PROJECT MANAGEMENT

MODULE 6 – Winter 2023

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Agenda:

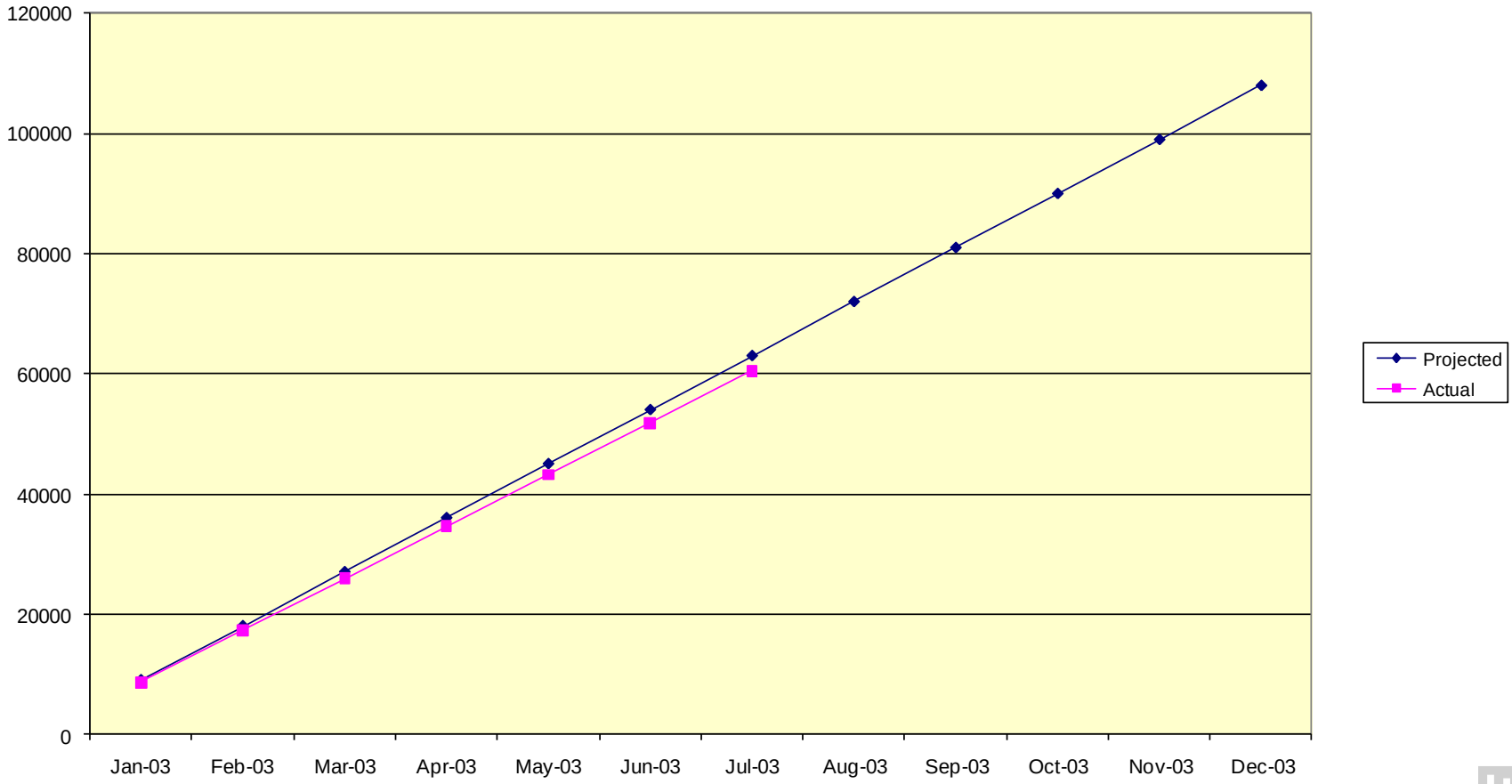
- Project Monitoring Analysis and Control
  - Earned Value Management (EVM)
- Midterm Overview and Review

Tracking project performance

EARNED VALUE MANAGEMENT

- A method to measure project performance against the project baseline. Results from an earned value analysis indicating potential deviation of the project from cost and schedule baselines.
- An integrated project management system based on the earned value concept that uses a time-phased budget baseline to compare actual and planned schedule and costs.

