Taxation in Korea

I. Depreciation Methods

Depreciation Terminology

Definition: ***Book (noncash) method*** to represent **decrease in value** of a tangible asset over time

Two types: book depreciation and tax depreciation

Book depreciation: used for *internal accounting* to track value of assets

Tax depreciation: used to determine *taxes due* based on tax laws

In Korea, **tax & book depreciation can be calculated using *Straight Line, Declining Balance, and Unit-of-production Methods***

In Korea, **Salvage values are assumed to be 0**

Straight Line Depreciation

➟ **Book value decreases *linearly with time***

$$D_t = \frac{P - S(=0)}{n}$$

Where: D_t = annual depreciation charge
t = year
P = first cost or unadjusted basis
S = salvage value **(= 0)**
n = recovery period

$$B_t = P - tD_t$$

Where: B_t = book value after t years

SL depreciation rate is **constant** for each year: $d = d_t = 1/n$

Declining Balance (DB) Depreciation

➡ **Determined by multiplying P at beginning of year *by fixed percentage d***

Book value for year t is given by:

$$B_t = P(1 - d)^t$$

$$\therefore d = 1 - \sqrt[n]{\frac{B_n}{P}}$$

$$= 1 - \sqrt[n]{0.05}$$ ⬅ Assume as if B_n = 5% of P

Where: B_t = Book value for year t
d = uniform depreciation rate
P = first cost or unadjusted basis

Example: Declining Balance

A depreciable construction truck has a first cost of ₩1.0M, 5 years of life. Find the (a) depreciation cost, (b) book value after 3 years using DB depreciation.

Solution:

$$d = 1 - \sqrt[5]{0.05} = 0.4507$$

year	Depreciation Cost	Book Value
0		1,000,000
1	450,720	549,280
2	247,571	301,709
3	135,986	165,723
4	74,694	91,028
5	91,028	-

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II. Corporate Tax Rate

Korea Corporate Tax Rates - 2021

If Taxable Income (TI) is:			
Over, ₩M	But not over, ₩M	Tax is, ₩M and %	Of the amount over, ₩M
0	200	10%	0
200	20,000	20 + 20%	200
20,000	300,000	3,980 + 22%	20,000
300,000	No limit	65,580 + 25%	300,000

- Income tax rates are ***graduated*** or ***progressive*** as TI increases
- Each rate is the ***marginal tax rate*** for the TI range

- **Residence tax : 10% will be added**
- **5 years of carry-forward (deficit)**
- **Income deductions & exemptions by corporate tax law**

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III. After-Tax Economic Analysis

Tax Terms and Relations - Corporations

- Gross Income ***GI*** or operating revenue ***R*** -- Total income for the tax year realized from all revenue producing sources including salvage value

- Operating expenses ***OE*** -- All annual operating costs (AOC) and maintenance & operating (M&O) costs incurred in transacting business; these are tax deductible; depreciation and interests not included here

- Income Taxes and tax rate ***T*** -- Taxes due annually are based on taxable income *TI* and tax rates, which are commonly **graduated** (or **progressive**) by TI level.

Taxes = tax rate × taxable income
= *T* × (GI – OE – D – I)

Depreciation Cost

Interests

- Net operating profit after taxes ***NOPAT*** – Money remaining as a result of capital invested during the year; amount left after taxes are paid.

NOPAT = taxable income – taxes = TI – *T* × (TI)
= TI × (1 – *T*)

Income Tax Terms and Relations (Corporations)

Income taxes are real cash flow payments to governments levied against income and profits. The allowances of asset depreciation (noncash) and interests paid (cash) are used in income tax computations.

Two fundamental relations: NOI and TI

Net operating income = gross revenue – operating expenses

$$NOI = GI - OE$$ *(only actual cash involved)*

NOI is also call **EBIT(DA)** (earnings before interest and taxes)

Taxable income = gross revenue – operating expenses

– depreciation – interests paid

$$TI = GI - OE - D - I$$

(involves noncash item)

Note: All terms and relations are calculated for each year t, See Table 9-6 in Text material

Cash Flow After Taxes (CFAT)

- NCF is cash inflows – cash outflows. Now, **consider taxes and deductions**, such as **depreciation and interests paid**
- Cash Flow Before Taxes (CFBT)

CFBT = gross income – expenses – initial investment + Salvage

= GI – OE – P + S

- Cash Flow After Taxes (CFAT)

