Earned Value Analysis
Basic Concepts

Ricardo Viana Vargas, MSc, IPMA-B, PMP
ricardo.vargas@macrosolutions.com.br

Ricardo Viana Vargas, MSc, IPMA-B, PMP

Ricardo Viana Vargas is a project, portfolio and risk management specialist. During the past 15 years, he has been responsible for over **80 major projects** in various countries in the areas of petroleum, energy, infrastructure, telecommunications, information technology and finances, comprising an investment portfolio of over 18 billion dollars.

He was the first Latin American volunteer to be elected Chairman of the Board for the **Project Management Institute (PMI)**, the largest project management organization in the world with close to 500,000 members and certified professionals in 175 countries.

Ricardo Vargas has written **ten books** on project management, published in Portuguese and English, which have sold over 200,000 copies throughout the world. In 2005 he received the PMI Distinguished Award for his contribution to the development of project management and the PMI Professional Development Product of the Year award for the PMDome® workshop, considered the best project management training solution in the world.

He is a project management professor for various MBA courses, and actively participates on editorial boards for specialized journals in Brazil and the United States. Vargas is a recognized reviewer of the **PMBOK Guide**, the most important reference in the world for project management, and also chaired the official translation of PMBOK into Portuguese.

He is a chemical engineer and holds a master's degree in Industrial Engineering from UFMG (Federal University of Minas Gerais). Ricardo Vargas also holds a Master Certificate in Project Management from George Washington University and is certified both as a Project Management Professional (PMP) by PMI and as IPMA-B by the International Project Management Association. He attended the Program on Negotiation for Executives at **Harvard Law School**.

Over an eleven year timeframe, which began in 1995, Ricardo, in conjunction with two partners, established one of the most solid Brazilian businesses in the area of technology, project management and outsourcing, which had a staff of **4,000 collaborators** and an annual income of 50 million dollars in 2006, when Ricardo Vargas sold his share of the company to dedicate himself on a fulltime basis to the internationalization of his project management activities.

He is a member of the Association for Advancement of Cost Engineering (**AACE**), the American Management Association (**AMA**), the International Project Management Association (**IPMA**), the Institute for Global Ethics and the Professional Risk Management International Association (**PRMIA**).
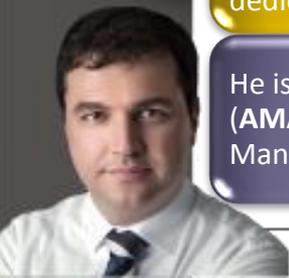
EVMS Definition

- The earned value concept focuses on a relationship between the actual costs being expended against the physical work done on the project.