Traditional Cost Analysis



Glossary of Terms

EV	**Earned value for a task is simply the percent complete times its original budget. Stated differently, EV is the percent of the original budget that has been earned by actual work completed.**
PV	**The planned time-phased baseline of the value of the work scheduled. An approved cost estimate of the resources scheduled in a time-phased cumulative baseline [BCWS—budgeted cost of the work scheduled].**
AC	**Actual cost of the work completed. The sum of the costs incurred in accomplishing work. [ACWP—actual cost of the work performed].**
CV	**Cost variance is the difference between the earned value and the actual costs for the work completed to date where CV = EV – AC.**
SV	**Schedule variance is the difference between the earned value and the baseline line to date where SV = EV – PV.**
BAC	**Budgeted cost at completion. Total budgeted cost of the baseline or project cost accounts.**
EAC	**Estimated cost at completion.**
ETC	**Estimated cost to complete remaining work.**
VAC	**Cost variance at completion. VAC indicates expected actual over- or under-run cost at completion.**

Development of Project Baselines

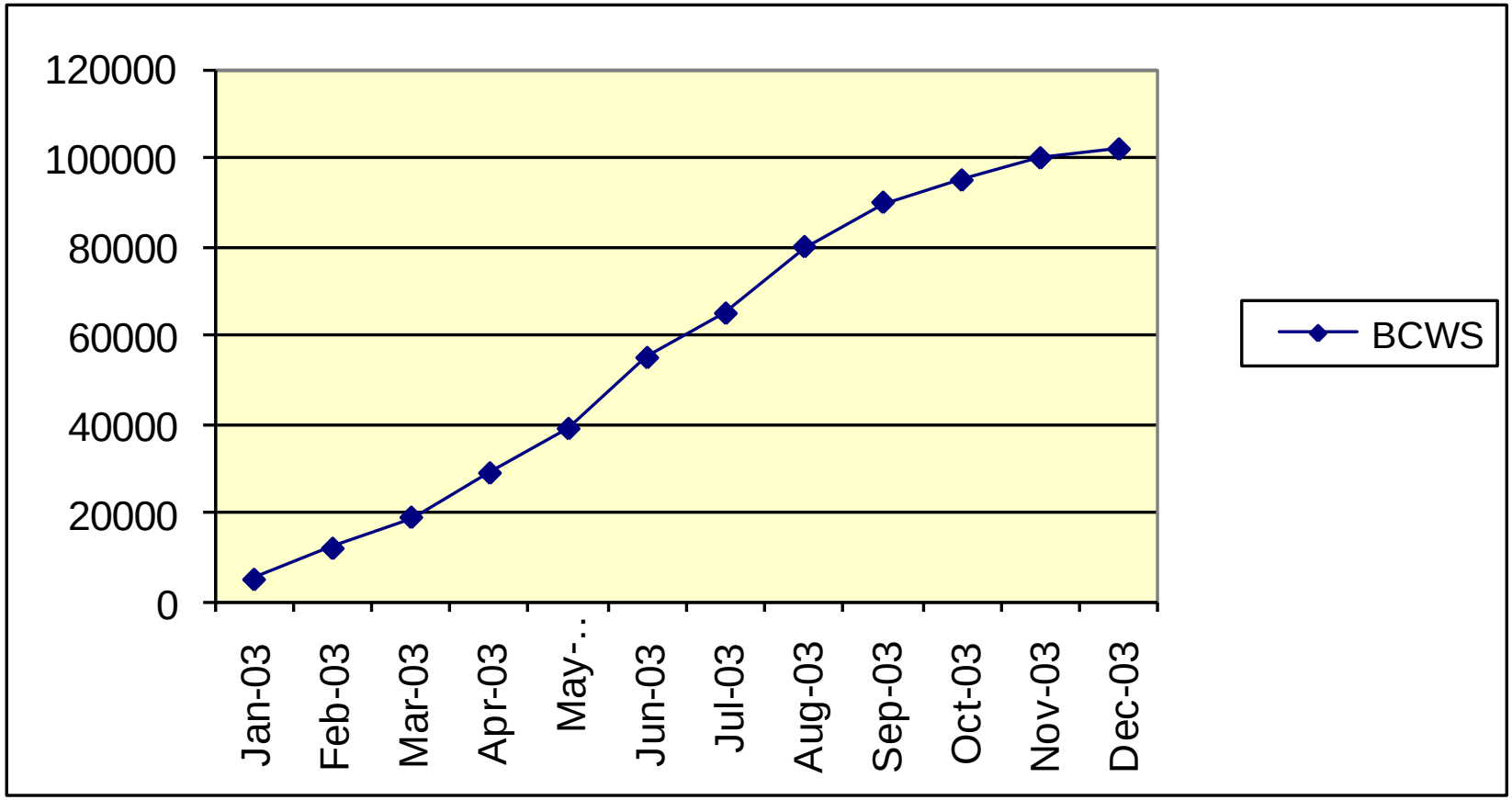
- Purposes of a Baseline (PV)
  - An anchor point for measuring performance
    - A planned cost and expected schedule against which actual cost and schedule are measured.
    - A basis for cash flows and awarding progress payments.
    - A summation of time-phased budgets (cost accounts as summed work packages) along a project timeline.
- What Costs Are Included in Baselines?
  - Labor, equipment, materials, project direct overhead costs (DOC)

