# Economic Value Added (EVA)

- The Economic Value Added (EVA) is a measure of **surplus value** created on an investment.
- Define the **return on capital** (ROC) to be the **ìtrueî cash flow return on capital** earned on an investment.
- Define the cost of capital as the **weighted average of the costs of the different financing instruments** used to finance the investment.

EVA = (Return on Capital - Cost of Capital) (Capital Invested in Project)

**Things to Note about EVA**

- **EVA is a measure of** dollar surplus value**, not the** percentage difference **in returns.**
- **It is** closest in both theory and construct to the net present value **of a project in capital budgeting, as opposed to the IRR.**
- The **value of a firm, in DCF terms**, can be written in terms of the EVA of projects in place and the present value of the EVA of future projects.

**DCF Value and NPV**

Value of Firm = Value of Assets in Place + Value of Future Growth

= ( Investment in Existing Assets + $NPV_{Assets\ in\ Place}$) + NPV of all future projects

= ( I + $NPV_{Assets\ in\ Place}$) + $\sum_{t=1}^{t=N} NPV_t$

where there are expected to be N projects yielding surplus value (or excess returns) in the future and I is the capital invested in assets in place (which might or might not be equal to the book value of these assets).

**The Basics of NPV**

$NPV_j = : \sum_{t=1}^{t=n} \frac{(EBIT_t(1-t) + Depr_t)}{(1+WACC)^t} - \text{Initial Investment}$ *Life of the project is n years*

$\text{Initial Investment} = \sum_{t=1}^{t=n} \frac{WACC\ (\text{Initial Investment})}{(1+WACC)^t} + \frac{\text{Initial Investment}}{(1+WACC)^n}$ : *Alternative Investment*

$NPV_j = \sum_{t=1}^{t=n} \frac{(EBIT_t(1-t) + Depr_t)}{(1+WACC)^t} - \sum_{t=1}^{t=n} \frac{WACC\ (\text{Initial Investment})}{(1+WACC)^t} - \frac{\text{Initial Investment}}{(1+WACC)^n}$

$= \sum_{t=1}^{t=n} \frac{EBIT_t(1-t)}{(1+WACC)^t} - \sum_{t=1}^{t=n} \frac{WACC\ (\text{Initial Investment})}{(1+WACC)^t} - \frac{\text{Initial Investment}}{(1+WACC)^n} - \sum_{t=1}^{t=n} \frac{Depr_t}{(1+WACC)^t}$

**NPV to EVA (Continued)**

- **Define** ROC = EBIT (1-t) / Initial Investment: *The earnings before interest and taxes are assumed to measure true earnings on the project and should not be contaminated by capital charges (such as leases) or expenditures whose benefits accrue to future projects (such as R & D).*
- **Assume that** $\frac{\text{Initial Investment}}{(1+WACC)^n} = \sum_{t=1}^{t=n} \frac{Depr_t}{(1+WACC)^t}$: *The present value of depreciation covers the present value of capital invested, i.e, it is a return of capital.*

$$NPV_t = \sum_{t=1}^{t=n} \frac{ROC\ (Initial\ Investment)}{(1+WACC)^t} - \sum_{t=1}^{t=n} \frac{WACC\ (Initial\ Investment)}{(1+WACC)^t}$$

$$NPV_t = \sum_{t=1}^{t=n} \frac{(ROC - WACC)\ (Initial\ Investment)}{(1+WACC)^t} = \sum_{t=1}^{t=n} \frac{EVA_t}{(1+WACC)^t}$$

