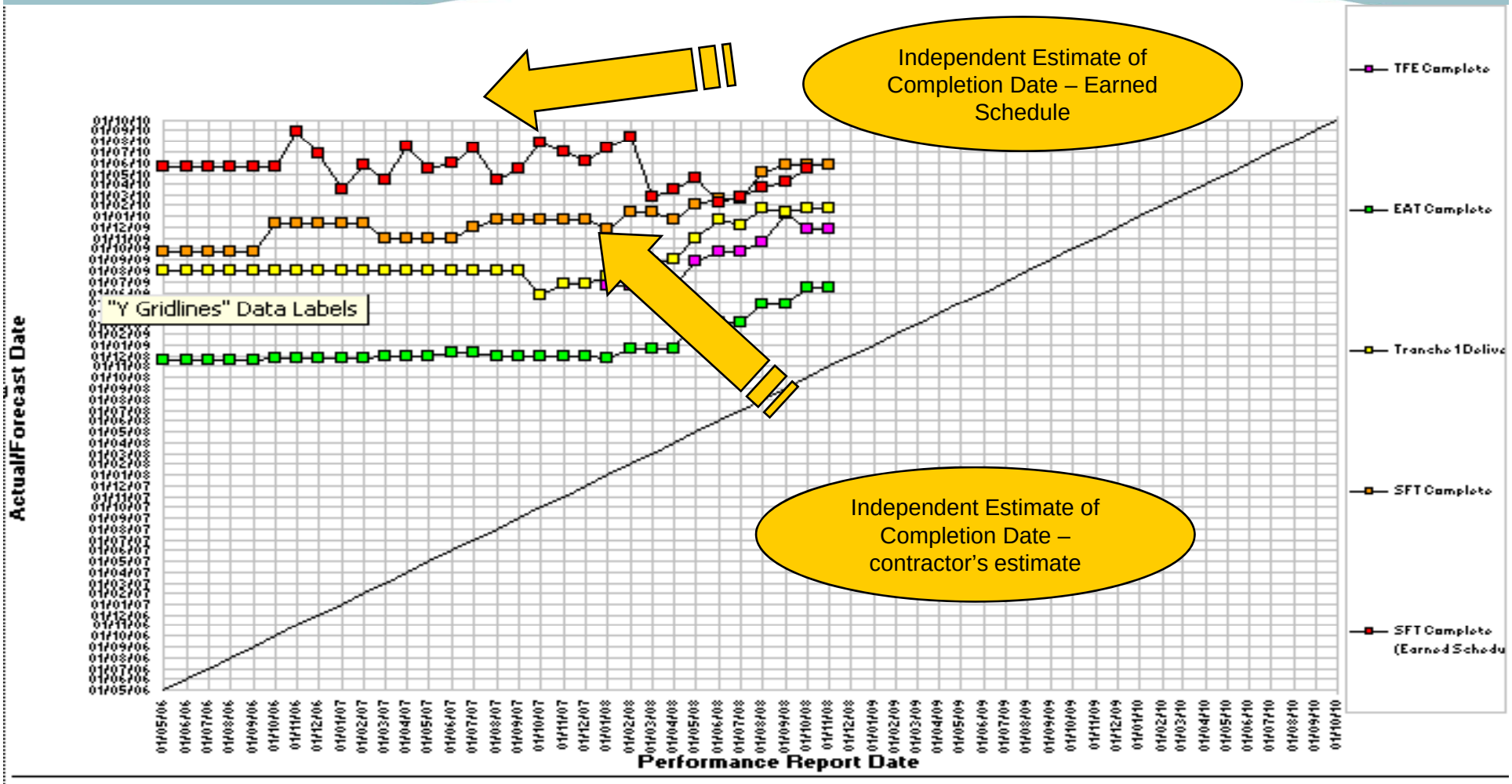
Milestone tracking – seeing is believing!



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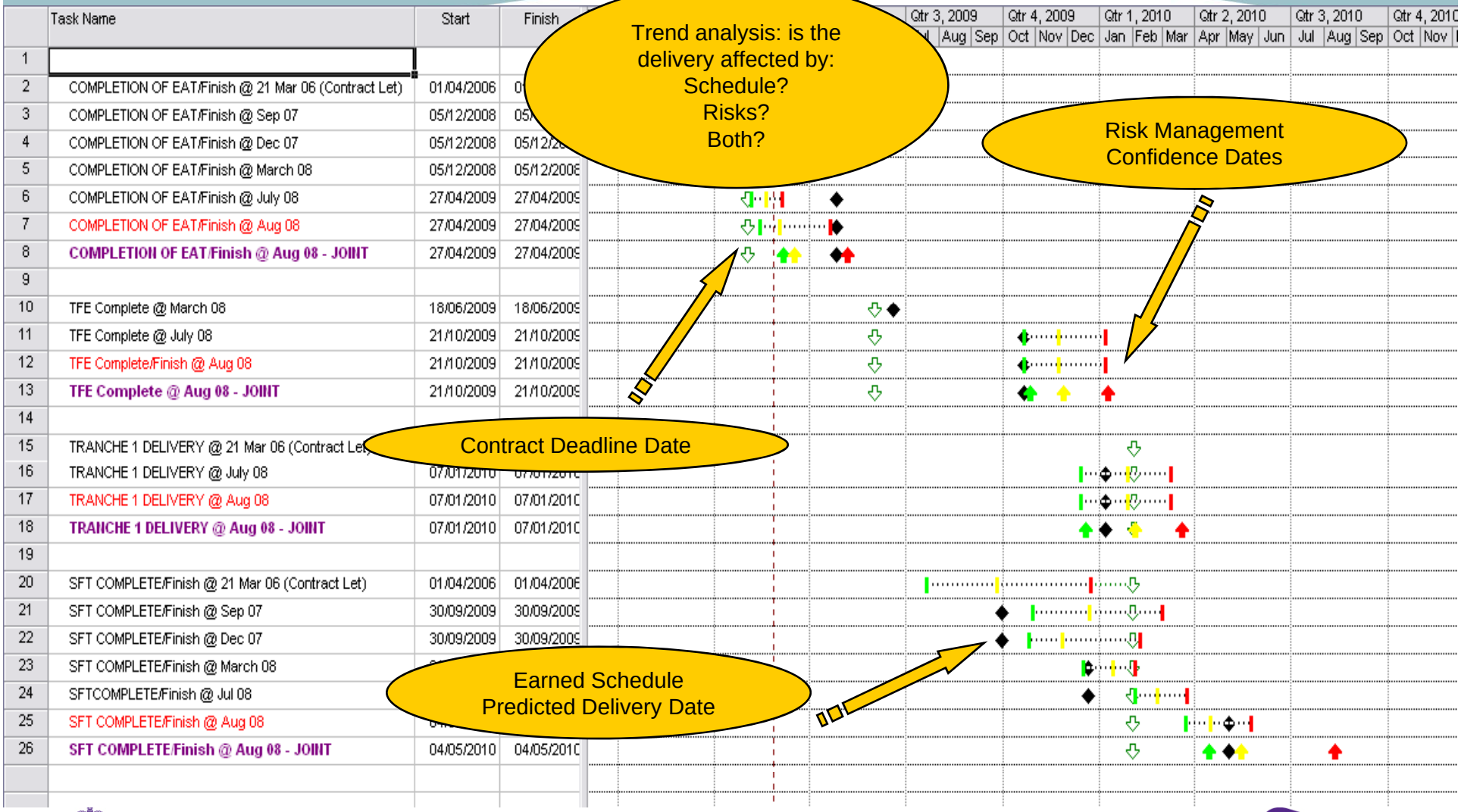
Integration of ES, risk and deadlines