CFAT = CFBT – taxes

= GI – OE – P – (GI – OE – D – I)(T_e) + S

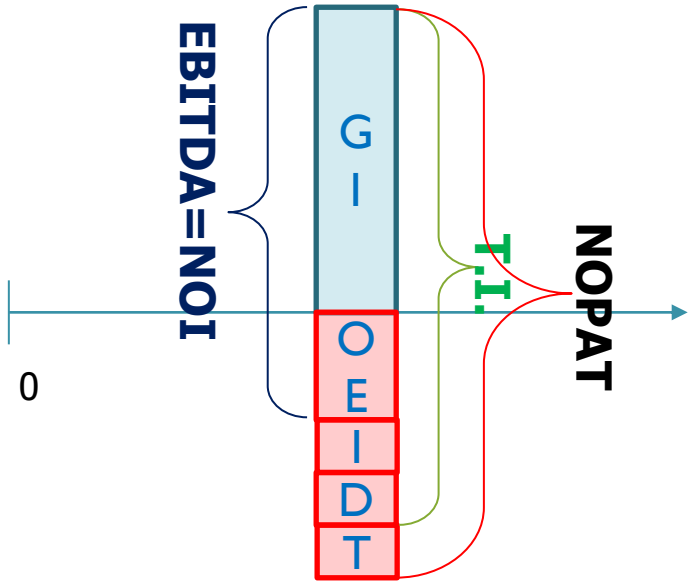
since **NOPAT=(GI – OE – D – I) – (GI – OE – D – I)(T_e)**

= (NOPAT + D + I) – P + S

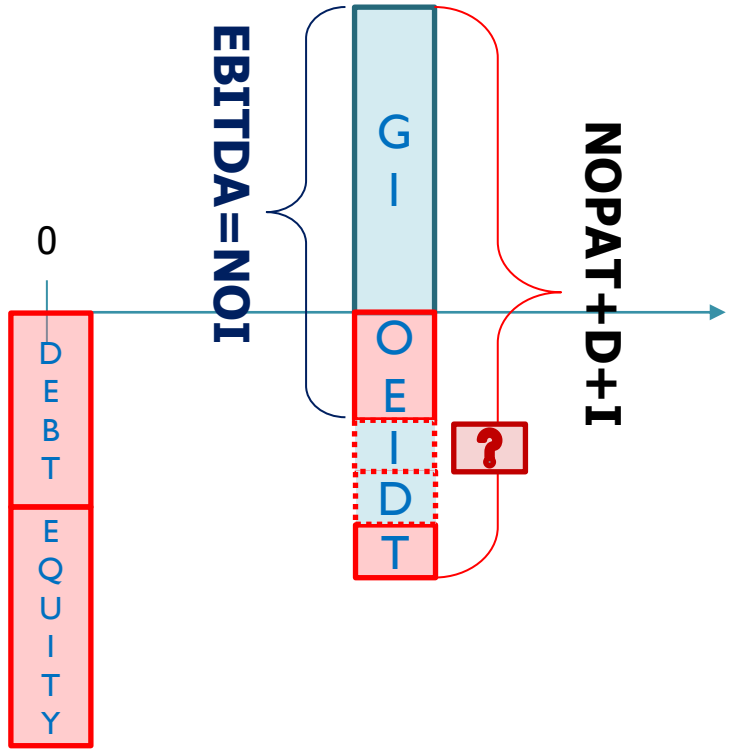
A **negative TI** value is considered a **tax savings** for the project

Income Statements vs. Cash Flow

- Income Statements



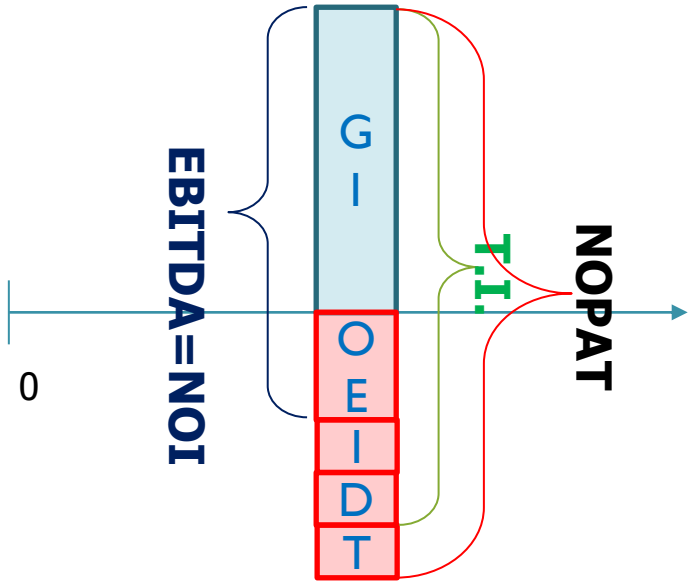
- Project View Cash Flow(ROI)