**DCF Valuation, NPV and EVA**

$$\text{Value of Firm} = (I + NPV_{\text{Assets in Place}}) + \sum_{t=1}^{t=N} NPV_t$$

$$= \left(I_A + \sum_{t=1}^{t=1} \frac{(ROC - WACC)\ I_A}{(1+WACC)^t}\right) + \left[\sum_{t=1}^{t=N} \left(\sum_{t=1}^{t=1} \frac{(ROC - WACC)\ I_t}{(1+WACC)^t}\right)\right]$$

$$= \left(I_A + \sum_{t=1}^{t=1} \frac{(ROC - WACC)\ I_A}{(1+WACC)^t}\right) + \left[\sum_{t=1}^{t=N} \left(\sum_{t=1}^{t=t-1} \frac{(ROC - WACC)\ I_t}{(1+WACC)^t}\right)\right]$$

$$= \left(I_A + \sum_{t=1}^{t=1} \frac{EVA_A}{(1+WACC)^t}\right) + \left[\sum_{t=1}^{t=N} \left(\sum_{t=1}^{t=t-1} \frac{EVA_t}{(1+WACC)^t}\right)\right]$$

In other words,

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Firm Value = Capital Invested in Assets in Place + PV of EVA from Assets in Place + Sum of PV of EVA from new projects

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**A Simple Illustration**

Assume that you have a firm with

$I_A = 100$ In each year 1-5, assume that

$ROC_A = 15\%$ $\Delta$ I = 10 (Investments are at beginning of each year)

$WACC_A = 10\%$ $ROC_{\text{New Projects}} = 15\%$

WACC = 10%

- Assume that all of these projects will have infinite lives.

After year 5, assume that

- Investments will grow at 5% a year forever
- ROC on projects will be equal to the cost of capital (10%)

**Firm Value using EVA Approach**

Capital Invested in Assets in Place = $ 100

EVA from Assets in Place = (.15 - .10) (100)/.10 = $ 50

+ PV of EVA from New Investments in Year 1 = [(.15 - .10)(10)/.10] = $ 5

+ PV of EVA from New Investments in Year 2 = $[(.15 - .10)(10)/.10]/1.1^2$ = $ 4.55

+ PV of EVA from New Investments in Year 3 = $[(.15 - .10)(10)/.10]/1.1^3$ = $ 4.13

+ PV of EVA from New Investments in Year 4 = [(.15 - .10)(10)/.10]/$1.1^4$ = $ 3.76

+ PV of EVA from New Investments in Year 5 = [(.15 - .10)(10)/.10]/$1.1^5$ = $ 3.42

**Value of Firm = $ 170.86**

**Firm Value using DCF Valuation**

| | Base Year | 1 | 2 | 3 | 4 | 5 | Terminal Year |
|---|---|---|---|---|---|---|---|
| EBIT(1-t) from Assets in Place | 15 | 15 | 15 | 15 | 15 | 15 | |
| EBIT(1-t): yr 1 | | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | |
| EBIT(1-t) in yr 2 | | | 1.50 | 1.50 | 1.50 | 1.50 | |
| EBIT(1-t) in yr 3 | | | | 1.50 | 1.50 | 1.50 | |
| EBIT(1-t) in yr 4 | | | | | 1.50 | 1.50 | |
| EBIT(1-t) in yr 5 | | | | | | 1.50 | |
| EBIT(1-t) | | 16.50 | 18.00 | 19.50 | 21.00 | 22.50 | 23.63 |
| - Net Capital Expenditures | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 11.25 | 11.81 |
| FCFF | -10.00 | 6.50 | 8.00 | 9.50 | 11.00 | 11.25 | 11.81 |
| PV of FCFF | -10.00 | $ 5.91 | $6.61 | $7.14 | $7.51 | $6.99 | |
| Terminal Value | | | | | | $236.25 | |
| PV of Terminal Value | | | | | | $146.69 | |
| Value of Firm | $170.85 | | | | | | |

**In Summary**

- Both EVA and Discounted Cash Flow Valuation should provide us with the same estimate for the value of a firm.
- In their full forms, the information that is required for both approaches is exactly the same - expected cash flows over time and costs of capital over time.
- A policy of maximizing the present value of economic value added over time should be the equivalent of a policy of maximizing firm value.

