METHODS USED IN ASSESSING THE SENSITIVITY OF PROFIT

Abstract. The use of econometric methods is extremely useful in assessing the sensitivity of profit. In the case of determining the break-even point for non-linear dependency and the break-even point under conditions of uncertainty, the average value of the financial result is a function of average sales volume, while the standard deviation of earnings depends on the standard deviation of sales. To determine the probability of achieving the break-even point, and the probability of realizing a profit at a certain level, it is necessary to standardize the financial result. In the case of determining the degree of operational and financial leverage, in the realm of dynamic indicators rating changes in sales revenue, operating profit, gross profit, net income, EPS and ROE, are used. In the case of static rates of leverage, the value of quotients are determined before and after, taking into account operational and financial risks. In assessing the positive effects of financial leverage, it is important - the effective cost of debt is lower Return on Assets and Earning before Interest and Tax levels above the limit of the operational EBIT * defined as the result of interest-rate debt times total capital. It is very important to use leverage in management and planning. Knowing the degree of financial and operational leverage, as well as planning an increase or decrease in production, we can calculate the percentage increases and decreases in individual results and the changes in the rate of return on equity.

Key words: sensitivity of profit, break-even point, the sphere of security - margin of safety, operating leverage, financial leverage, total leverage, econometric methods.

1. INTRODUCTION

Many econometric models are applied to economics. Econometrics uses the tools of mathematics, statistics and computer science to study the quantitative relationships between phenomena and economic variables. The objective of econometrics is an empirical analysis of economic theory, the prediction of economic processes and the provision of evidence for control of these processes. The basic tool for doing this is the econometric model.

Yet, econometrics should also be distinguished from mathematical economics, which uses the economic analysis of mathematics. Econometrics is frequently used in applied econometrics, and is associated with forecasting, simulation and formal modeling.¹

Econometric models can be divided according to different criteria:

a) in terms of the number of explanatory variables:
   • models with one explanatory variable,

• models with many explanatory variables,

b) in terms of the number of variables expounded:
• models with one explanatory variable,
• models with many explanatory variables,

c) in terms of the interpretation of the explanatory variables:
• models of cause and effect, in which all the explanatory variables can be regarded as the cause of formation of the dependent variable (for example, the model dependence of the cost of production),
• symptomatic models in which there is no direct cause-effect relationship, but there are variables that are symptoms of some difficult to observe or unobservable phenomena, which causes response variable,
• models of development trend, i.e. trends in which the only explanatory variable is the time variable (usually denoted by \( t \)),
• autoregressive, where among the explanatory variables, we can distinguish an explanatory variable in the past,

d) in terms of the analytical form:
• linear models (where the relationship between the response variable and explanatory variables is linear),
• nonlinear models (when the relationship takes the form of non-linear, for example; hyperbole, parabola, etc.),

e) in terms of the inclusion of the time factor:
• dynamic models where there is a time variable or where there are time-delayed variables,
• static models, i.e. models that are not dynamic.

Econometric methods are very useful in analyzing and determining the break-even point and the use of operational and connected leverage. They are used in planning and management of an enterprise.\(^2\)

2. SENSITIVITY OF PROFIT MULTIPLIER – DEFINITION

Sensitivity analysis is an analysis that relies on predicting the result, using the system variables affecting the results. It mainly concerns determining the viability of the sensitivity of

the given undertaking to changes in input parameters of the economic model. It forms an
important tool in reducing the risk of decisions in a market economy, especially on the profit-
ability of investment. The main task of sensitivity analysis is to calculate the a turning point,
which means to evening out the cost of the product sold, with the proceeds from its sale.

This analysis allows calculation the boundary for the application of specific factors that
ensure the achievement of a certain threshold of profitability. It can be used to consider the
potential impact of different price and cost structures that may be associated with different
production systems or operations.

Thus, through sensitivity analysis study, the impact of different factors or a combination
of profitability (profits) for a company, are understood.

It may concern:
• determining the sensitivity of earnings variability in each factor analysis (e.g. with a
multiplier of profit),
• determining the ceiling of each factor analysis, ensuring break-even, i.e. at zero profit-
ability,
• establishing the break-even shifts in response to changes factors in a specific scale in
an isolated manner.

Types of sensitivity analysis:
• Determining the height of the ceiling;
• The margin of safety;
• Operating leverage;
• Financial leverage;
• Total leverage;
• Profit multipliers.3

The most commonly used measures of sensitivity include the so-called profit- earnings
multiples. Income multipliers are a kind of catalysts. Their design is based on the theoretical
concept of flexibility in terms of the scoring functions of relevant factors. 4

You can define the following multipliers:
• prices,
• variable cost of unit
• fixed costs

4 Galazka M., Multivariate assessment of the sensitivity of operating profit as a tool of management accounting,
• sales volume.
In literature on this subject one finds the following formula for the multiplier approach.