	Task Name	Start	Finish
1			
2	COMPLETION OF EAT/Finish @ 21 Mar 06 (Contract Let)	01/04/2006	0
3	COMPLETION OF EAT/Finish @ Sep 07	05/12/2008	05/
4	COMPLETION OF EAT/Finish @ Dec 07	05/12/2008	05/12/2
5	COMPLETION OF EAT/Finish @ March 08	05/12/2008	05/12/2008
6	COMPLETION OF EAT/Finish @ July 08	27/04/2009	27/04/2009
7	COMPLETION OF EAT/Finish @ Aug 08	27/04/2009	27/04/2009
8	**COMPLETION OF EAT/Finish @ Aug 08 - JOINT**	27/04/2009	27/04/2009
9			
10	TFE Complete @ March 08	18/06/2009	18/06/2009
11	TFE Complete @ July 08	21/10/2009	21/10/2009
12	TFE Complete/Finish @ Aug 08	21/10/2009	21/10/2009
13	**TFE Complete @ Aug 08 - JOINT**	21/10/2009	21/10/2009
14			
15	TRANCHE 1 DELIVERY @ 21 Mar 06 (Contract Let)		
16	TRANCHE 1 DELIVERY @ July 08	07/01/2010	07/01/2010
17	TRANCHE 1 DELIVERY @ Aug 08	07/01/2010	07/01/2010
18	**TRANCHE 1 DELIVERY @ Aug 08 - JOINT**	07/01/2010	07/01/2010
19			
20	SFT COMPLETE/Finish @ 21 Mar 06 (Contract Let)	01/04/2006	01/04/2006
21	SFT COMPLETE/Finish @ Sep 07	30/09/2009	30/09/2009
22	SFT COMPLETE/Finish @ Dec 07	30/09/2009	30/09/2009
23	SFT COMPLETE/Finish @ March 08		
24	SFTCOMPLETE/Finish @ Jul 08		
25	SFT COMPLETE/Finish @ Aug 08		
26	**SFT COMPLETE/Finish @ Aug 08 - JOINT**	04/05/2010	04/05/2010

Qtr 3, 2009 | Aug | Sep | Qtr 4, 2009 | Oct | Nov | Dec | Qtr 1, 2010 | Jan | Feb | Mar | Qtr 2, 2010 | Apr | May | Jun | Qtr 3, 2010 | Jul | Aug | Sep | Qtr 4, 2010 | Oct | Nov

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Schedule Adherence – are you doing it right?

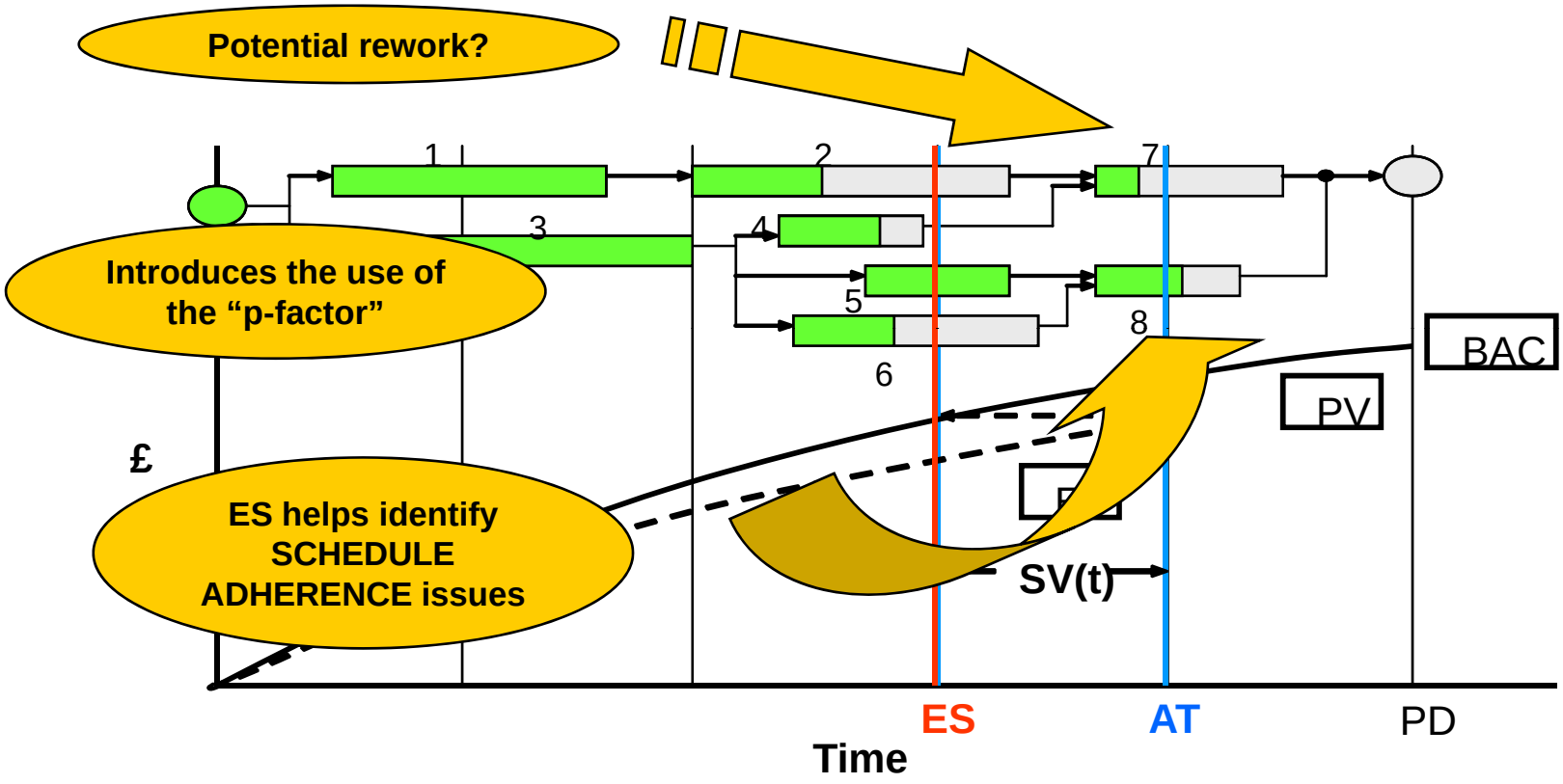
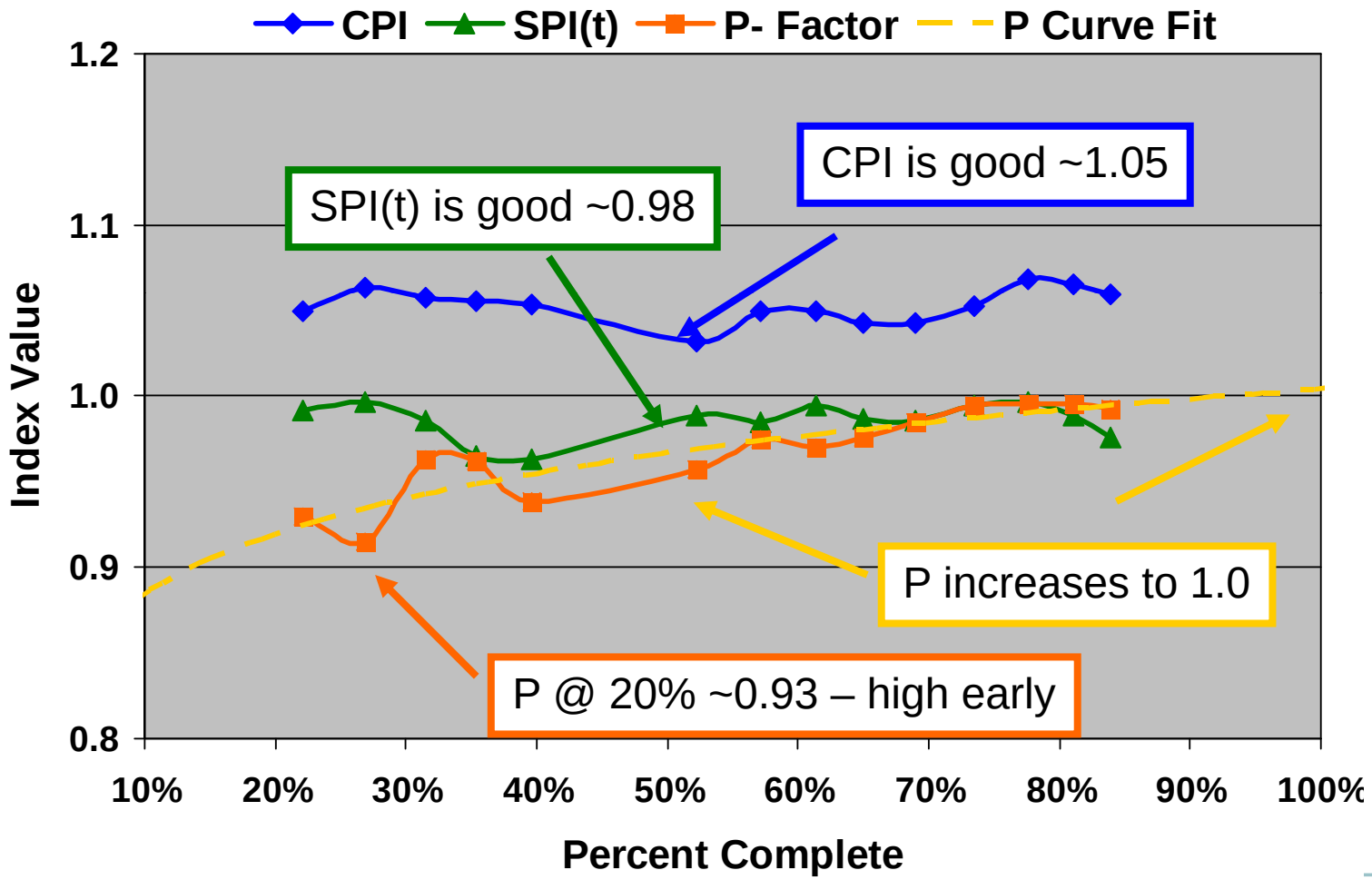