- **The focus is on the true cost performance: what we got for what we spent.**

Elementos do EVA

- **BCWS (*Budget Cost of Work Scheduled*) –** It is a value that indicates the amount of the budget that should have be expended, taking into consideration the cost baseline of the activity or resource. BCWS is calculated using the baseline costs divided into phases and acumulated until the status date or present date. It comes from the project's budget.
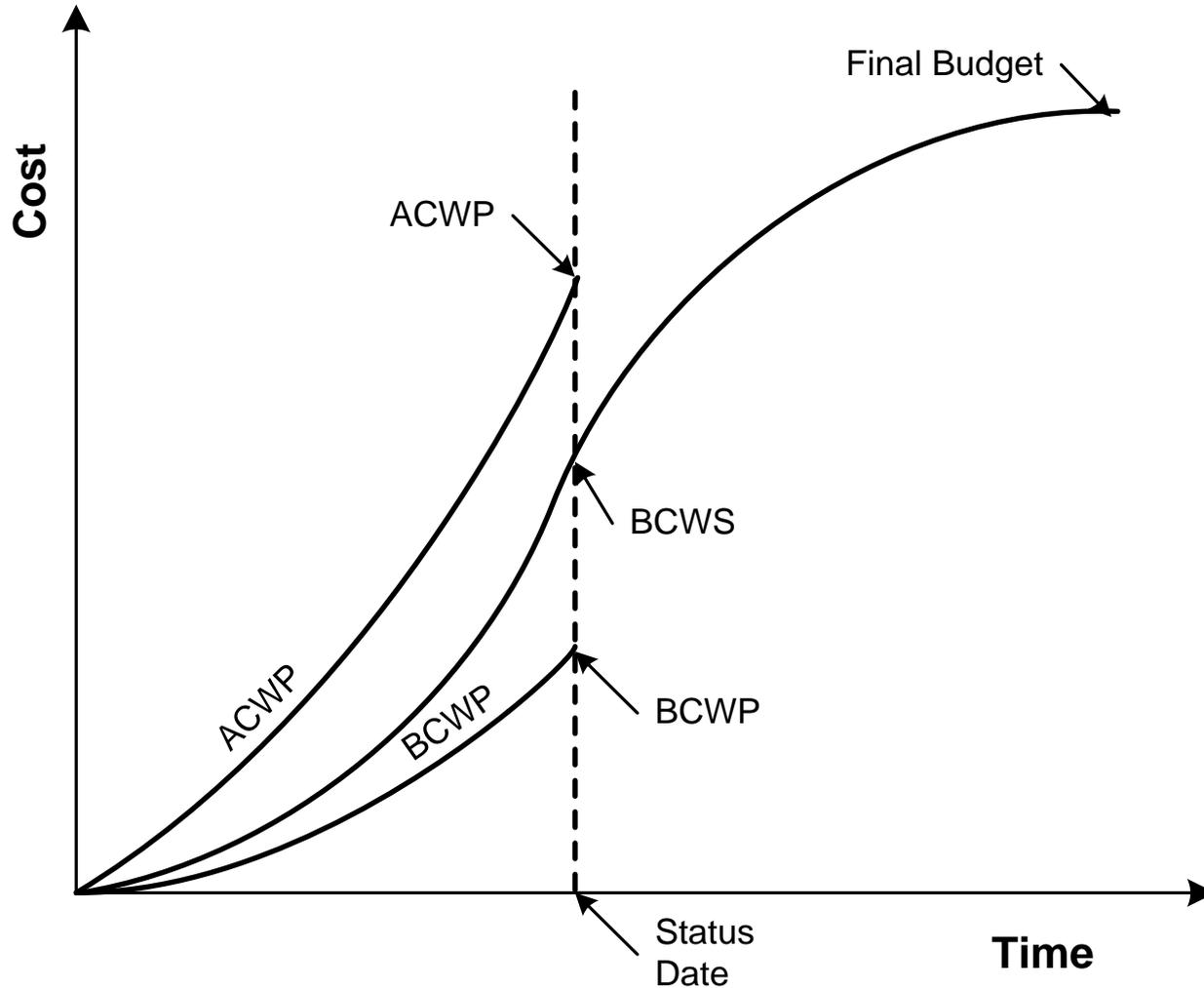
EVA Elements