Model. 1. Profit multiplier

\[ E_y = \frac{y}{z} \]

where:
- \( y \) – is the unit value of the gain factor (price, unit variable cost or fixed cost per unit),
- \( z \) – is operating profit per unit.


Terms referring to the degree of operating, financial or total leverage are often used in literature, instead of the multiplier concept, when describing sales volume.\(^5\)

### 3. LIMITING THE SIZE AND MARGIN OF SAFETY

Determining the size limit depends on determining the value or size, which at an unchanged level of other factors, will ensure only the break-even point. It is determined for each factor in terms of their absolute or relative (percentage) changes from the real (intended) to the break-even point.\(^6\)

Determines the following size limits:
- Limit on the volume of sales - minimum size (break-even point),
- Limits the sale price - price min,
- Limits the size of costs - max.\(^7\)

**The break-even** point is called point of equalization (BEP). It's the volume of production (sales) at which revenues are equal to total production costs. Assuming that the total costs are the sum of fixed and variable costs, and the sale is the product of price and quantity of goods, we achieve the following:

The sum of variable costs \((V_c)\) is the product of production quantities and unit variable cost \((Q \cdot uvc)\). Fixed costs express the total value of the costs for a given period.\(^8\)

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\(^8\) Nowak E., *Accounting of management …*, pp. 146-153.
Model 2. BEP - quantitative break-even point

\[ p \cdot Q = F_c + Q \cdot uvc \]

hence

\[ Q_{BEP} = \frac{F_k}{p - uvc} \]

where:

- \( p \) - price product,
- \( Q \) - quantity of production (sold),
- \( p - uvc = gm \) - unit gross profit, gross margin,
- \( uvc \) - unit variable cost.


If the amount of production sold is greater than the amount \( Q \) BEP this means that a company may count on operating profits.

Valuable safety margin is calculated by the price and quantity of production or fixed costs divided by the rate of profit in the price of the product.

Model 3. Value (amount) sales in BEP

\[ S(P)_o = c \cdot Q_i \]

\[ S(P) = \frac{F_c}{m/p} \]

where:

- \( m/p \) - is the rate of gross profit in the price of the product.


The price limit can be calculated from two models already converted.

Model 4. Value of price limit

\[ P_l = \frac{Q \cdot uvc + F_c}{Q} ; \quad P_l = \frac{V_c + F_c}{Q} \]

where:

- \( P_l \) - price limit,
- \( Q \) - production quantity of the safety margin,
- \( V_c \) - total variable costs of production sold in the safety margin,
- \( F_c \) - fixed costs,
- \( uvc \) - unit variable costs.

Limiting cost levels is the quotient of the difference of sales revenue, and fixed costs, and the quantity of output sold in the safety margin.

Model 5. Value unit variable cost limited

\[ uvc = \frac{Q \cdot (p - Fc)}{Q} \]

Source: Nowak E., Accounting of management, pp. 246-253.

The level of fixed cost limits can be calculated by the formula below.

Model 6. Value of Fixed cost in BEP

\[ Fc = Q \cdot (p - Vc) \]

Source: Nowak E., Accounting of management, pp. 246-253.

Based on data from the safety margin (BEP) can also designate a safety margin of for revenue - that is, how much a company can reduce its income, and not find itself in the loss zone. This margin of safety can be designated as absolute and relative.

Model 7. Margin of safety in value and presented

\[ Ma = p \cdot Q_p - p \cdot Q_o \]
\[ Mr = \frac{p \cdot Q_p - p \cdot Q_o}{p \cdot Q_p} \cdot 100\% \]

where:

\( Q_p \) - planned or executed volume of production,

\( M_a \) - absolute Margin of safety,

\( Mr \) - Margin of safety presented.

Source: Nowak E., Accounting of management, pp. 246-253.

Therefore, it is now easy to determine the size of the profit from the planned level of production, ensuring the volume of production sold, achieves the planned profit, or its value. ⁹

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Model 8. Quantity an value sales if company planned EBIT

\[ Q_p = F_c + \frac{E_p}{p - \text{uvc}} \]

\[ S_p = p \cdot Q_p \]

\[ S_p = \frac{F_c + E_p}{1 - \frac{\text{uvc}}{p}} \]

where:

\( E_p \) – planned earnings before interest and tax.

Source: Nowak E., Accounting of management, pp. 246-253.