Figure 3. Earned Schedule - *Bridges EVM to Schedule* (Actual)

Real Data Results



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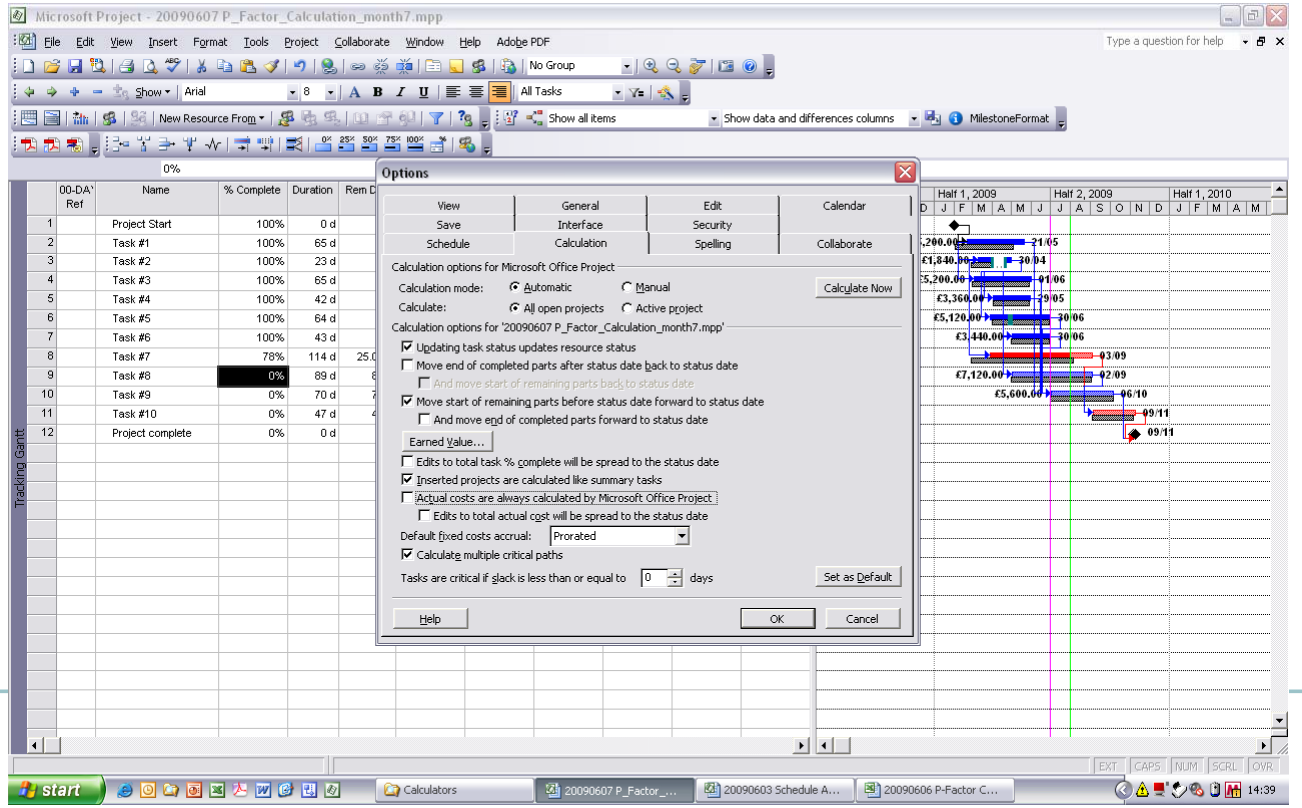
A cautionary tale…