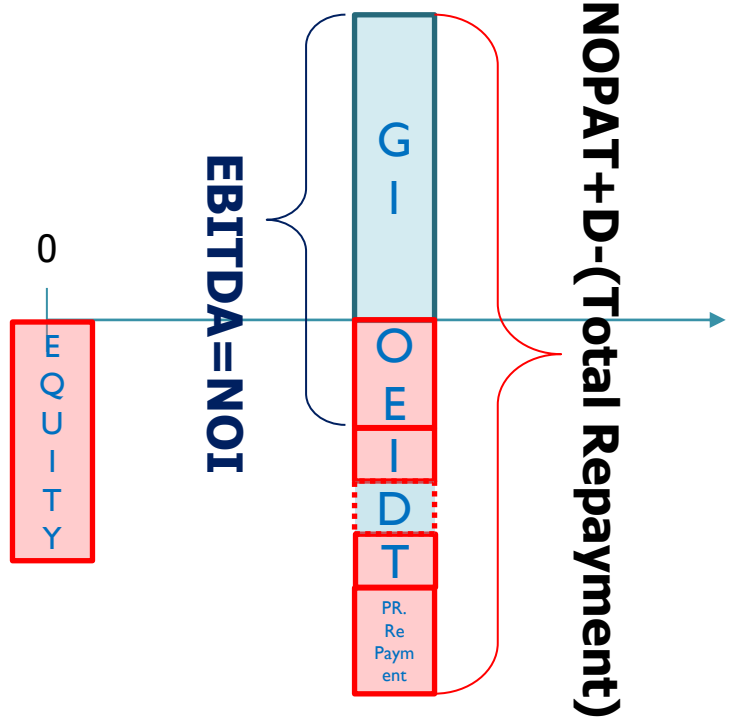
See Table 9-6 in Text Material

Income Statements vs. Cash Flow

- Income Statements



- Stockholder View Cash Flow (ROE)



After-Tax ROE and ROI Calculation

- **ROI** is rate of return on investment(or Project)

= GI – OE – P(Total Money) – Tax

= – P(Total Money) + EBITDA (Earning Before Interest, Tax, and Depreciation & Amortization) – Tax

= – P(Total Money) + NOPAT + Depreciation + Interest

- **ROE** is rate of return on equity

= GI – OE – P(My money) – Tax – Amount of Repayment(Total)

= – P(My Money) + NOPAT + Depreciation – Total Repayment

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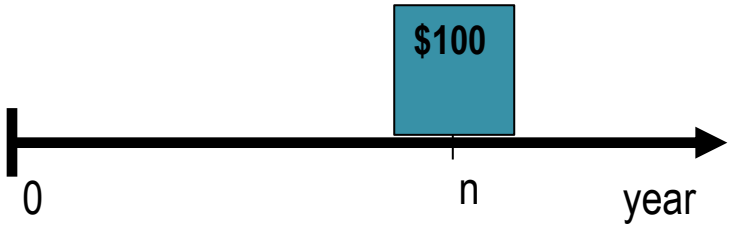
IV. Inflation

Actual $ vs. Constant $

- **Actual $** : expressed in the amount of **$ bills** that you are expected to have at year n
- **Constant $** : expressed in the amount of **purchasing power** as of year 0 that you are expected to have at year n

$100(Actual)



$100(Constant)

+

Constant $

Could be purchased with $100 at year 0

Convert

+

Conversion from Constant $ to Actual $

(Inflation, f = 5%)

Period	NCF **Constant $**	Conversion Factor	NCF in **Actual $**
0	-$250.00	(1+0.05)^0	-$250.00
1	$100.00	(1+0.05)^1	$105.00
2	$100.00	(1+0.05)^2	$110.25
3	$100.00	(1+0.05)^3	$115.76
4	$100.00	(1+0.05)^4	$121.55
5	$100.00	(1+0.05)^5	$127.63

Understanding Inflation

Inflation: Increase in amount of money needed to purchase *same amount of goods or services.* Inflation results in a ***decrease in purchasing power,*** *i.e., one unit of money buys less goods or services*

Two ways to work problems *when considering inflation:*

(1) Convert to constant value (CV) dollars, then use real rate *i*

If *f* = inflation rate (% per year), the equation is:

$$\text{Constant \$} = \frac{Actual\ \$}{(1+f)^n}, \quad \therefore \text{PV} = \frac{Constant\ \$}{(1+i)^n} = \frac{Actual\ \$}{(1+f)^n \times (1+i)^n}$$

(2) Leave money amounts ***as is*** and use ***interest rate adjusted for inflation,*** $i_f = i + f + (i)(f)$, $\therefore \text{PV} = = \frac{Actual\ \$}{(1+i+f+i \cdot f)^n}$

Example: Constant Value Dollars

How much would be *required today* to purchase an item that increased in cost by exactly the inflation rate? The cost 30 years ago was $1000 and inflation has consistently averaged 4% per year.