⊙ **BCWP (*Budget Cost of Work Performed*) –** It is a value that indicates the amount of the budget that should have been expended taking into consideration the work that has already been performed up to the moment, as well as the cost baseline of the activity or resource. The activity's BCWP is calculated taking into consideration its executed percentage multiplied by its total budget. BCWP is also known as "acumulated value or added value".
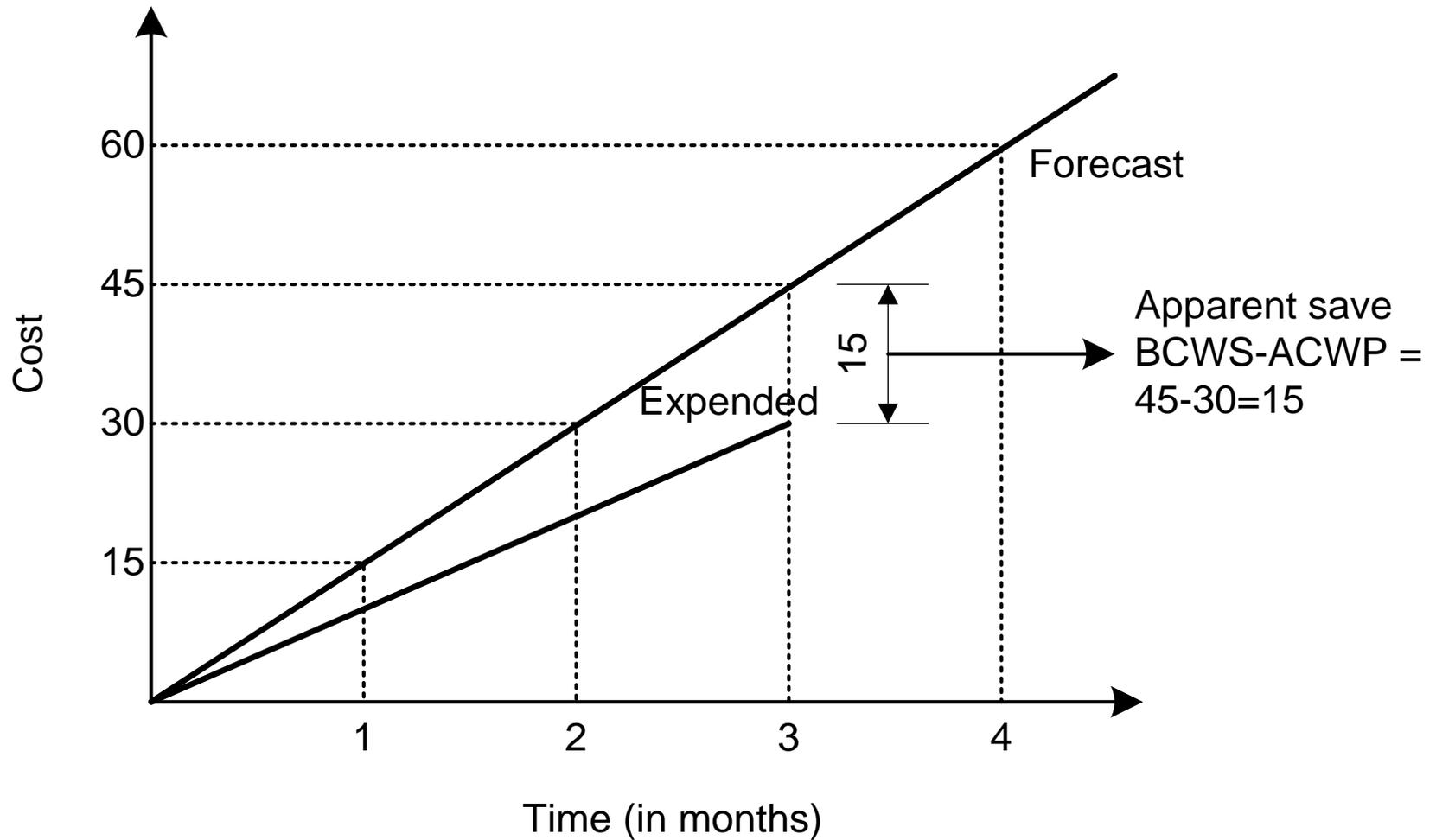
EVA Elements