Keep in mind that the lower the acceptable percentage level changes (safety indicator) with respect to a given factor, the greater the degree of its impact on profit - profit that is more responsive (sensitive) to changes in the given factor.\(^{10}\)

Example 1

Limited Liability Company D has assets that are 40% financed by foreign capital earning 13% (interest), production sold in January is 20,000 units, the unit price 20 PLN/unit, uvc is 12.5 PLN/unit and 90,000 PLN fixed costs.

Equity capital is 384,000 and liability is 256,000. Then:

\[ Q_{BEP} = \frac{90,000}{20 - 12.5} = 12,000 \text{ units} \]

\[ S(P)_{o} = 12,000 \text{ units} \cdot 20 \text{ PLN/unit} = 240,000 \text{ PLN} \]

\[ \text{uvc} = \frac{12,000 \cdot 20 - 90,000}{12,000} = 12.5 \text{ PLN/unit} \]

\[ p = \frac{12,000 \cdot 12.5 + 90,000}{12,000} = 20 \text{ PLN/unit} \]

With a planned operating profit of 82,500 the new point of return is:

\[ Q_p = \frac{90,000 + 82,500}{(20 - 12.5)} = 23,000 \text{ units} \]

Then the value of income is equal to:

\[ S(P)p = 23,000 \text{ units} \cdot 20 \text{ PLN/unit} = 460,000 \text{ PLN} \]

\(^{10}\) Nowak E., Costing the company, Ed. Expert, Wroclaw, 2005.
Therefore, the enterprise must achieve sales of 460,000 PLN to achieve EBIT of 82,500 PLN.

Percentage of production capacity should be used so as not to incur losses.

Model 9. The break-even point as a percentage of capacity

\[ PR_q = \frac{Fc \cdot 100}{q \cdot (c - uvc)} \]

where:

\[ q \] - the capacity or the actual sales


If the break-even point is, e.g. 60% of production capacity, this also means that the safety factor is 40%. We assume that the factors are changed at the same scale by 10%, both favorable and unfavorable for the company. The greater the shift in the break-even point, resulting from a change in a particular factor, the greater the sensitivity of the firm to the given factor, and vice versa.

In this case, the sensitivity analysis is meant to determine the break-even point for the optimistic and pessimistic scenario. The study takes into account the combined effect of all factors. To determine the break-even point while taking into account the impact of any changes in the factors used, the following formula is employed.

Model 10. The sensitivity analysis based on the profitability threshold shifts

\[ BEP_{o/p} = \frac{Fc \cdot (1'Fc)}{q \cdot p \cdot (1'p) - q \cdot uvc \cdot (1'uvc)} \cdot 100 \]

where:

\[ BEP_{o/p} \] - break-even point in optimistic (o) or pessimistic (p) conditions,

\[ 'Fc \] - growth rate of fixed costs,

\[ 'p \] - growth of prices of goods,

\[ 'uvc \] - growth in unit variable costs.


Example 2

We want to calculate the break-even point for the quantitative data in Example 1, assuming a 10% increase in prices, unit costs (variable) and fixed costs.
\[ \text{BEP}_p = \frac{90,000 \cdot (1 + 0.1)}{20,000 \cdot 2 \cdot (1 + 0.1) - 20,000 \cdot 12.5 \cdot (1 + 0.1)} = 60\% \]

Production would increase by (60% x 12,000 units) 7200 units, the operator was not in the operational loss zone. So the new point of return is (12,000 units + 7,200 units) 9,200 units.

The break-even point achieved in the production of various (multiple products) is when the sum of fixed costs and variable costs of individual products will be equal to the total sales of the entire assortment.

Model 11. The break-even point in the production of various (multiple products)-property

\[
\sum_{i=1}^{N} Q_i \cdot p_i - \sum_{i=1}^{N} Q_i \cdot uvc_j - Fc = 0
\]

\[
\sum_{i=1}^{N} Q_i \cdot p_i = \sum_{i=1}^{N} Q_i \cdot uvc_j + Fc
\]

\[
Q_{BEP} = \frac{Fc}{\sum_{i=1}^{N} (p_i - uvc_j) \cdot U_i}
\]


The break-even point with non-linear dependency is determined on the basis of the features and functions of total sales revenue. If both functions are second degree functions, they are compared to obtain a quadratic function of profit, which intersects with the axis OX in two locations, defining the zero level of operating profit and the set levels of production sold.  