Planned Value (PV) /
Budgeted Cost of Work Scheduled (BCWS)

Definition : PV is the budgeted cost for the work scheduled to be completed on an activity or WBS component.

Interpretation: What is the estimated value of the work planned to be done?

Planned Value (PV) /
Budgeted Cost of Work Scheduled (BCWS)

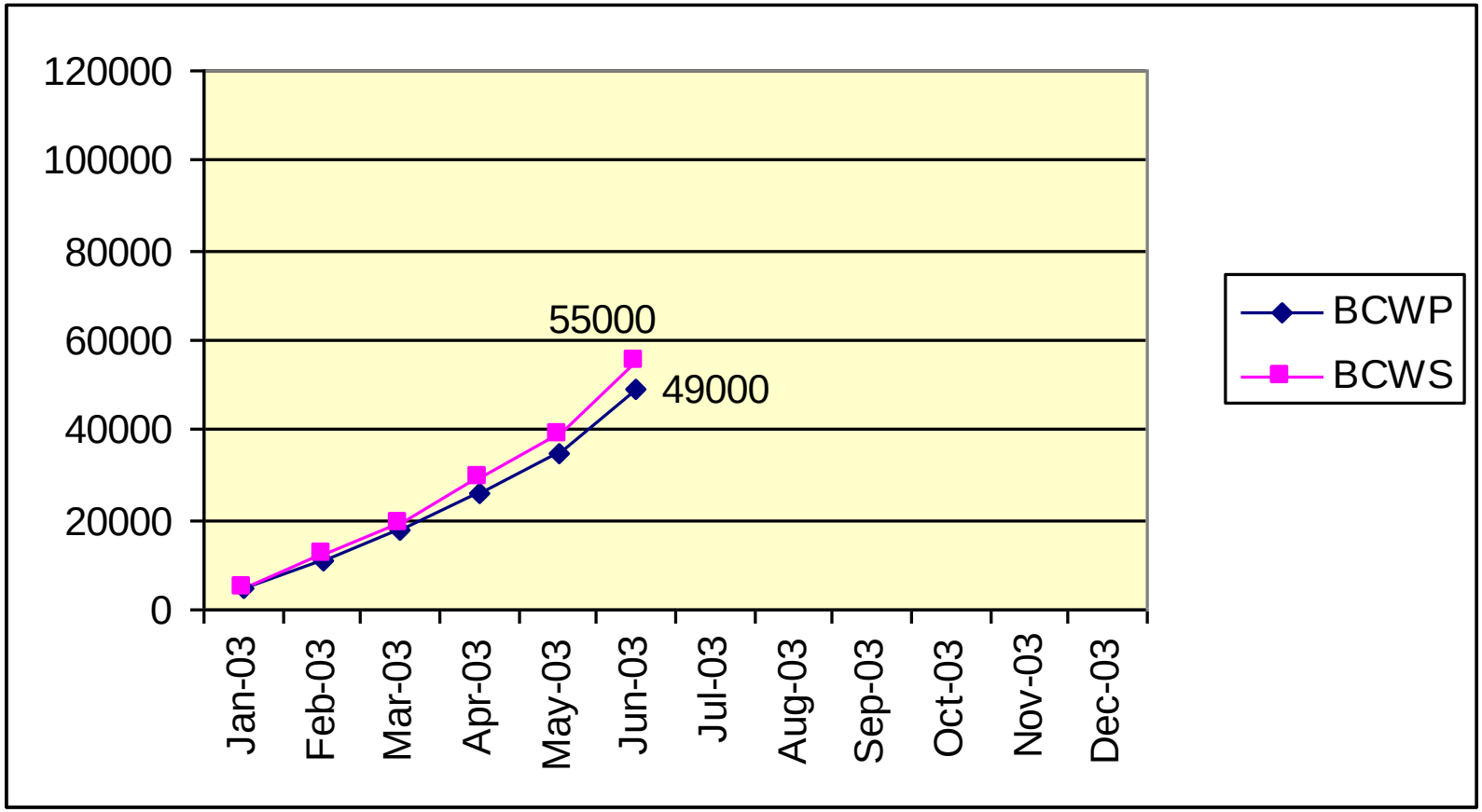


Earned Value (EV) /
Budgeted Cost of Work Performed (BCWP)

Definition : EV is the budgeted amount for the work actually completed on the schedule activity or WBS component.

Interpretation: What is the estimated value of work actually completed?

Earned Value (EV) /
Budgeted Cost of Work Performed (BCWP)

