Finance Notes by Dr. J. Kashefi

 **BREAK-EVEN ANALYSIS** **and IMPACT of** **LEVERAGE**

The relationship between sales volume (revenue) and profitability under different operating conditions provides information to managers so they may plan for changes in the firm' s level of operations, financing needs, and profitability.

Operating breakeven analysis deals only with the upper portion of the income statement--the portion from sales to net operating income (NOI), or earnings before interest and taxes (EBIT). This portion generally is referred to as the operating section, because it contains only the revenues and expenses associated with the normal production operations of the firm.

 **INCOME STATEMENT**

SALES P x Q

less: VARIABLE COST (v x Q)

less: FIXED COST (F)

EBDIT (P-v)Q - F Equation (1)

Less: Depreciation (Dep)

EBIT (P-v)Q - F - Dep Equation (2)

less: Interest payment (I)

EBT (p-v)Q -F - Dep - I Equation (3)

Less: TAX= t% -t[(P-v)Q -F- Dep - I]

EAT [(P-v)Q - F - Dep - I](1 - T)

Plus: Depreciation +Dep

Cash Flow [(P-v)Q -F - Dep - I](1 -T) + Dep Equation (4)

**OPERATING BREAK-EVEN POINT**

 ***Operating breakeven analysis***is a method of determining the point at which sales will just cover operating costs--that is, the point at which the firm's operations will break even--but it also shows the magnitude of the firm's operating profits or losses if sales exceed or fall below that point.

A firm's operating breakeven point can be calculated algebraically in terms of units or total dollar sales. The operating breakeven quantity in units is defined as the units of output at which total revenues are equal to total operating costs (fixed costs plus variable costs) Let P = price per unit, F = fixed costs, and v = variable cost per unit, then by setting equation (1) equal to zero, we have:

EBDIT = (P -V)Q -F =0,



The breakeven sales volume, SBE , can be calculated as:



Operating breakeven analysis can shed light on three important types of business decisions:

1. It can help determine how large the sales of a new product must be to achieve profitability.
2. It can be used to study the effects of a general expansion in the level of the firm's operations.
3. It can help management analyze the consequences of modernization and automation projects.

**ACCOUNTING BREAK-EVEN POINT**

Firms that have fixed costs which include a large amount of noncash expenses often find it useful to compute the ***Accounting operating breakeven point****.* The accounting operating breakeven point, QABE, is calculated by setting equation (2) equal to zero:

 EBIT = (P -v)Q -F - Dep =0, then



**FINANCIAL BREAK-EVEN**

Financial breakeven analysis is a method of determining the operating income, or EBIT, the firm needs to just cover all of its financing costs and produce earnings per share equal to zero.

Financial breakeven analysis deals with the lower portion of the income statement--the portion from operating income (EBIT) to earnings available to common stockholders.

* The lower portion of the income statement is generally referred to as the financing section, because it contains the expenses associated with the financing arrangements of the firm. If we set equation (3) equal to zero, we have:

EBT = (P - V)Q -F - Dep - I = 0, then  **EBITBE = I**

* The amount of preferred dividends must be stated on a before-tax basis to determine the financial breakeven point. However, if a firm has no preferred stock the firm only needs to cover its interest payments, so the financial breakeven point simply equals the interest expanse.
* Financial breakeven analysis can be used to help determine the impact of the firm's financing mix on the earnings available to common stockholders.

**OVERALL BREAK-EVEN POINT**

The overall break-even quantity can be calculated when Cash flow is set equal to zero, that is, CF = 0, then 

**PRESENT VALUE BREAK-EVEN POINT:** The formula for calculating NPV is as follows:



If NPV = 0, then



where C0 /(PVIFA r, T) is the equivalent annual cost (EAC).

Comparison of the operating, accounting, and overall operating breakeven points can provide useful information about the firm' s flow of funds from operations.

**ANALYSIS and IMPACT of LEVERAGE**

**1. Operating Leverage**

If fixed operating costs are presented in the firm’s cost structure, operating leverage results.

High fixed costs arise from employing larger amounts of capital, thus permitting the firm to operate with reduced labor and smaller variable costs.

A high degree of operating leverage means that a relatively small change in sales will result in a relatively large change in operating income.

The ***degree of operating leverage*** *(DOL)* measures the effect of a change in sales volume on earnings before interest and taxes (EBIT). It is defined as the percentage change in EBIT associated with a given percentage change in sales:



The degree of operating leverage can also be stated in terms of sales revenue, DOLS:



* The higher the degree of operating leverage, the more profits will fluctuate, in both an upward and a downward direction, in response to changes in sales volume.
* The closer a firm is to its operating breakeven point, the greater is its degree of operating leverage.
* It generally can be concluded the higher the DOL for a particular firm, the closer the firm is to its operating breakeven point, and the more sensitive its operating income is to a change in sales volume.
* Firms with higher DOLs generally are considered to have riskier operations than firms with lower DOLs.
1. **Financial leverage**

Financial leverage considers the impact changing operating income has on earnings per share, or earnings available to common stockholders.

Financial leverage takes over where operating leverage leaves off, further magnifying the effects on earnings per share of changes in the level of sales. For this reason, operating leverage sometimes is referred to as first-stage leverage and financial leverage is referred to as second-stage leverage.

* The ***degree of financial leverage*** *(DOFL)* is defined as the percent change in EPS that results from a given percent change in EBIT, and it is calculated as:



* To find the effects on income available to common stockholders, multiply the percentage change in EBIT by DOFL. The greater the degree of financial leverage, the greater the impact of a given change in EBIT on EPS.
* The higher the DOFL for a particular firm, then it generally can be concluded the closer the firm is to its financial breakeven point, and the more sensitive its EPS is to a change in operating income.
* Firms with higher DOFLs generally are considered to have greater financial risk than firms with lower DOFLs.

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**3. Degree of total leverage (DTL)** combines DOL and DOFL.

The ***degree of total leverage*** *(DTL)* is defined as the percent change in EPS resulting from a change in sales volume.

The Degree of total leverage (DTL**)** combines DOL and DOFL, and this relationship between DOL and DOFL can be written as:

DTL = DOL x DOFL

This equation can be rewritten as:



DTL can be used to compute the new earnings per share (EPS projected) after a change in sales volume:

**EPS projected = EPS [1 + (%  Sales)(DTL)].**

* DTL is useful primarily for the insights it provides regarding the joint effects of operating and financial leverage on earnings per share.
* The forecasting (planning) and control of the firm is an ongoing activity, a vital function to the long-run survival of any firm.
* If projected operating results are unsatisfactory, management can reformulate its plans and develop more reasonable targets for the coming year.
* If the funds required to meet the sales forecast cannot be obtained, the projected level of operations can be scaled back.
* It is desirable to plan for the acquisition of funds well in advance.
* Any deviation from projections needs to be dealt with to improve future forecasts and the predictability of the firm's operations to ensure the goals of the firm are being pursued appropriately.