- **ACWP (*Actual Cost of Work Performed*) –** It shows the incurred costs of the performed work until the status date or present date.
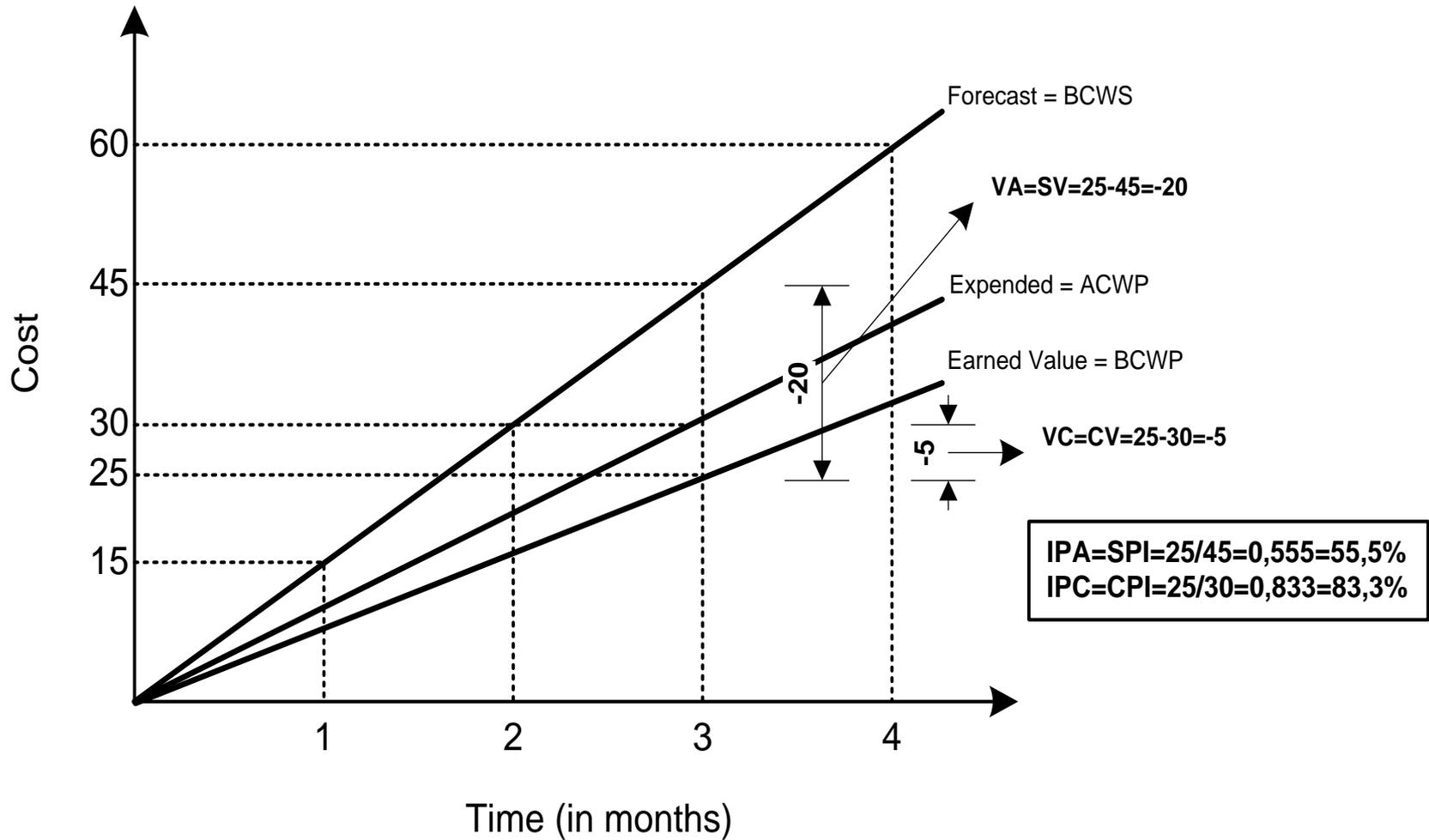
EVA Graphically

Traditional Approach Example

Cost vs Time (in months)

Labels on chart: 60, 45, 30, 15 (Cost axis); 1, 2, 3, 4 (Time axis)

Forecast

Expended

15

Apparent save
BCWS-ACWP =
45-30=15

RICARDO VARGAS

Earned Value Example

Forecast = BCWS

VA=SV=25-45=-20

Expended = ACWP

Earned Value = BCWP

VC=CV=25-30=-5

-20

-5

IPA=SPI=25/45=0,555=55,5%
IPC=CPI=25/30=0,833=83,3%

Cost

60

45

30

25

15

Time (in months)

1   2   3   4

RICARDO
VARGAS

Schedule Variance

- **SV (*Scheduled Variation*) – I**t is the monetary difference between the earned value (BCWP) and the schedule baseline (BCWS). If SV is positive, the project is ahead in terms of cost; when negative, the project is late in terms of cost.

$$SV = BCWP - BCWS$$

Cost Variance

⊙ **CV (*Cost Variation*) –** it is the difference between the estimated cost to reach the present level of conclusion (BCWP) and the actual incurred cost (ACWP), up to the status date or present date. If CV is positive, the cost is less than the its forecast (or baseline); if it is negative, the activity has gone beyond its budget.

$$CV = BCWP - ACWP$$

Time Variance

- **TV (*Time Variance*) –** It is the time difference between what was expected and what has been executed by the project. It can be graphically shown by plotting the BCWS and BCWP curves, and finding the date that BCWS adds the same value as BCWP. The difference between the status date and the calculated date represents the project's delay or advance.