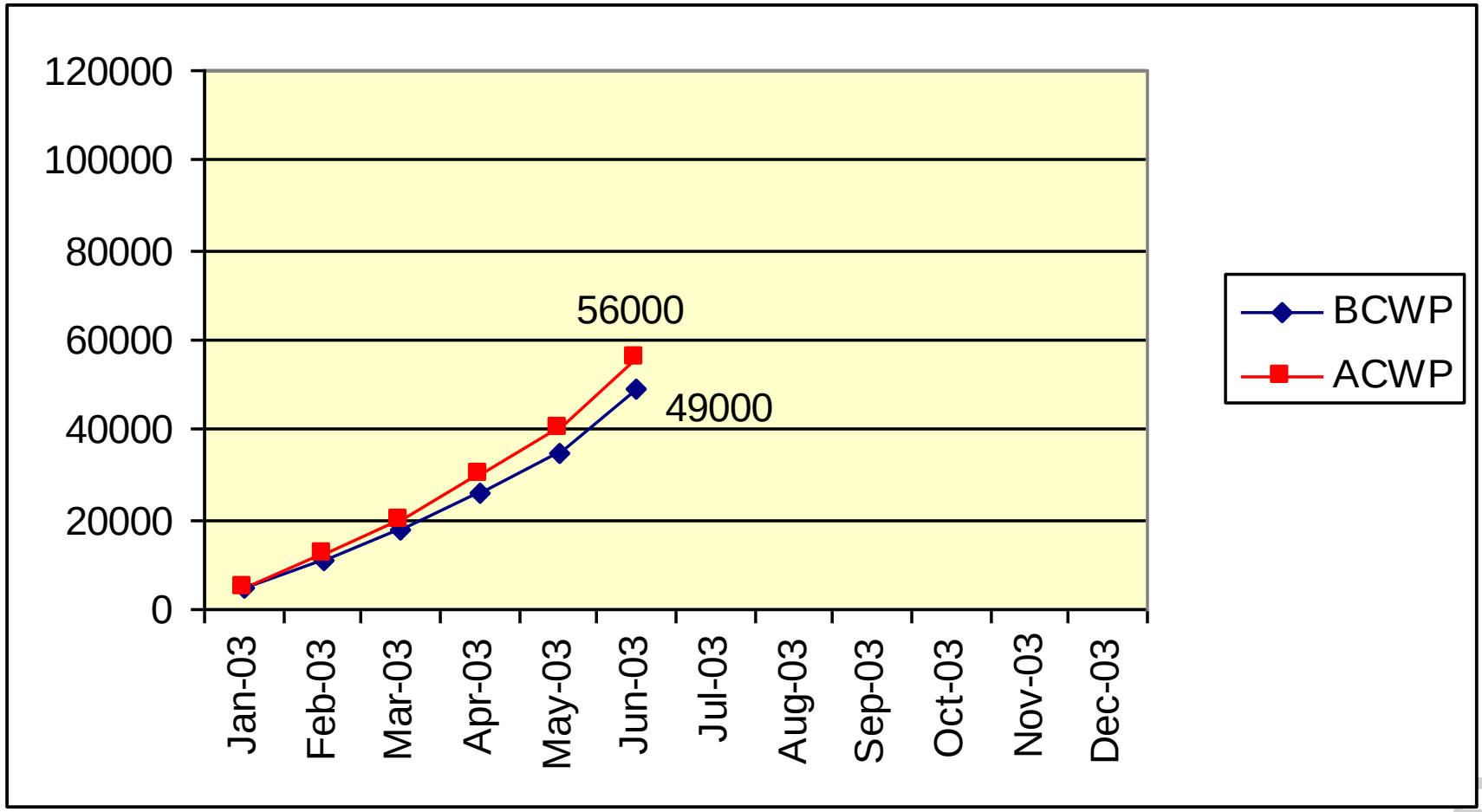


Actual Cost **(AC) /** Actual Cost of Work Performed (ACWP)

Definition : AC is the total cost incurred in accomplishing work on the schedule activity or WBS component. This AC must correspond in definition and coverage to whatever was budgeted for the PV and the EV (e.g., direct hours only, direct costs only, or all costs including indirect costs)

Interpretation: What is the actual cost incurred for the work accomplished?

Actual Cost **(AC) /**
Actual Cost of Work Performed (ACWP)



Methods of Variance Analysis

- Comparing Earned Value
  - With the expected schedule value.
  - With the actual costs.
- Assessing Status of a Project
  - Required data elements
    - Data Budgeted cost of the work scheduled (PV)
    - Budgeted cost of the work completed (EV)
    - Actual cost of the work completed (AC)
  - Calculate schedule and cost variances
    - A positive variance indicates a desirable condition, while a negative variance suggests problems or changes that have taken place.

Methods of Variance Analysis (cont.)

