Cost Control: analysis of deviations from budget

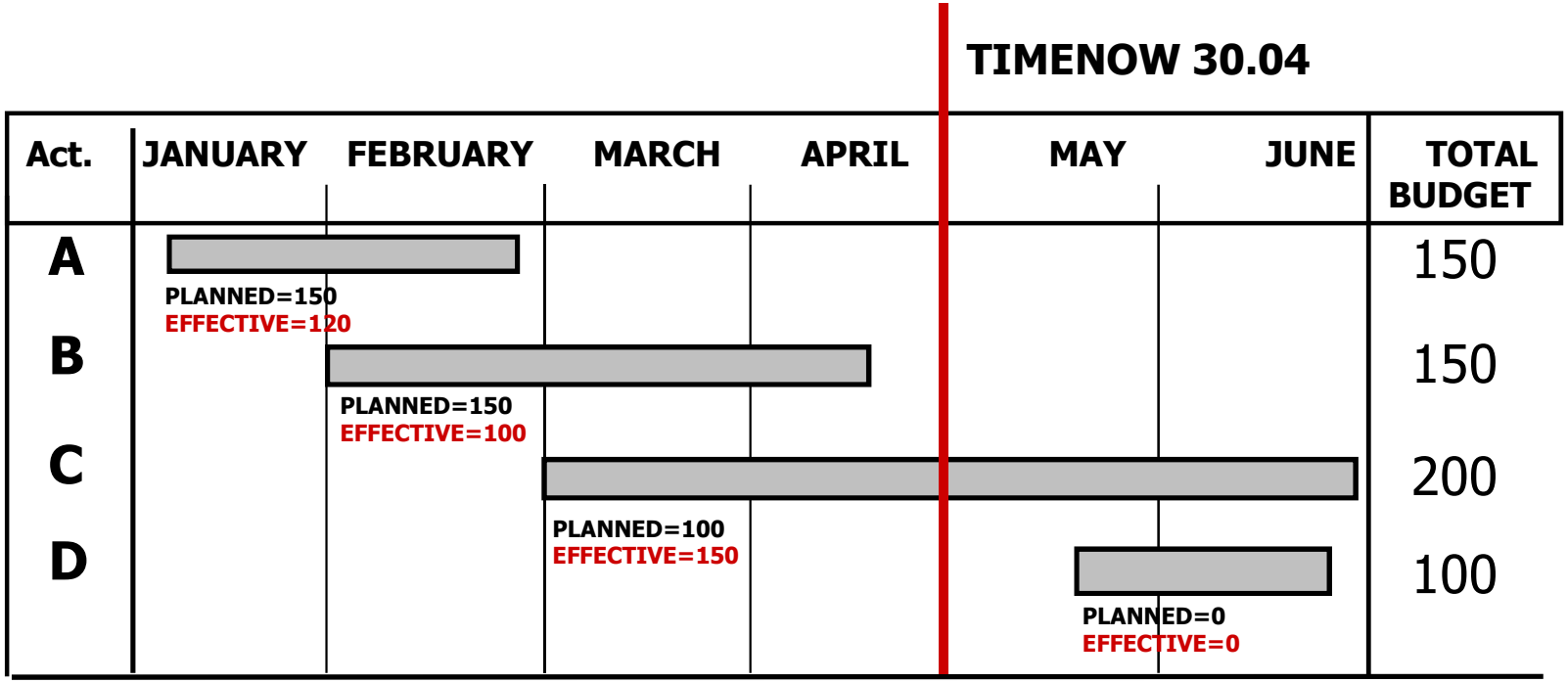
The Project Cost Control is conducted using:

- the curve Budgeted Cost of Work Scheduled (BCWS): curve of the cost budgeted (Planned Value - PV) for scheduled work in the planning stage; It is also called baseline
- the curve Actual Cost of Work Performed (ACWP): curve of the actual work done (performed) and actual costs (Actual Cost - AC);
- the curve Budgeted Cost Of Work Performed (BCWP): curve of the actual work done but expected costs

The ACWP is the curve of the final balance and then arises in contrast with the baseline, which is the curve of the estimate; BCWP is the hybrid between the two