**In Practice: Some Measurement Issues**

- How do you measure the capital invested in assets in place?
  - Many firms use the book value of capital invested as their measure of capital invested. To the degree that book value reflects accounting choices made over time, this may not be true.
  - In cases where firms alter their capital invested through their operating decisions (for example, by using operating leases), the capital and the after-tax operating income have to be adjusted to reflect true capital invested.
- How do you measure return on capital?
  - Again, the accounting definition of return on capital may not reflect the economic return on capital.
  - In particular, the operating income has to be cleansed of any expenses which are really capital expenses (in the sense that they create future value). One example would be R& D.
  - The operating income also has to be cleansed of any cosmetic or temporary effects.
- How do you estimate cost of capital?
  - DCF valuation assumes that cost of capital is calculated using market values of debt and equity.
  - If it assumed that both assets in place and future growth are financed using the market value mix, the EVA should also be calculated

using the market value.

- If instead, the entire debt is assumed to be carried by assets in place, the book value debt ratio will be used to calculate cost of capital. Implicit then is the assumption that as the firm grows, its debt ratio will approach its book value debt ratio.

**Year-by-year EVA Changes**

- Firms are often evaluated based upon year-to-year changes in EVA rather than the present value of EVA over time.
- The advantage of this comparison is that it is simple and does not require the making of forecasts about future earnings potential.
- Another advantage is that it can be broken down by any unit - person, division etc., as long as one is willing to assign capital and allocate earnings across these same units.
- While it is simpler than DCF valuation, using year-by-year EVA changes comes at a cost. In particular, it is entirely possible that a firm which focuses on increasing EVA on a year-to-year basis may end up being less valuable.

**Year-to-Year EVA Changes**

| | *0* | *1* | *2* | *3* | *4* | *5* | *Term. Yr.* |
|---|---|---|---|---|---|---|---|
| EBIT(1-t) | $ 15.00 | $ 16.50 | $ 18.00 | $ 19.50 | $ 21.00 | $ 22.50 | $ 23.63 |
| WACC(Capital) | $ 10.00 | $ 11.00 | $ 12.00 | $ 13.00 | $ 14.00 | $ 15.00 | $ 16.13 |
| EVA | $ 5.00 | $ 5.50 | $ 6.00 | $ 6.50 | $ 7.00 | $ 7.50 | $ 7.50 |
| PV of EVA | | $ 5.00 | $ 4.96 | $ 4.88 | $ 4.78 | $ 4.66 | |
| Terminal Value of EVA | | | | | | $ 75.00 | |
| Value: Assets in Place = | $ 100.00 | | | | | | |
| PV of EVA = | $ 70.85 | | | | | | |
| Value of Firm = | $ 170.85 | | | | | | |

**When Increasing EVA on year-to-year basis may result in lower Firm Value**

1. If the increase in EVA on a year-to-year basis has been accomplished at the expense of the EVA of future projects. In this case, the gain from the EVA in the current year may be more than offset by the present value of the loss of EVA from the future periods.

- For example, in the example above assume that the return on capital on year 1 projects increases to 17%, while the cost of capital on these projects stays at 10%. If this increase in value does not affect the EVA on future projects, the value of the firm will increase.
- If, however, this increase in EVA in year 1 is accomplished by reducing the return on capital on future projects to 14%, the firm value will actually decrease.

**Firm Value and EVA Tradeoffs over Time**

| | *0* | *1* | *2* | *3* | *4* | *5* | *Term. Yr.* |
|---|---|---|---|---|---|---|---|
| Return on Capital | 15% | 17% | 14% | 14% | 14% | 14% | 10% |
| Cost of Capital | 10% | 10% | 10% | 10% | 10% | 10% | 10% |
| EBIT(1-t) | $ 15.00 | $ 16.70 | $ 18.10 | $ 19.50 | $ 20.90 | $ 22.30 | $ 23.42 |
| WACC(Capital) | $ 10.00 | $ 11.00 | $ 12.00 | $ 13.00 | $ 14.00 | $ 15.00 | $ 16.12 |
| EVA | $ 5.00 | $ 5.70 | $ 6.10 | $ 6.50 | $ 6.90 | $ 7.30 | $ 7.30 |
| PV of EVA | | $ 5.18 | $ 5.04 | $ 4.88 | $ 4.71 | $ 4.53 | |
| Terminal Value of EVA | | | | | | $ 73.00 | |

| | |
|---|---|
| Value: Assets in Place = | $ 100.00 |
| PV of EVA = | $ 69.68 |
| Value of Firm = | $ 169.68 |

