ENGR 401 Professional Practice

FINANCE FOR ENGINEERS III

BREAK-EVEN AND RATIO ANALYSIS

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What Does Your Budget Look Like?

Review: Fixed and Variable Expenses

Fixed expenses

- are constant and/or known for the budget period.

Variable expenses

- are unpredictable or depend on external factors.

When budgeting, it's good to know the break-even point.

Break-even Analysis

The break-even analysis determines the break-even point (a.k.a. BEP). Applicable to almost every situation (even personal finances)

- The point where revenue equals expenditure
- Revenue above the BEP is *profit*
- Revenue below the BEP is *loss*
- Increases in fixed or variable costs will move the BEP upward, and *vice versa*

Break-even Point Equation

The basic financial variables are:

C_f : Fixed costs

C_v : Variable costs (per unit)

N : Number of units

P : Price per unit

BEP is where total costs = total revenues

What is the general equation for the BEP in terms of the variables above?

Break-even Point Equation

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C_f : Fixed costs

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P : Price per unit

BEP is where total costs = total revenues

Total Cost = $C_f + (N \times C_v)$ **Total Revenue** = $(N \times P)$

BEP Equation: $C_f + (N \times C_v) = (N \times P)$

Break-even Point Equation

The equation $C_f + (N \times C_v) = (N \times P)$ can now be used to calculate various quantities:

- Total revenue BEP given costs and unit volume
- Unit volume BEP given costs and unit price
- Cost BEP given unit volume and price

Break-even Analysis

You've decided to start your own side-business writing Android apps.

Your overheads are low, but you do want a reasonable return on your time… otherwise you might as well get a part-time job!

You work consistently and have factored your development time into your fixed costs.

On the next sheet, we will calculate:

a) The BEP for app price selling on the Google Play Store.
b) The BEP for sales volume if you charge a particular price.
c) The maximum fixed costs you can sustain (i.e. your salary plus other fixed costs) if your app sells a number of units at a particular price

Break-even Analysis

Given basic costs:

C_f = \$9,000

C_v = \$1.53 per sale*

calculate:

a) The BEP for app price if you sell 10,000 units on the Google Play Store.

b) The BEP for sales volume if you set your app price at \$2.99.

c) The maximum fixed costs you can sustain (i.e. your salary plus other fixed costs) if your app sells 4,000 units at \$1.99

* Actual costs may vary, see: https://support.google.com/googleplay/android-developer/answer/112622

The Fundamental Accounting Equation

This equation is the foundation of the double-entry bookkeeping system:

$$\text{Assets} = \text{Liabilities} + \text{Capital}$$

or, equivalently

$$\text{Assets} - \text{Liabilities} = \text{Stockholder's Equity}$$

These are statements of *accounting philosophy* not *natural philosophy*.

This equation underpins the concept of the balance sheet.

Ratio Analysis

Benefits:

- Provides a quick measure of business performance, and
- an indication of trends over time.

Limitations:

- Only available (meaningfully) for historical data
- Business condition can change rapidly within the current period.

Ratio Analysis: Return on Equity

Provides a measure of the return on your monetary investment into the business.

$$\text{Return on Equity} = \frac{\text{Net profit after tax}}{\text{Total Equity}}$$

Example: for Total Equity $100k and Net profit after tax $4.5k, the Return on Equity is 4.5%

A satisfactory Return on Equity should be greater than the bank interest rate for term deposits!

Ratio Analysis: Working Capital Ratio

Provides a measure of the ability of the business to meet its short-term financial commitments.

$$\text{Working Capital Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

Example: for Current Assets $550k and Current Liabilities $220k, the Working Capital Ratio is 2.5

As a rough rule, a ratio of 2:1 indicates a healthy business state. This ratio may fluctuate, depending on cash cycles in the business.

Ratio Analysis: Proprietorship Ratio

Provides a measure of the degree of capitalisation of the business by the owners/shareholders.

$$\text{Proprietorship Ratio} = \frac{\text{Total Equity}}{\text{Total Assets}}$$

Example: for Total Equity $125k and Total Assets $330k, the Proprietorship Ratio is 37%

A low ratio indicates an *undercapitalised* business, which is a risk. The shareholders should have an appropriate stake relative to creditors; a rough rule is a 40% proprietorship ratio is the minimum desirable.

Ratio Analysis: Expenses to Sales

Provides a measure of the profitability, the marginal expense rate for each sale.

$$\text{Expenses to Sales} = \frac{\text{Total Expenses}}{\text{Total Sales}}$$

Example: for Total Expenses $25k and Total Sales $900k, the Expenses to Sales Ratio is 2.7%

Most useful for estimating future expenses or as a trend indicator to catch rising expenses which might be otherwise hidden in the financial statements.

Ratio Analysis: Net Profit to Revenue

Provides a direct measure of the profitability of the business, the profit per unit revenue.

$$\text{Net Profit to Revenue Ratio} = \frac{\text{Total Net Profit}}{\text{Total Revenue}}$$

Example: for Total Net Profit $4.5k and Total Revenue $1,050k, the Net Profit to Revenue Ratio is 0.4%

Most useful as a trend indicator to catch falling profits over time.

Net Profit to Revenue Ratio should typically increase with time (if prices are held constant) because costs increase with time.

Ratio Analysis: Real Companies

In your pods, make some quick ratio analysis for your company of interest.

Return on Equity = $\frac{\text{Net profit after tax}}{\text{Total Equity}}$

Working Capital Ratio = $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

What does this tell you?

Proprietorship Ratio = $\frac{\text{Total Equity}}{\text{Total Assets}}$

Expenses to Sales = $\frac{\text{Total Expenses}}{\text{Total Sales}}$

Net Profit to Revenue Ratio = $\frac{\text{Total Net Profit}}{\text{Total Revenue}}$