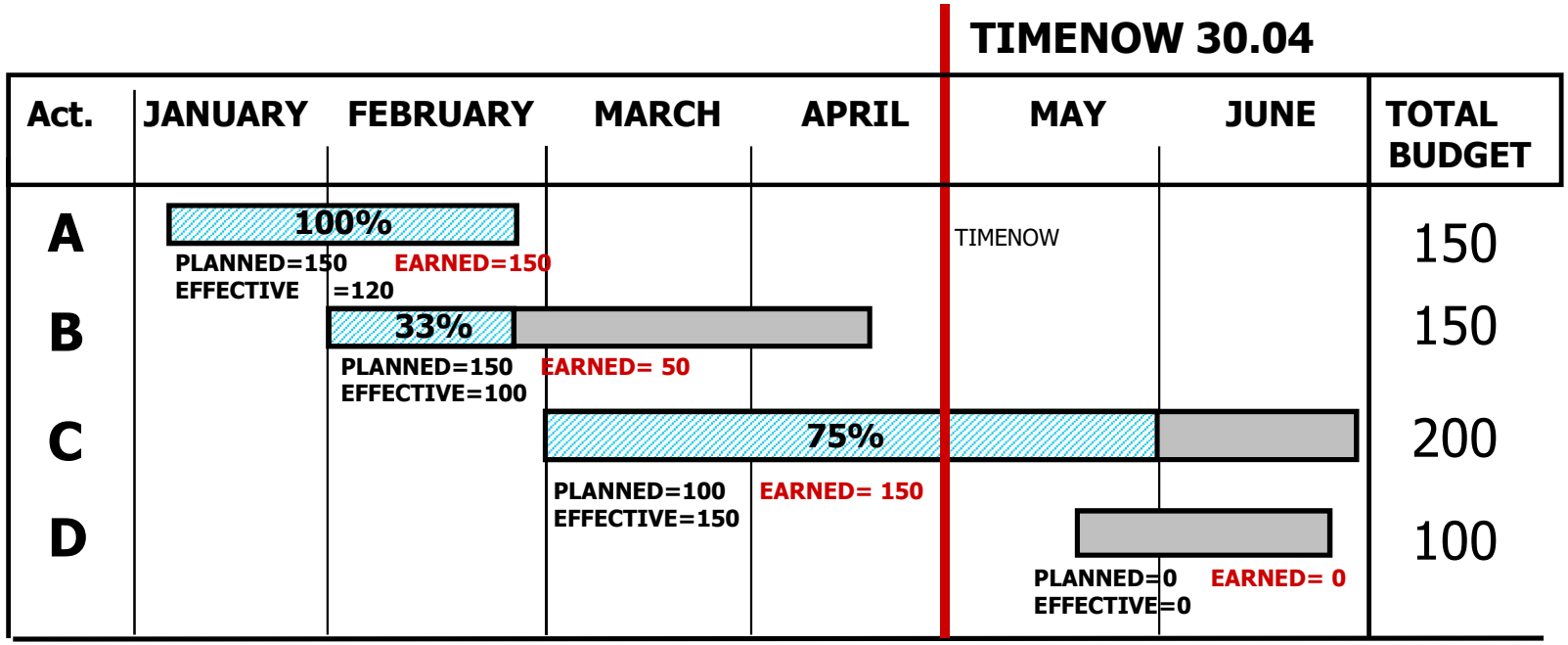
It is also possible to calculate the time delay as the difference between planned time (Scheduled Time - ST) and time taken to perform the work (Actual Time - AT)

Example Earned Value



Totals at Timenow	Planned cost Effective cost	(PV) = 400 (AC) = 370	?	**Deviation : - 30**	600

Example Earned Value



Time now totals	Planned cost Earned Value Effective cost	(PV) = 400 (EV) = 350 (AC) = 370	**Time deviation: -50** **Costs deviation: -20**	600

?

Earned Value Method (EVM)

The method is called ***Earned Value Method***, where value is defined as value as regards the budget of the work effectively done.