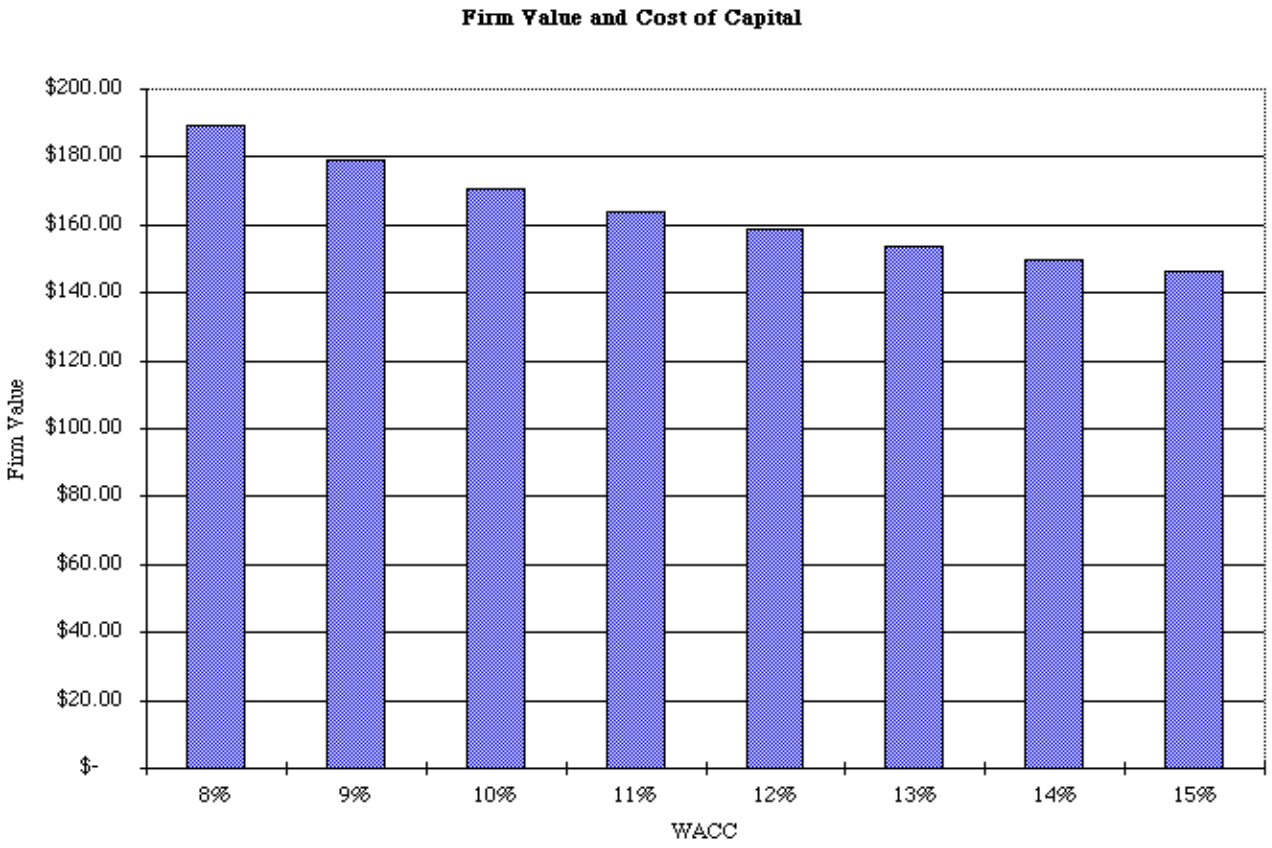
**EVA and Risk**

2. When the increase in EVA is accompanied by an increase in the cost of capital, either because of higher operational risk or changes in financial leverage, the firm value may decrease even as EVA increases.