- This method is focused at ‘Top Level’ of the schedule
- Assumes that the corrective action implemented is effective from ‘status date’ to project completion
- Risks – both current and new – have yet to be considered
- Lack of detail to implement corrective action at specific work package level

Schedule Adherence

- When using schedule adherence…
- Ensure calculation selections are consistent throughout delivery of the project



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Available software

Product Name	Supplier	Functions
COBRA	DELTEK	EV and ES calculation Import/export capability to MS Office products Available in both web-pack and stand-alone versions
wInsight	DELTEK	EV graphics manipulator Automated generation of EV data in MS PowerPoint Available in both web-pack and stand-alone versions
Schedule Adherence Analyser	Project Flightdeck	Earned Schedule and Schedule Adherence calculator – used with MS Project/Primavera Available in both web-pack and stand-alone versions
Steelray	Steelray	Schedule & Risk Network check for robustness Available in both web-pack and stand-alone versions Used with MS Project/Primavera Helps compute BEI and CPLI

Comparison between EV and ES (1)

Status	Earned Value (EV)	Earned Schedule (ES)
	Actual Costs (AC)	Actual Time (AT)
Schedule Variance	SV	SV(t)
Schedule Performance Indicator	SPI	SPI(t)
Future Work	Budgeted Cost for Work Remaining (BCWR)	Planned Duration for Work Remaining (PDWR)
Estimate At Complete	EAC (supplier)/(customer)	EAC(t)
	Independent EAC (IEAC)	IEAC(t)
To Complete Performance Index	TCPI	TSPI

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Comparison between EV and ES equations

Status	Earned Value (EV)	Earned Schedule (ES)
Schedule Variance	SV = EV-PV	SV(t) = ES-AT
Schedule Performance Indicator	SPI = EV/PV	SPI(t) = ES/AT
Future Work	BCWR = BAC-EVcum	PDWR= PD-EScum
Estimate At Complete	EAC1=AC+(BAC-EV)/CPI	EAC(t) = PD/SPI(t) EAC(t)(2) = AT+(PD-ES)/SPI(t)
To Complete Performance Index	TCPI = (BAC-EV cum)/(EAC-ACcum)	TSPI = (PD-ES)/(PD-AT) TSPI= (PD-ES)/(ED-AT)

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Prolongation

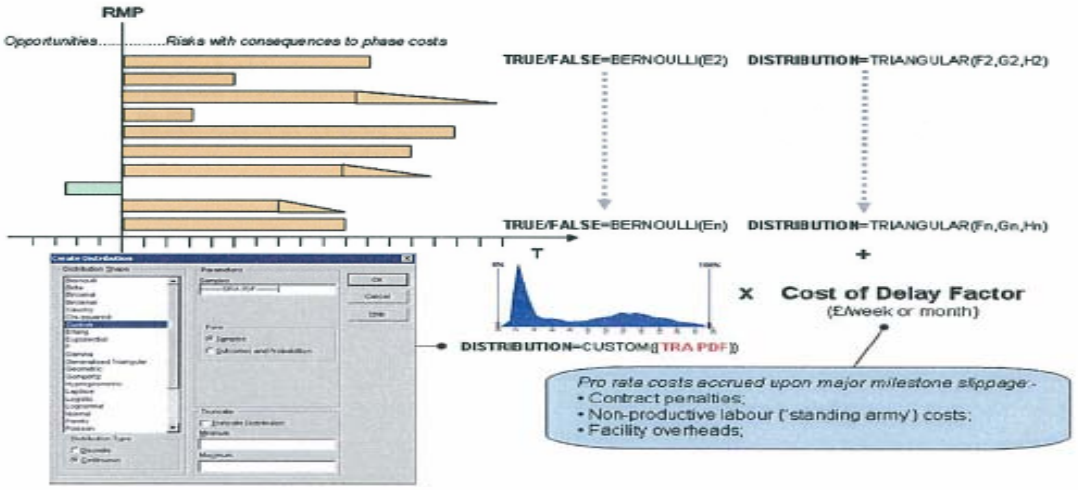
- Also known as ‘Cost Of Delay’ - COD
- Why should a project manager need to know this?
- Confidence models have shown that there appears to be a disjoint between Cost Risk Analysis (CRA) and Timescale Risk Analysis (TSA)
- Relates to:
- Marching Army costs
- Variation Of Price (VOP)
- Commercial penalties

Prolongation (2)

- Confidence models have shown a disjoint between Cost and Schedule Risk Analysis (CRA & SRA)
- Below is an example of emerging best practice from an MOD supplier, suggesting one method for calculating the COD

Perform the TRA and obtain PDF on timescale;

Use the 'continuous' custom profile as a distribution in the CRA covering the 'standing army' risk at each milestone (note: only works if timescale impact is quantified 'relative' to milestones);



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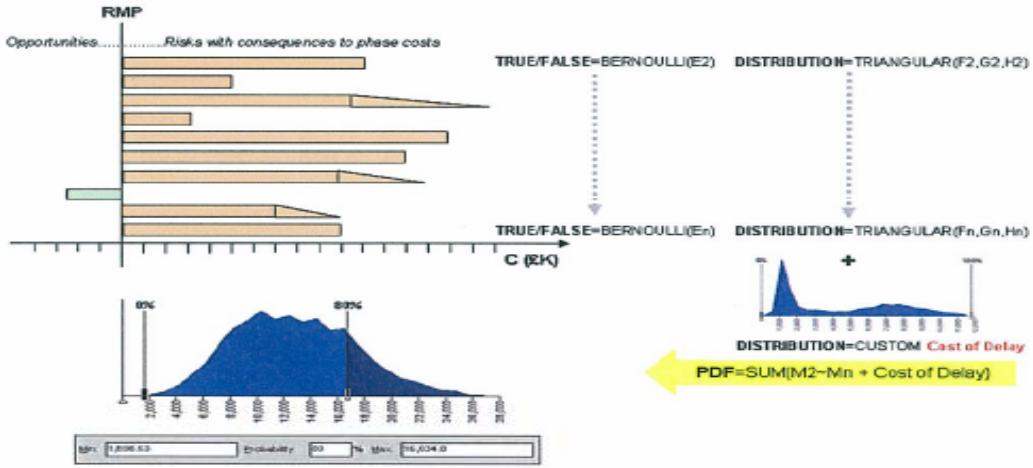
Prolongation (3)

Need to 'multiply' by Cost of Delay Factor to obtain PDF on Cost;