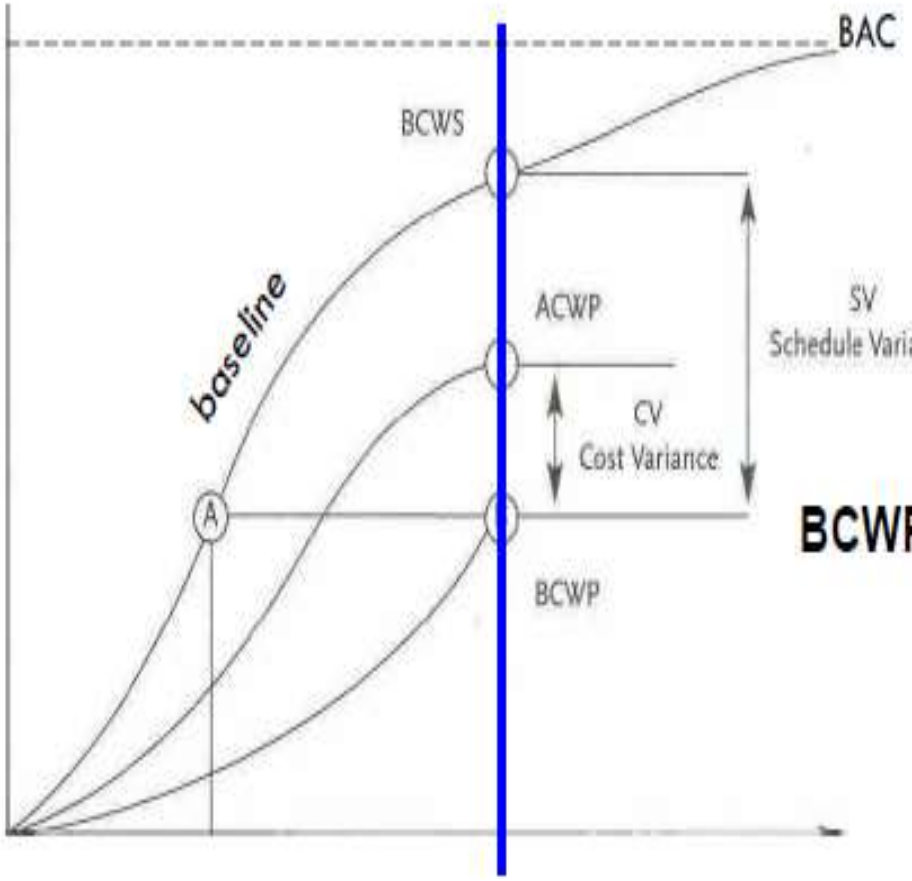
Earned Value = EV = expected budget * (physical advancement/planned advancement)

data:

- Total project budget (***BAC = budget at completion***)
- Percentage of progress of the works (**%L**)

In a time t, we can calculate the Earned Value (EV) as:

$$EV(t) = BAC \times \%L$$



BCWP = BAC * (%compl.)

BAC = Budget at completion

Deviation of costs and times

Cost Variance: **CV = EV – AC**

Schedule Variance: **SV = EV – PV**

- **Cost Variance**: it is the difference between the planned budget and the amount actually spent
- **Schedule Variance**: it is the deviation between the actual duration and the planned one

CV>0 the cost of completing the work is less than planned
CV=0 the cost of completing the work is right on plan
CV<0 the cost of completing the work is higher than planned

SV>0 work is ahead of schedule
SV=0 work is on schedule
SV<0 work is behind schedule

Other indicators

Cost Performance Index: **CPI = EV / AC**

Schedule Performance Index: **SPI = EV / PV**

Cost Performance Index (CPI): a value of CPI less than 1 indicates a situation of higher costs than estimated, while a value higher than 1 indicates a situation of lower costs than estimated

Schedule Performance Index (SPI): the work is behind schedule when SPI < 1 and the work is ahead of schedule when SPI > 1

Analysis of time and cost performance

Cost Variance (CV) / Cost Performance Index (CPI)	Schedule Variance (SV) / Schedule Performance Index (SPI): SV > 0 e SPI >1	SV = 0 e SPI = 1	SV < 0 e SPI < 1
CV > 0 e CPI >1	In advance and under budget	On time and under budget	Delay and under budget
CV = 0 e CPI = 1	In advance and on budget	On time and on budget	Delay and on budget
CV < 0 e CPI < 1	In advance and over budget	On time and over budget	Delay and over budget

- Optimal situations
- Full respect of scheduling
- Critical situations

Example Earned Value

CV = 350 - 370 = - 20

SV = 350 - 400 = - 50

- The actual cost at TimeNow is greater than earned value:
  - we are spending more than you would have had to spend on what has been achieved: we are out with costs;

- The planned value at TimeNow is greater than earned value:
  - the value of what was actually achieved in terms of budget is less than what has been planned, we are out with times;