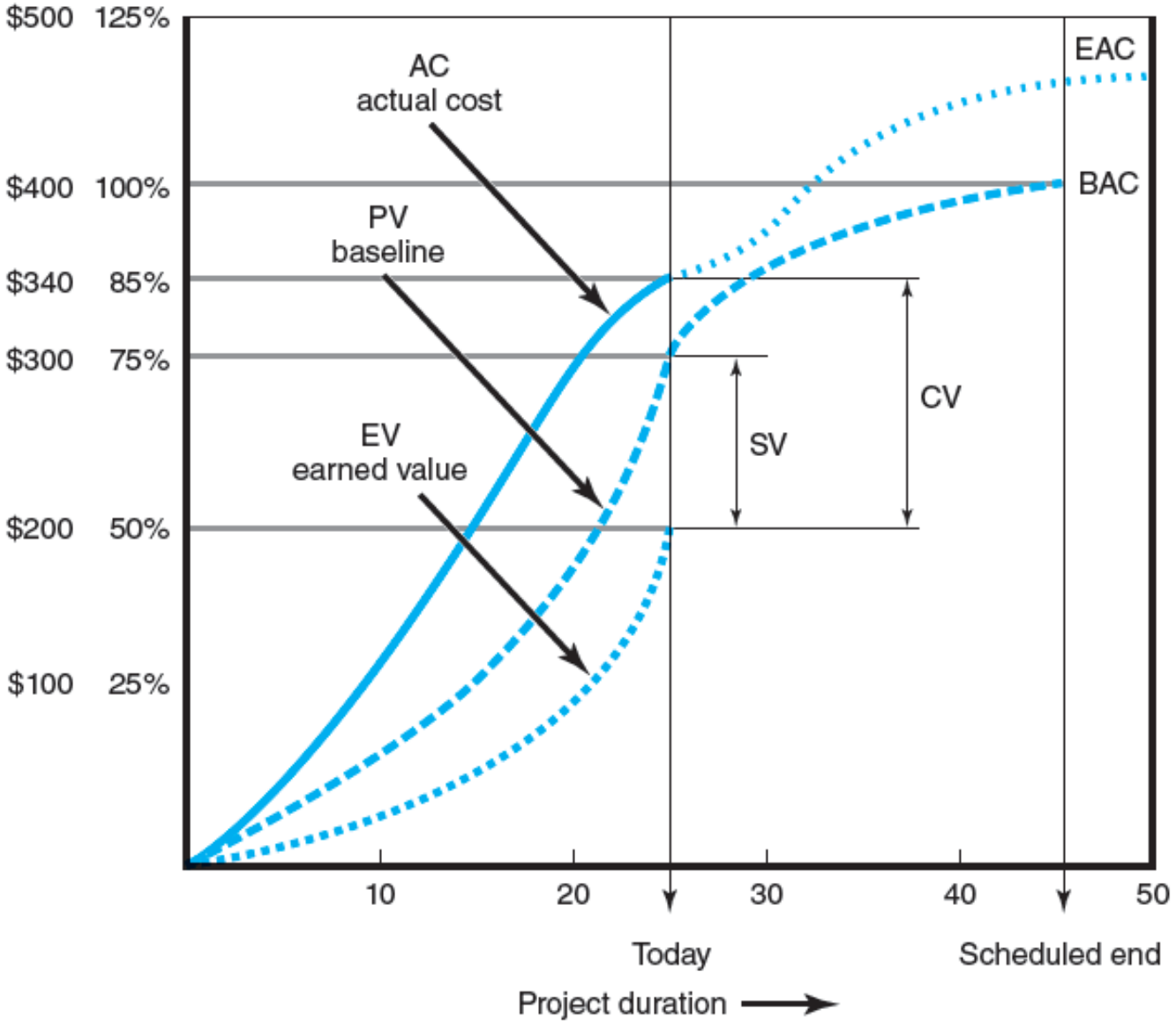
- Cost Variance (CV)
  - Indicates if the work accomplished using labor and materials costs more or less than was planned at any point in the project.

    CV = EV - AC

- Schedule Variance (SV)
  - Presents an overall assessment in dollar terms of the progress of all work packages in the project scheduled to date.

    SV = EV - PV

Cost/Schedule Graph



Indexes to Monitor Progress

Performance Indexes

- Cost Performance Index (CPI)
  - Measures the cost efficiency of work accomplished to date.
  - CPI = EV/AC
  - Eg. a CPI of .93 means that for every $1 we have spent thus far on the project, we are getting 93 cents worth of performance

- Scheduling Performance Index (SPI)
  - Measures scheduling efficiency
  - SPI = EV/PV
  - Eg. an SPI of .93 means that for every $1 we planned to spend on this project, we are getting 93 cents worth of performance

Interpretation of Indexes

Index	Cost (CPI)	Schedule (SPI)
>1.00	Under cost	Ahead of schedule
=1.00	On cost	On schedule
<1.00	Over cost	Behind schedule