Plotting SV, CV e TV in a EVA Chart

Exercise

Cost

Time

ACWP

BCWS

BCWP

Situation 1

Situation 2

Situation 3
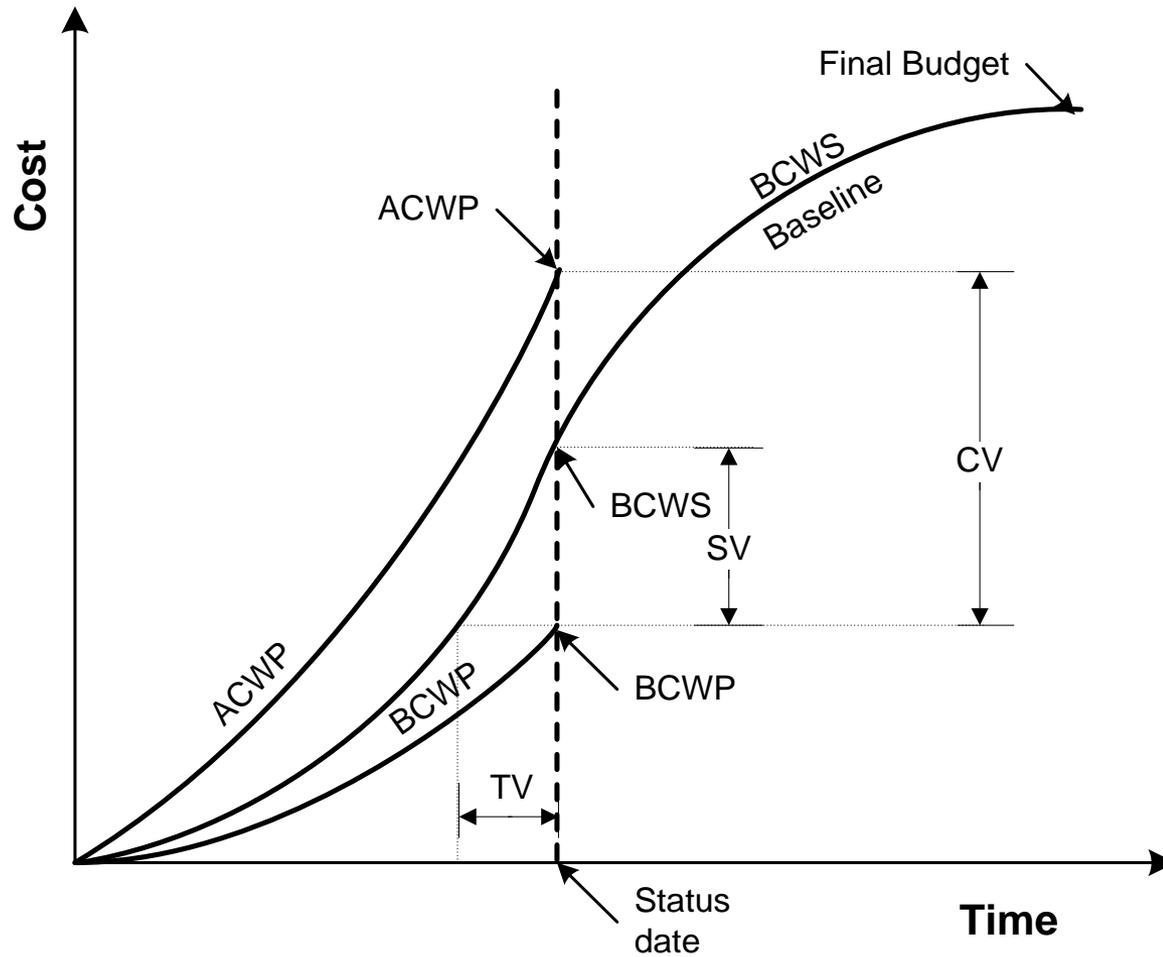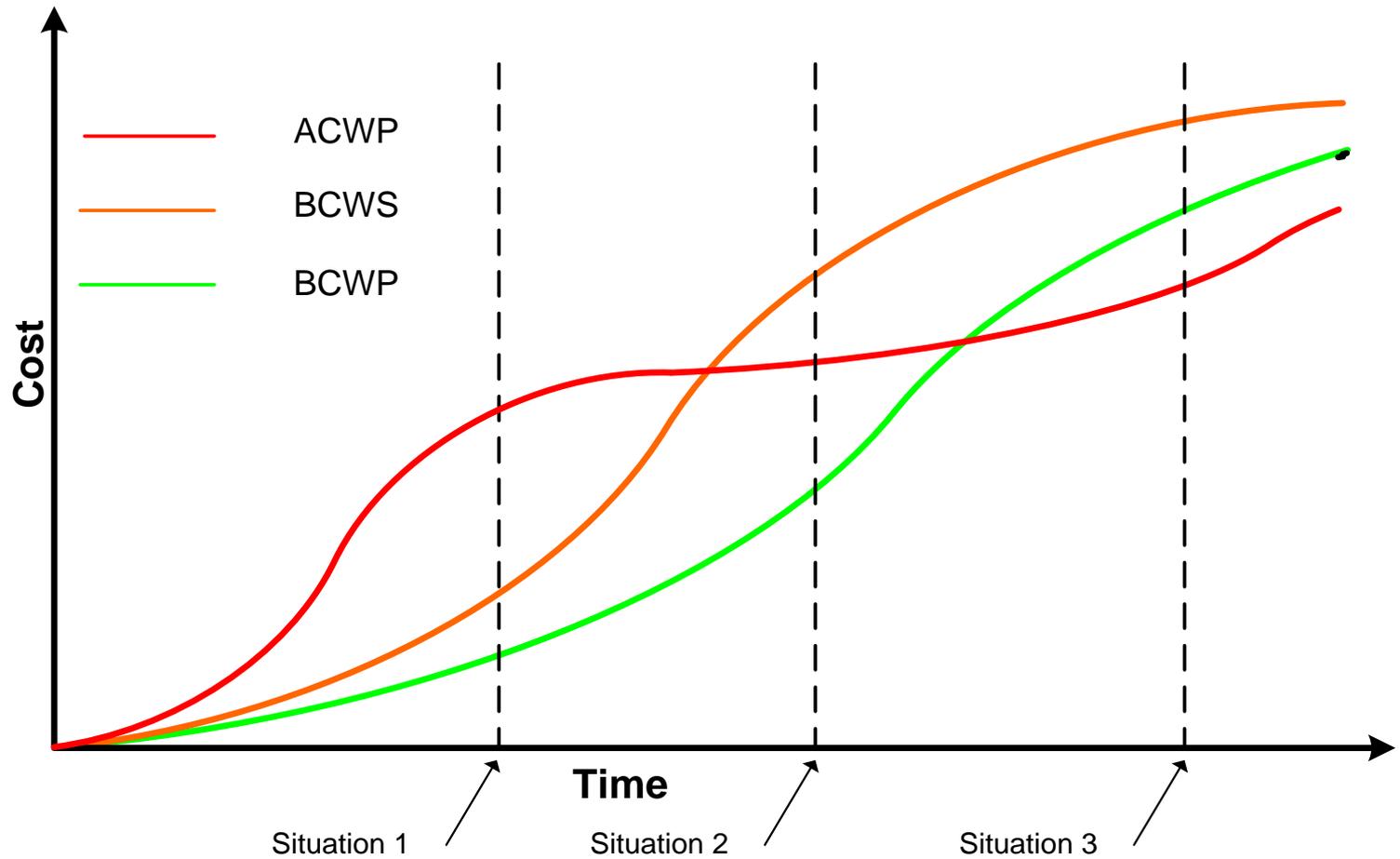
SPI - Schedule Performance Index