Solution: Solve for future dollars

$$\text{Future dollars} = \text{constant value dollars}(1 + f)^n$$
$$= 1000(1 + 0.04)^{30}$$
$$= \mathbf{\$3,243}$$

Note: This calculation only accounts for the *decreased purchasing power of the currency*. It does ***not*** take into account the ***time value of money***

Deflation: Opposite of inflation; purchasing power of money is *greater* in future than at present; however, money, credit, jobs are 'tighter'

Three Different Rates

- Real or inflation-free rate ***i*** – Rate at which interest is earned when *effects of inflation are removed*; *i* represents the real increase in purchasing power

- Market or inflation-adjusted rate i_f – Rate that *takes inflation into account.* Commonly stated rate everyday

- Inflation rate ***f*** – Rate of *change in value of currency*

Relation between three rates is derived using the relation

$$P = F\frac{1}{(1+i_f)^n} = F(P/F,i_f,n)$$

Market rate is: $i_f = i + f + (i)(f)$

Example: PW with Inflation

A honing machine will have a cost of $25,000 (future cost) six years from now. Find the PW of the machine, if the real interest rate is 10% per year and the inflation rate is 5% per year using (a) constant-value dollars, and (b) future dollars.

Solution: (a) Determine *constant-value* dollars and *use i* in PW equation

$$\mathbf{CV} = 25{,}000 / (1 + 0.05)^6 = \$18{,}655$$

$$\mathbf{PW} = 18{,}655(P/F,10\%,6)$$
$$= \$10{,}530$$

(b) Leave as future dollars and *use* i_f in PW equation

$$\mathbf{i_f} = 0.10 + 0.05 + (0.10)(0.05) = 15.5\%$$

$$\mathbf{PW} = 25{,}000(P/F,15.5\%,6)$$
$$= \$10{,}530$$

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V. Examples

Examples without inflation(Ex10-5)

Seoultech(Co) considering to invest a 5-years' $10M(Initial Asset Investment)-project where $1M will be funded by equity and $9M by debt financing. The EBITDA of the project is estimated as $3M per year, and no salvage value is expected. Tax rate is assumed to be 40%, and Straight Line depreciation be applied. Interest rate for debt financing is 10% per year, and equal amounts of repayment are scheduled during 5 years.

a) Calculate After-tax ROI assuming no debt financing
b) Calculate After-tax ROI with debt financing
c) Calculate After-tax ROE with debt financing

Examples with inflation(Ex. 11-6)

Seoultech(Co) considering to invest a 4-years' $10M-(Initial Asset Investment)-project. The EBITDA of the project is estimated as $4M per year(as of present's constant dollar value), and no salvage value is expected. Tax rate is assumed to be 40%, and Straight Line depreciation be applied. Inflation rate is forecasted as 20% per year.

a) Calculate Before-Tax ROI with or without inflation
b) Calculate After-tax ROI assuming no inflation
c) Calculate After-tax ROI with inflation
d) Assume $1M by debt financing with 10% of interest rate for equal amount of repayment. Calculate After-tax ROE with inflation

Example 3. S Co. is planning to launch a new business in an attempt to increase operational margin in these depressed markets. This business requires 500billion won each in the beginning of the starting two years. The first 500 billion won (2022.1.1) which is coming from the earned surplus can be considered as an operational cost, while the 500 billion won (2023.1.1) in the next year, an acquisition cost(10 years of declining balance of depreciation with no salvage value), is to come from a debt financing by 5% interest rate with equal payment for 10 years.

The new service in this business is to be offered from new years day in 2023. Number of subscribers is forecasted as 500,000 at the starting year and will be increased by 100,000 each year until it reaches 1Million and stays there. ARPU (Average Revenue Per User) is estimated as 20,000won each month, and operational expense, as 10% of the revenue excluding the depreciation cost.

Assume that revenue and expenses occur at the end of each year. Tax rate is 35% of the taxable income.

1) Calculate the depreciation cost in each year.
2) Calculate the interest payment in each year
3) How much is the after-tax-ROI?
4) How much is the after-tax-ROE?
5) If the inflation rate is 5% per year, How much is the after-tax-ROI? Assume that all the price is current price.