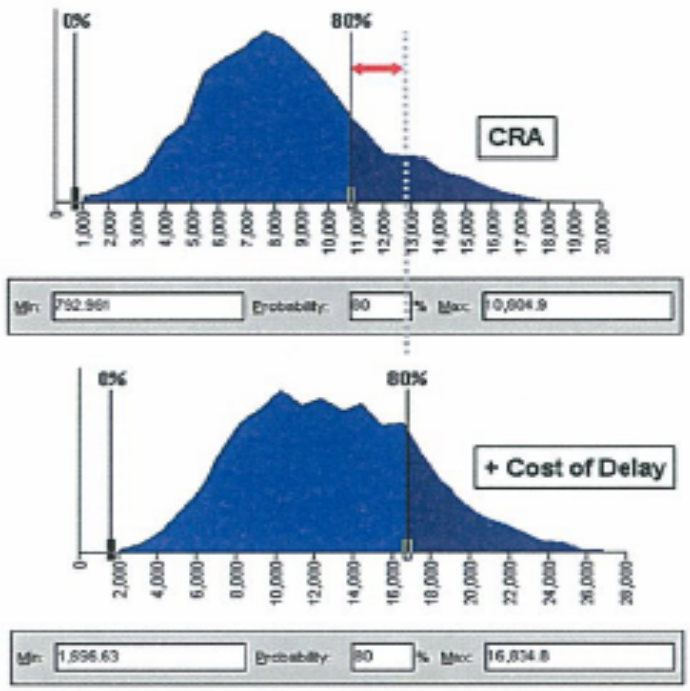
Choose appropriate confidence level (e.g. 80%) and note value;

Raise one risk per milestone articulated as standing army or cost of delay type;

Quantify this risk as 100% probable at the noted value (Nil timescale impact) and include in the register;

This will then appear in the significant risk summary (21-pack);

Prolongation (4)



The difference between the chosen confidence level (in this case 80%) values of the CRA and '+ Cost of Delay' Analyses can then be quantified in the Register (& therefore the Significant Risk Summary) as the Most Likely (single point) Post Mitigation Cost Impact of a single risk (per milestone) articulated as 'Cost of Delay' with 100% probability of occurrence (but 'Nil' Schedule Impact) .

N.B. must remember to 'temporarily' remove such risks from subsequent iterations of CRA/TRA/'+Cost of Delay' analyses prior to re-instatement with updated values;

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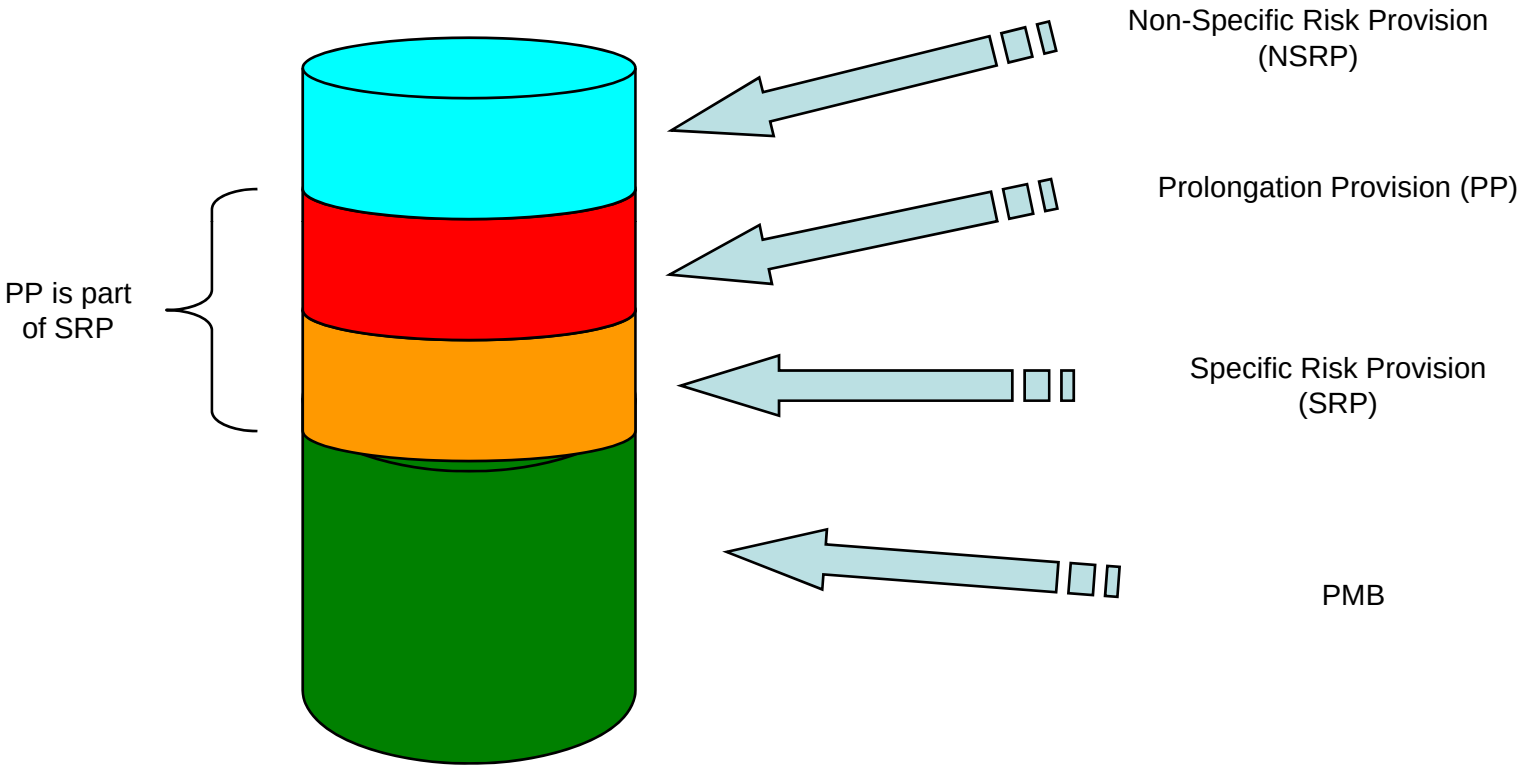
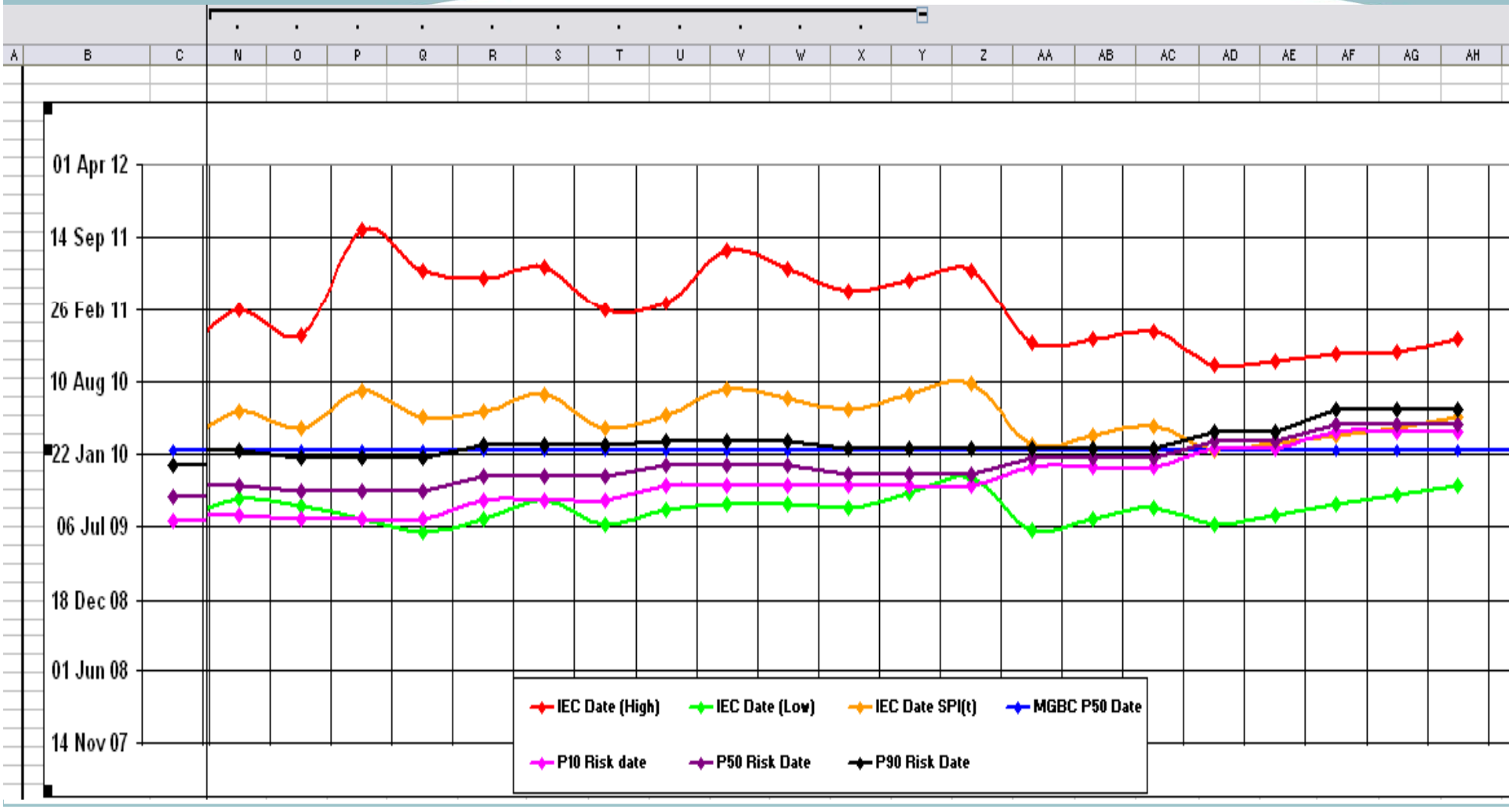
Interfacing Earned Schedule with Risk