⊙ **SPI (Schedule Performance Index) –** It is the ratio between the earned value (BCWP) and the planned value as in the baseline (BCWS). SPI shows the conversion ratio of the planned value into earned value.

⊙ If SPI is less than 1, it indicates that the project is being performed in a conversion rate less than it was expected.

$$SPI = \frac{BCWP}{BCWS}$$

CPI – Cost Performance Index

- **CPI (Cost Performance Index) –** It is the ratio between the earned value (BCWP) and the actual cost (ACWP). CPI shows the conversion of the actual incurred costs and their equivalent earned value in a given time frame.

- If CPI is less than 1, it indicates that the project is expending more than it was foreseen.

$$CPI = \frac{BCWP}{ACWP}$$

Monitoring the Performance Indexes Over Time

Index

+

1

-

Good > 1

As planned = 1

Bad < 1

1   2   3   4

Time (in months)
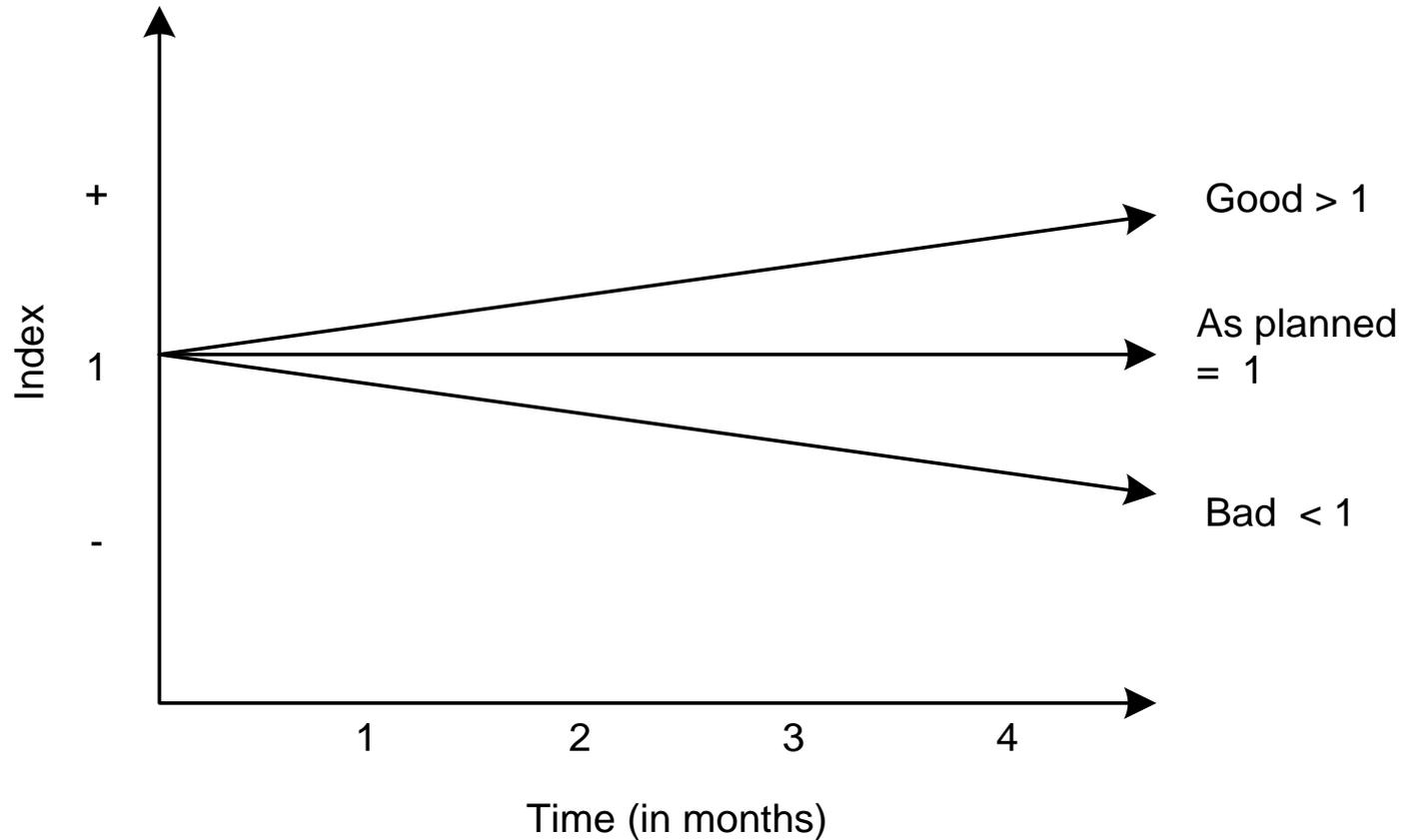
Forecasting

- EAC - Estimated at Completion
- ETC - Estimated to Complete
- PAC – Plan at Completion
- TAC – Time at Completion
- DAC – Delay at Completion

EAC (Estimated at Completion)

⊙ ***EAC (Estimated at Completion) –*** Monetary value that represents the project's final cost when the project finishes. It includes the incurred costs so far (ACWP) plus the estimated remaining costs (ETC).

$$EAC = ACWP + ETC$$

ETC (Estimated to Complete)

- ***EAC (Estimated at Completion) –*** Monetary value that represents the project's final cost when the project comes to an end. It includes the incurred costs so far (ACWP) plus the estimated remaining costs (ETC).

$$EAC = ACWP + ETC$$

ETC (Estimated to Complete)

- ETC Less sensible

$$EAC = BAC - BCWP$$

- ETC Traditional

$$ETC = \frac{BAC - BCWP}{CPI}$$

- ETC More sensible

$$ETC = \frac{BAC - BCWP}{CPIxSPI}$$

PAC e TAC

⦿ ***PAC (Plan at completion) –*** It's the project's estimated completion date (baseline project finish)

⦿ ***TAC (Time at Completion) –*** It's the project's estimated completion date. It is calculated as the ration between the foreseen date PAC and SPI.