Example Earned Value

Example

CPI = 350 / 370 = 0,94

SPI = 350 / 400 = 0,87

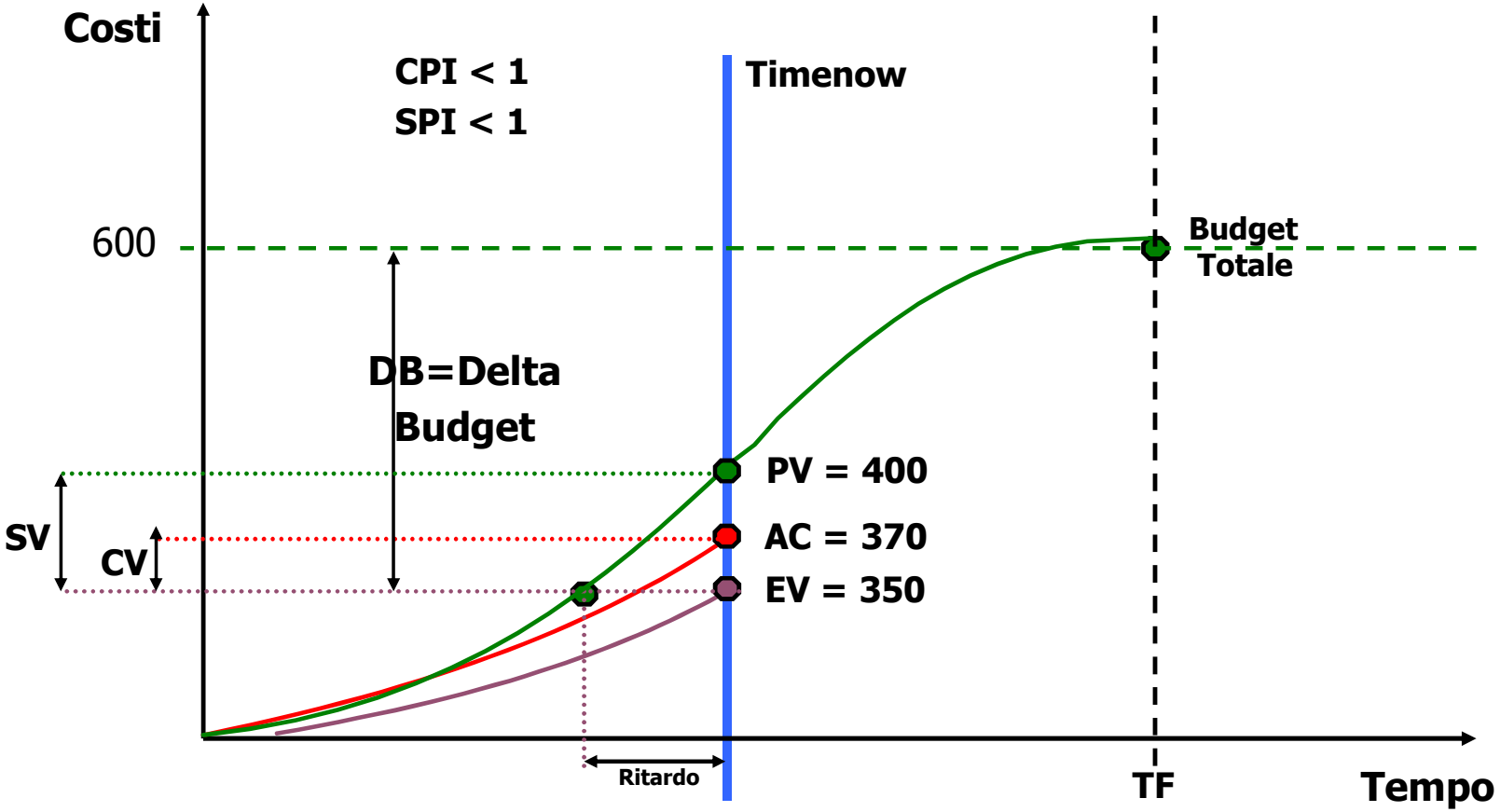
The cost efficiency index is smaller than 1:

- we are getting 94% of the value for each euro spent, we are inefficient on costs;

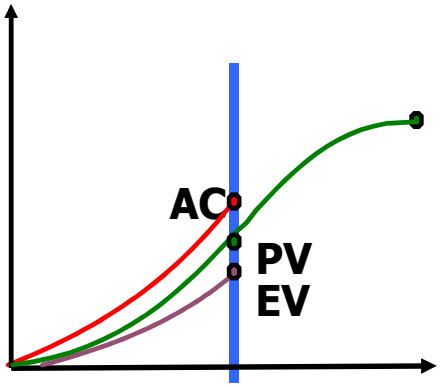
The time efficiency index is smaller than 1:

- we are implementing the 87% of what was planned, we are inefficient on times;