- For instance, in the example above, assume that the spread stays at 5% on all future projects but the cost of capital increases to 11% for these projects. The value of the firm will drop.

**EVA with Changing Cost of Capital**

| | 0 | 1 | 2 | 3 | 4 | 5 | Term. Yr. |
|---|---|---|---|---|---|---|---|
| Return on Capital | 15% | 16% | 16% | 16% | 16% | 16% | 11% |
| Cost of Capital | 10% | 11% | 11% | 11% | 11% | 11% | 11% |
| EBIT(1-t) | $15.00 | $16.60 | $18.20 | $19.80 | $21.40 | $23.00 | $24.15 |
| WACC(Capital) | $10.00 | $11.10 | $12.20 | $13.30 | $14.40 | $15.50 | $16.65 |
| EVA | $5.00 | $5.50 | $6.00 | $6.50 | $7.00 | $7.50 | $7.50 |
| PV of EVA | | $4.95 | $4.87 | $4.75 | $4.61 | $4.45 | |
| Terminal Value | | | | | | $68.18 | |
| Value of Assets in Place = | $100.00 | | | | | | |
| PV of EVA = | $64.10 | | | | | | |
| Value of Firm = | $164.10 | | | | | | |




## Advantages of EVA

1. EVA is closely related to NPV. It is closest in spirit to corporate finance theory that argues that the value of the firm will increase if you take positive NPV projects.

2. It avoids the problems associates with approaches that focus on percentage spreads - between ROE and Cost of Equity and ROC and Cost of Capital. These approaches may lead firms with high ROE and ROC to turn away good projects to avoid lowering their percentage spreads.

3. It makes top managers responsible for a measure that they have more control over - the return on capital and the cost of capital are affected by their decisions - rather than one that they feel they cannot control as well - the market price per share.

4. It is influenced by all of the decisions that managers have to make within a firm - the investment decisions and dividend decisions affect the return on capital (the dividend decisions affect it indirectly through the cash balance) and the financing decision affects the cost of capital.

## EVA and Market Value Added

- The relationship between EVA and Market Value Added is more complicated than the one between EVA and Firm Value.
- The market value of a firm reflects not only the Expected EVA of Assets in Place but also the Expected EVA from Future Projects
- To the extent that the actual economic value added is smaller than the expected EVA the market value can decrease even though the EVA is higher.

## Implications of Findings

- This does not imply that increasing EVA is bad from a corporate finance standpoint. In fact, given a choice between delivering a "below-expectation" EVA and no EVA at all, the firm should deliver the "below-expectation" EVA.
- It does suggest that the correlation between increasing year-to-year EVA and market value will be weaker for firms with high anticipated growth (and excess returns) than for firms with low or no anticipated growth.
- It does suggest also that "investment strategies"based upon EVA have to be carefully constructed, especially for firms where there is an expectation built into prices of "high" surplus returns.

## When focusing on year-to-year EVA changes has least side effects

1. Most or all of the assets of the firm are already in place; i.e, very little or none of the value of the firm is expected to come from future growth.

[This minimizes the risk that increases in current EVA come at the expense of future EVA]

2. The leverage is stable and the cost of capital cannot be altered easily by the investment decisions made by the firm.

[This minimizes the risk that the higher EVA is accompanied by an increase in the cost of capital]

3. The firm is in a sector where investors anticipate little or not surplus returns; i.e., firms in this sector are expected to earn their cost of capital.

[This minimizes the risk that the increase in EVA is less than what the market expected it to be, leading to a drop in the market price.]

## When focusing on year-to-year EVA changes can be dangerous

- 1. High growth firms, where the bulk of the value can be attributed to future growth.
- 2. Firms where neither the leverage not the risk profile of the firm is stable, and can be changed by actions taken by the firm.
- 3. Firms where the current market value has imputed in it expectations of significant surplus value or excess return projects in the future.
- Note that all of these problems can be avoided if we restate the objective as maximizing the present value of EVA over time. If we do so, however, some of the perceived advantages of EVA - its simplicity and observability - disappear.