$$TAC = \frac{PAC}{SPI}$$

RICARDO
VARGAS

DAC Delay at Completion

⦿ ***DAC (Delay at Completion) –*** It is the difference in time units between the project's planned completion date and its foreseen completion date. It is determined by the difference between the initial planned date PAC and the present forecast TAC. DAC is to be regarded as "delay at completion" and not as a time variance.

$$DAC = PAC - TAC$$

EVA com Todos os Elementos
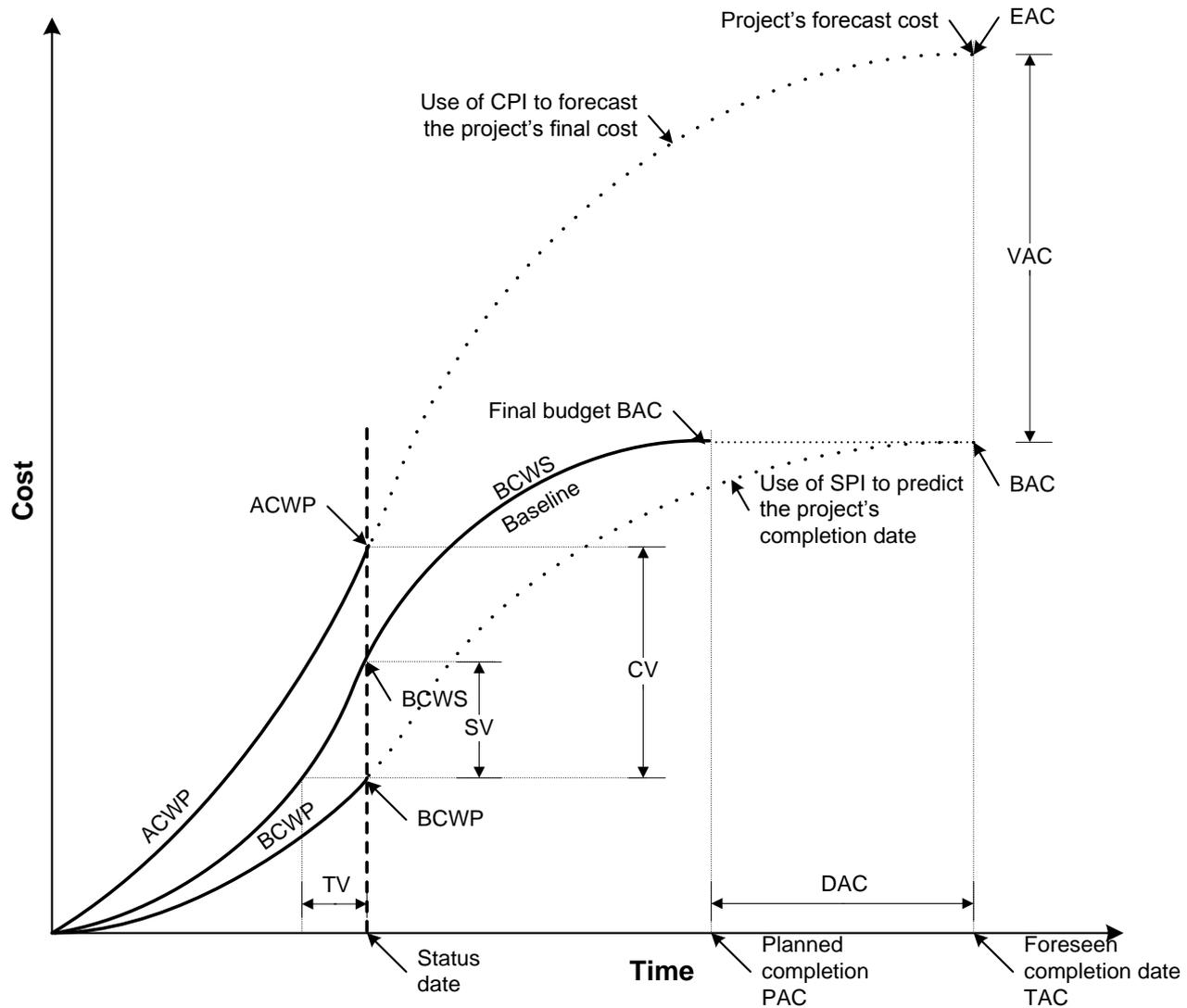
RICARDO VARGAS

Visit
www.ricardo-vargas.com
to access other presentations, podcasts, videos and technical content about project , risk and portfolio management.