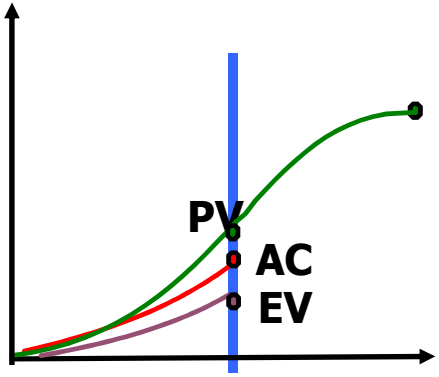
Example Earned Value



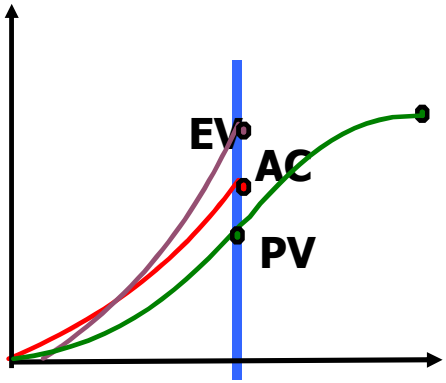
S curves



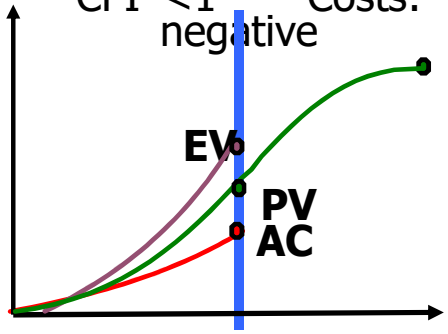
SPI <1 Time: negative
CPI <1 Costs: negative



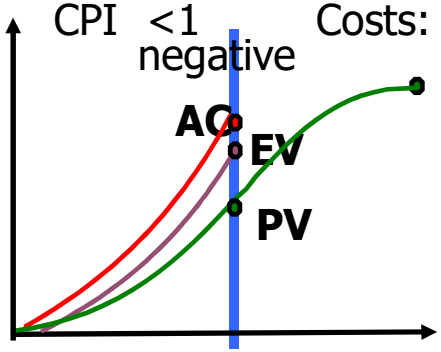
SPI <1 Time: negative
CPI <1 Costs: negative



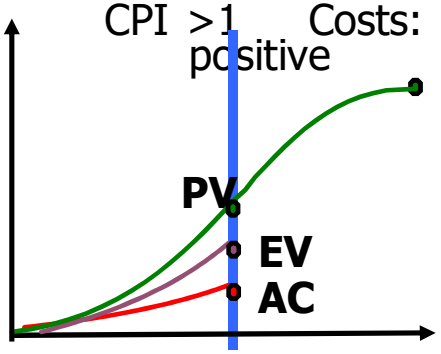
SPI >1 Time: positive
CPI >1 Costs: positive



SPI >1 Time: positive
CPI >1 Costs: positive



SPI >1 Time: positive
CPI <1 Costs: negative



SPI <1 Time: negative
CPI >1 Costs: positive

Estimate at Completion and Estimate to complete

Estimate at Completion (EAC):

EAC= AC + ETC

EAC = BAC - CV

ETC (Estimate to Completion) = BAC - EV

- It represents the estimated cost at the end of the project, taking into account what actually has been spent and what still must be implemented;
- Sums the actual cost at TimeNow to the estimate to complete;
- Estimate at completion is given from the remaining planned part compared to realized (Earned Value).

Estimate of the cost of the project at the end based on estimated costs

EAC can be calculated in three ways …

Without considering the efficiency at timenow:

EAC= AC+(BAC-EV)

Example: 370+(600-350) = **620**

Past inefficiencies are reflected in the final consumptive (AC) …

…but we do not consider them representative of the future performance (atypical deviations);

Estimate of the cost of the project at the end based on costs performance

… or

Considering the efficiency at timenow:

EAC= AC+(Budget Totale-EV)/CPI

Example: 370+(600-350)/0,94 = **636**

- we consider the past performance as a representative of the future one (typical deviation);
- then we correct estimate to complete basing on the CPI.

Estimate of the cost of the project at the end based on costs and time performance

… or

Considering the efficiency at timenow:

EAC= AC+(Budget Totale-EV)/(CPI*SPI)

Example: 370+(600-350)/(0,94*0,87) = **676**

- we consider the past performance as a representative of that future (typical deviation);
- we correct then the estimate to complete based on the CPI and SPI.

Estimate at Completion

Which is the most correct estimate at completion?