- Original concept – EVM and Risk
- Concentrates on Management Reserve
- Two distinct types
- Specific Risk Provision (SRP) (Technical Risk)
- Non-Specific Risk Provision (NSRP) (Management Risk)
- No equivalent for ‘Cost Of Delay’ to projects

Interfacing Earned Schedule with Risk



Interfacing ES and Risk



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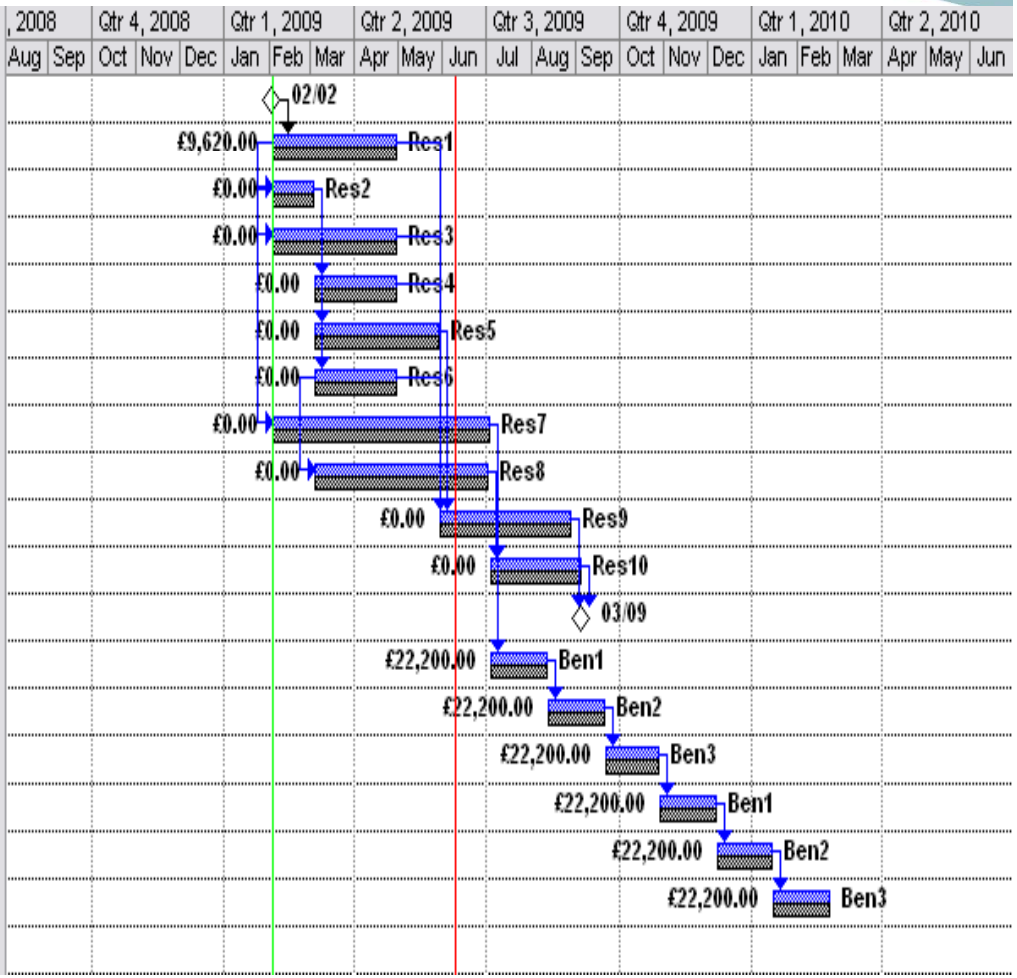
ES and Benefits

- ES links benefits realisation to the schedule
- Works for tangible, cashable benefits
- Value of benefit is known and can be measured
- ES will enable anticipated benefits delivery to be measured
- longer-term benefits seen as ‘benefit packages’
- Similarities to Planning Packages