EVM & Basic Project Management Questions

Project Management Questions	EVM Performance Measures
Are we under or over our budget? Are we behind or ahead of schedule?	Cost Variance (CV) Schedule Variance (SV)
How efficiently are we using our resources?	Cost Performance Index (CPI)
How efficient are we from a scheduling standpoint?	Schedule Performance Index (SPI)
What is the project likely to cost?	Estimate at Completion (EAC)
Will we be under or over budget?	Variance at Completion (VAC)
What will the remaining work cost?	Estimate to Complete (ETC)

- Reference: Practice Standard for Earned Value Management, PMI

Common Terms and Interpretations

Acronym	Term	Interpretation
BAC	Budget at Completion	How much did we Budget for the total project effort?
EAC	Estimate at Completion	What do we currently expect the total project to cost?
ETC	Estimate to Complete	From this point on, how much more do we expect it to cost to finish the project?
VAC	Variance at Completion	How much over or under budget do we expect to be at the end of the project?

Formulas

Name	Formula
Earned Value (EV)	% Complete x BAC
Cost Variance (CV)	EV – AC
Schedule Variance (SV)	EV – PV
Cost Performance Index (CPI)	EV / AC
Schedule Performance Index (SPI)	EV / PV
Estimate at Completion (EAC)	BAC / CPI
Estimate to Complete (ETC)	EAC – AC
Variance at Completion (VAC)	BAC - EAC

EVM exercise

Jennifer has 6 unique Tasks in her project, with each task having a budget of $5,000. Each task is expected to take 1 month to complete. Each task is to be completed one after the other, hence 6 months total duration for the project.

Answer the questions below using this project status chart:

Task	STATUS END OF 4th MONTH
TASK A	COMPLETE; spent $3,500
TASK B	COMPLETE; spent $4,000
TASK C	COMPLETE; spent $3,000
TASK D	80% COMPLETE; spent $4,500
TASK E	NOT YET STARTED
TASK F	NOT YET STARTED

At the end of the 4th month:

- What is the Cost Performance Index (CPI)?
- What is the Schedule Performance Index (SPI)?
- What is the Estimate at Completion (EAC)?
- What is the Variance at Completion (VAC)?

(*Assume that your performance will remain the same after the 4th month*)

Let's solve this together in class

Breakout Group Exercise 10-15min

In your Breakout Group – work on the following EVM question.

Nitesh Jaiswal is a project manager working on a building construction project. The project is expected to take 12 months and costs $ 720,000. At the end of the 6th month, Nitesh's clients wanted him to present them with the status of this project. His contractors have informed him that the project is 60% completed and they have spent $ 600,000.

(a) What is the Earned Value (EV) at the end of 6 months?
(b) What is the Actual Cost (AC) at the end of 6 months?
(c) What is the Cost Performance Index (CPI) at the end of the 6th month?
(d) What is the Cost Variance (CV) at the end of 6 months?
(e) What is the Variance at Completion (VAC)?

Assume that this project will continue with the same cost performance rate as identified at the end of the 6th month.

We will review the answers together in class

Midterm Exam:

Tuesday February 21 at 5:15 – 7:15 pm (during our regular class time)

- Worth 15% of final grade
- Will be on Blackboard available at 5:15 pm,
- Consist of a combination of short answer and quantitative questions

Midterm Exam Topics

Topics and concepts covered in modules 1 to 6 will be on the midterm Exam

- Organization Strategies
- SWOT Analysis
- Project Management lifecycle Phases
- Comparison of development approaches (Waterfall/Iterative/Incremental/Agile)
- Scope Management
- Use Case Diagrams
- Estimating Techniques and Agile Estimating
- WBS
- Project Scheduling and CPM
- Earned Value Management (EVM)

References

- Project Management: The Managerial Process, 6th edition, E.W. Larson and C.F. Gray
- Practice Standard for Earned Value Management, PMI

THANK YOU.

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