	Task Name	Duration	Start	Finish	Predecessors
1	Project Start	0 days	02/02/2009	02/02/2009	
2	Task #1	65 days	02/02/2009	29/04/2009	1
3	Task #2	23 days	02/02/2009	03/03/2009	2SS
4	Task #3	65 days	02/02/2009	29/04/2009	2SS
5	Task #4	42 days	03/03/2009	29/04/2009	3
6	Task #5	64 days	03/03/2009	29/05/2009	3
7	Task #6	43 days	03/03/2009	30/04/2009	3
8	Task #7	114 days	02/02/2009	03/07/2009	3SS
9	Task #8	89 days	03/03/2009	01/07/2009	7SS
10	Task #9	70 days	29/05/2009	28/08/2009	7,6,4,5,2
11	Task #10	47 days	03/07/2009	03/09/2009	9,8
12	Project complete	0 days	03/09/2009	03/09/2009	11,10
13	Benefit 1 realisation	30 days	03/07/2009	12/08/2009	8
14	Benefit 2 realisation	30 days	12/08/2009	21/09/2009	13
15	Benefit 3 realisation	30 days	21/09/2009	28/10/2009	14
16	Benefit 4 realisation	30 days	28/10/2009	07/12/2009	15
17	Benefit 5 realisation	30 days	07/12/2009	14/01/2010	16
18	Benefit 6 realisation	30 days	14/01/2010	23/02/2010	17



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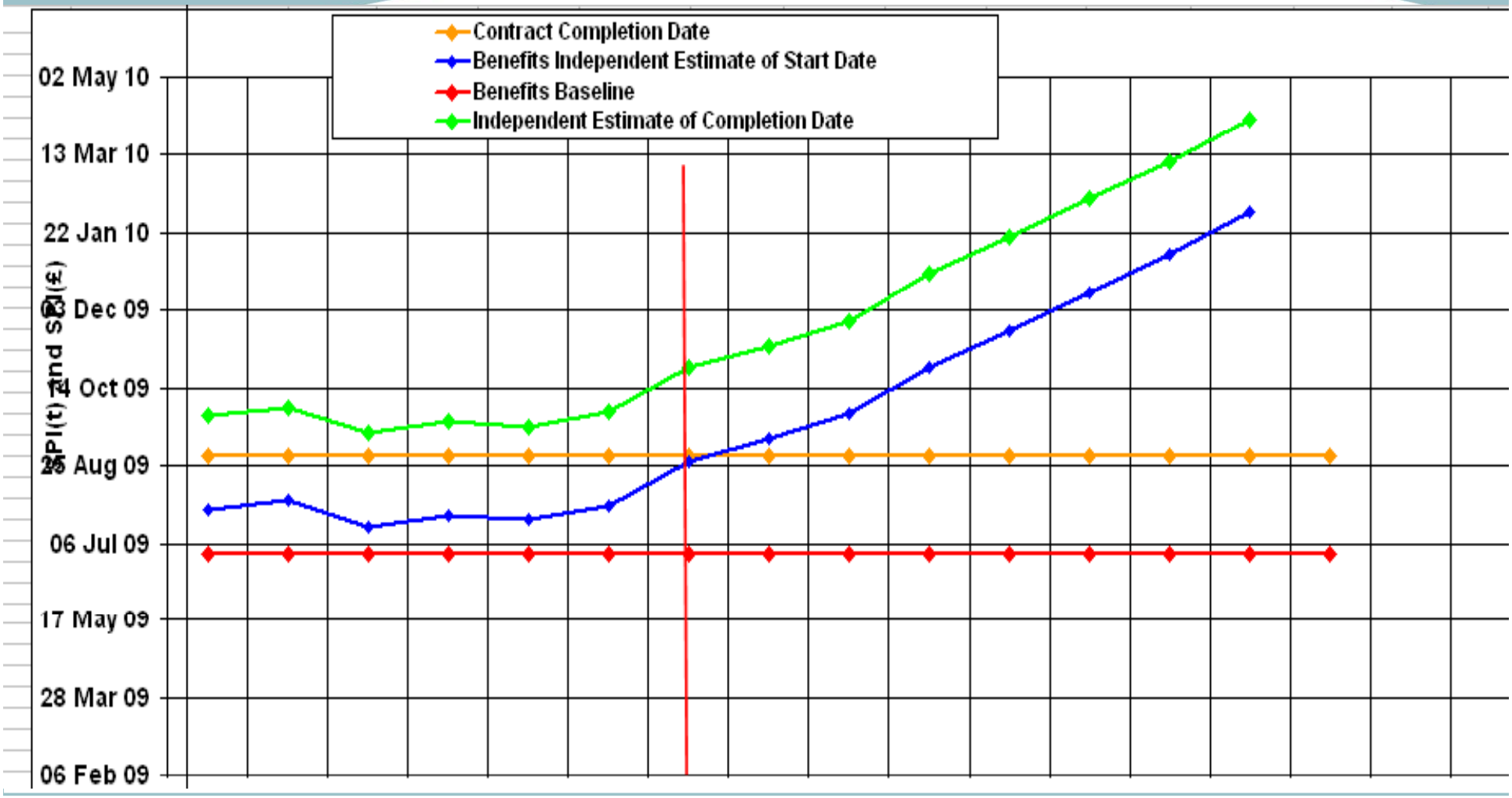
ES and Benefits Profile



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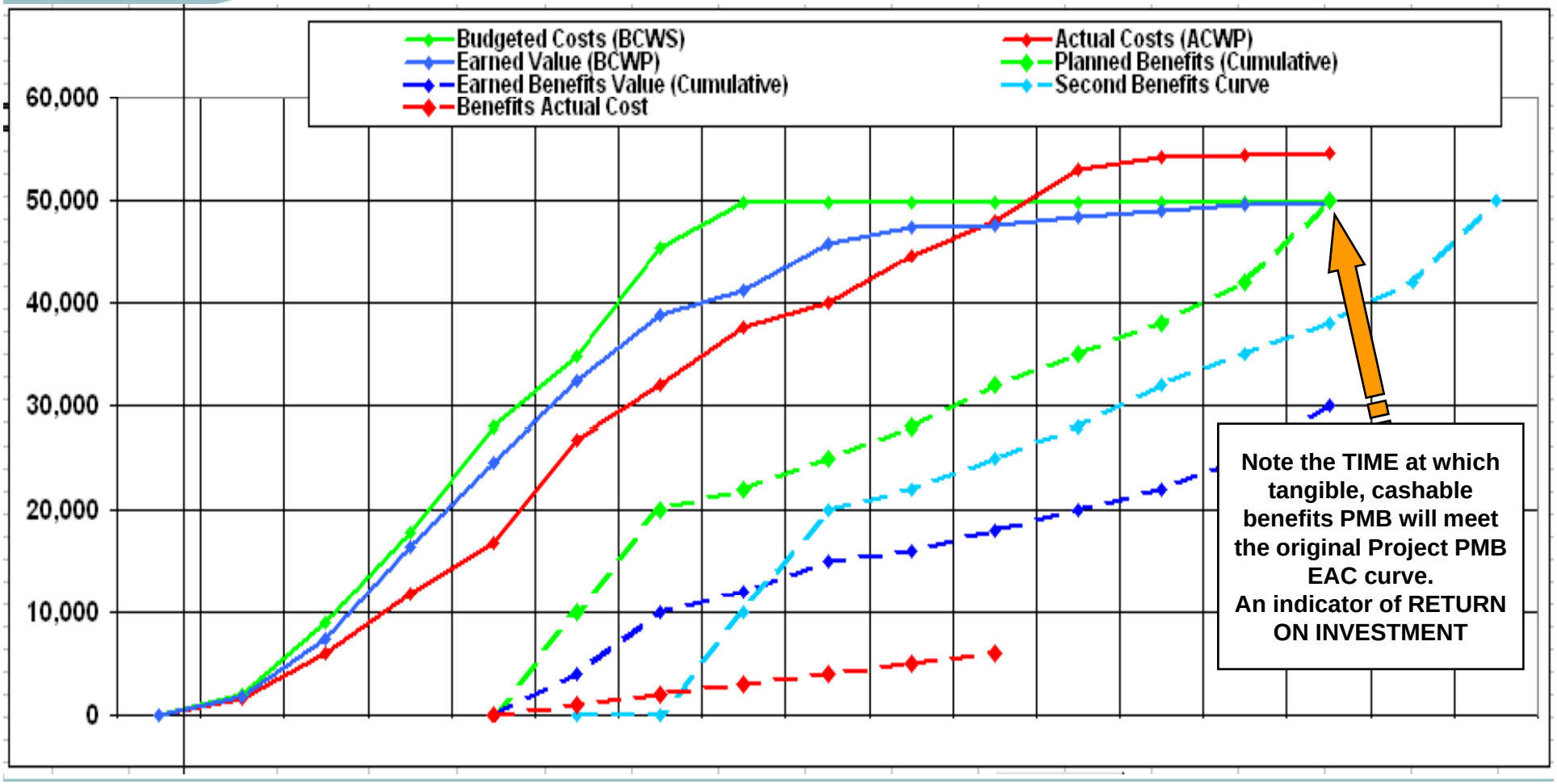
ES and Benefits Profile



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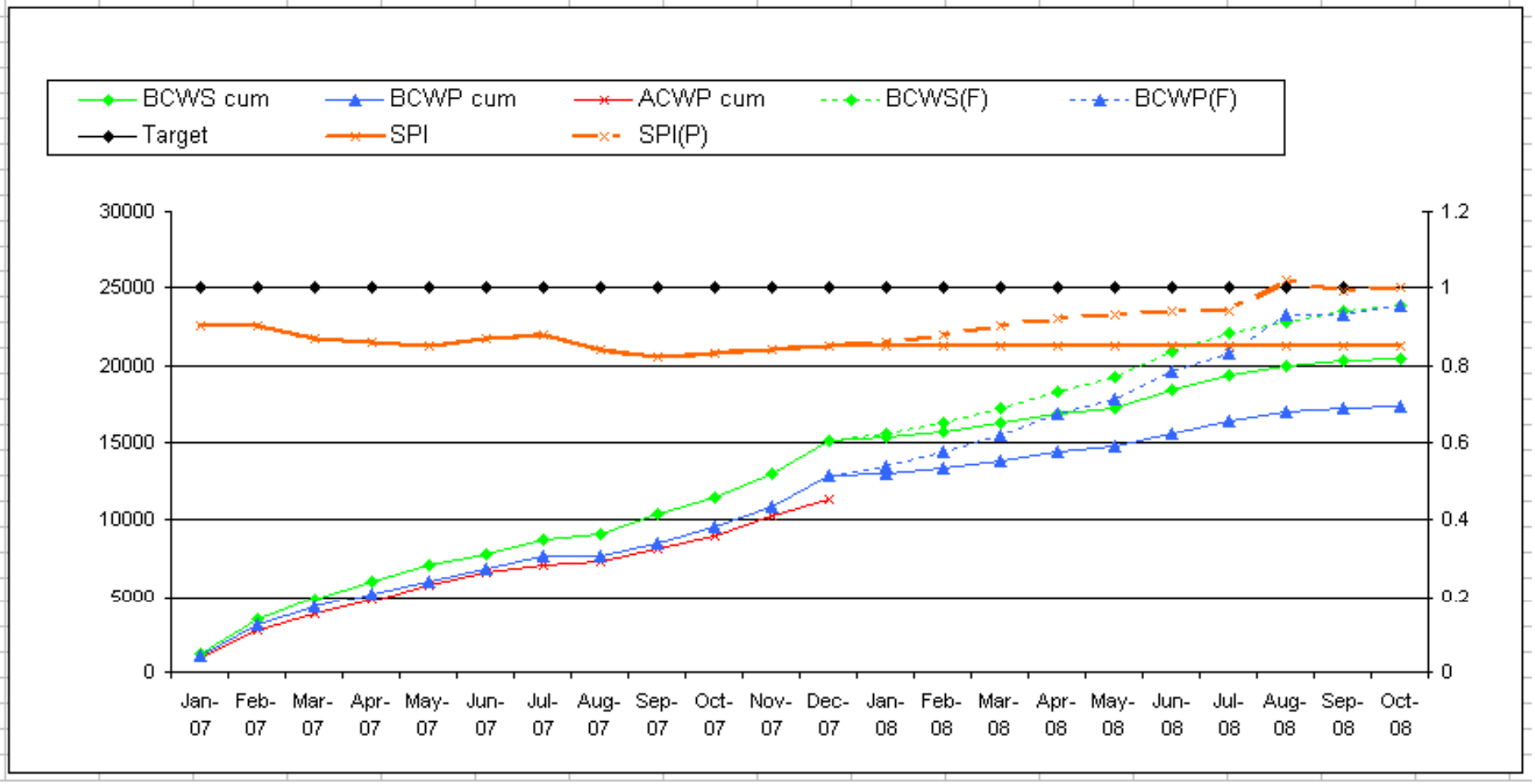
Taking Corrective Action



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ES and Benefits - terminology

Status	Earned Value (EV)	Benefits Value
	Planned Value (PV)	Planned Benefit Value (PBV)
	Earned Value (EV)	Earned Benefit Value (EBV)
	Actual Cost (AC)	Actual Cost to Benefits (ACB)

Thank you to…

- Walt Lipke and Kym Henderson
  - for use of Earned Schedule training material
- Project FALCON and Special Projects Team
  - For use of sanitized data

Earned Schedule References

- "A Case Study of Earned Schedule to do Predictions," *The Measurable News*, Winter 2007-2008: 16-18 [Hecht]
- "A Simulation and Evaluation of Earned Value Metrics to Forecast Project Duration," *Journal of Operations Research Society*, October 2007, Vol 58: 1361-1374 [Vanhoucke & Vandevoorde]
- "Measuring the Accuracy of Earned Value/Earned Schedule Forecasting Predictors," *The Measurable News*, Winter 2007-2008: 26-30 [Vanhoucke & Vandevoorde]
- Earned Schedule Website: www.earnedschedule.com

Available Resources

- PMI-Sydney http://sydney.pmichapters-australia.org.au/
  - Repository for ES Papers and Presentations
- Earned Schedule Website
- http://www.earnedschedule.com/
  - Established February 2006
  - Contains News, Papers, Presentations, ES Terminology, ES Calculators
  - Identifies Contacts & Training to assist with application
- Wikipedia references Earned Schedule
- http://en.wikipedia.org/wiki/Earned_Schedule