When calculating the break-even point in conditions of uncertainty, some assumptions must be made. This is fraught with uncertainty, especially in sales. The sales volume is normally distributed with known mean value and the known standard deviation.

\[ ^{11} \text{Ćwiakała – Malys A., Nowak W., Outline of the methodology of financial analysis, ed. UWr, W - w 2005, p. 166.} \]
**Model 12.** The distribution of sales

\[ X \sim N(m_X, s_X^2) \]

where:

- \( m_X \) - average sales volume,
- \( s_X \) - standard deviation of sales volume.


The result will have a normal distribution in falls the form:

**Model 13.** The distribution of result

\[ Z \sim N(m, s) \]

where:

- \( m \) - average earnings (expected value),
- \( m_z = (p_j - uvc)m_X - Fc \)
- \( s \) - standard deviation of earnings,
- \( s = (p - uvc) s_X \)


The financial result has the following form.

**Model 14.** The distribution of financial result

\[ Z \sim N\left( (p_j - uvc)m_X - Fc; s_z^2 = (p_j - uvc)^2 s_X^2 \right) \]


The value of average earnings is a function of average sales volume and standard deviation of earnings depending on the standard deviation of sales.

To determine the probability of achieving break-even and the likelihood of profit, a certain level of standardization should be given to the financial result.\(^{12}\)

**Model 15.** The standardization of financial result

\[ T_0 = \frac{Z_0 - m_z}{s_z} \]


This value indicates how many standard deviations in the financial result are the difference between the assumed level of profit $Z_0$ and its mean value $m$.

The break-even point $Z_0 = 0$, so the formula can be written as a ratio of average earnings (as a result of the expected value) and the standard deviation of this result.

**Model 16. The break-even point when $Z_0 = 0$**

$$T_0 = \frac{0 - m_z}{s_z} = - \frac{m_z}{s_z}$$


Having established the level of earnings and the standardized value of $Z_0$, you can designate two types of probabilities:

- the likelihood of achieving earnings of no more than a certain level of $Z_0$
- the likelihood of achieving financial results greater than the assumed amount of $Z_0$.

The likelihood of achieving a financial result not greater than the set level of $Z_0$ is a value of normal distribution function at the $T_0$ point.

**Model 17. The likelihood of achieving a financial result not greater than the set level of $Z_0$**

$$P(Z \leq Z_0) = F(T_0)$$

Source: mfiles.pl/pl/index.php/break-even, (access: 10.03.2012)

The likelihood of achieving financial results greater than the assumed amount of $Z_0$ is the completion of the previous probability.\(^{13}\)

**Model 18. The likelihood of achieving a financial result greater than the set level of $Z_0$**

$$P(Z > Z_0) = 1 - F(T_0)$$


These two types of probability may affect the achieving, or exceeding, of the break-even point.

4. Operating, Financial and Combined Leverage

Leverage means to obtain an effect on the income of the company (changing the return on equity) as a result of changes in the level of fixed costs or a change in the way of financing assets. Leverage is also a measure of operational and financial risk. We can distinguish between three types of leverage:

- operating;
- financial;
- total.

Operating leverage concerns the structure of assets and their use by the company in creating business value. Any increase in sales volume will more than proportionally increase the profit. An illustration of the impact of sales on the profit level is the degree of operating leverage (DOL). In dynamic terms, it is computed from the increments of the relevant elements of the income statement. In static terms, it is a quotient of the gross margin of the entire production sold, and operating profit (EBIT).\(^{14}\)

Model 19. Degree of operating leverage (approach to dynamic and static)

\[
DOL_d = \frac{\% \Delta EBIT}{\% \Delta S},
\]

\[
DOL_s = \frac{GM}{EBIT},
\]

where:

- \(\% \Delta S\) - percent increase in sales,
- \(\% \Delta EBIT\) - percent increase in operating profit (before interest and tax),
- \(GM\) - gross margin (revenue minus variable costs),
- \(EBIT\) - operating profit.


Operating leverage determines the extent to which one percent change in sales revenue affects the change in operating profit. The degree of operating leverage depends on the profitability of sales, as well as the structure of costs. Operating leverage is used, among others, in forecasting the future performance of a company.

An increase in utilization of manufacturing capacity causes the so-called relative reduction in fixed costs, which gives a more than proportionate change in operating profit.

The phenomenon of financial leverage is associated with the use of external capital in order to increase the efficiency of equity. Positive leverage effect occurs when the progression of the participation of external capital in the financing of the asset, increases the rate of profitability on equity (at a rate of interest on loans acquired less than the profitability of the assets of the business). A measure of changes in return on equity, causing an increase in profit (EBIT) by a certain percentage, is called the degree of leverage. The degree of leverage can be determined dynamically, by using the indicators of the pace of change, or statically.

Model 20. Degree of financial leverage (approach to dynamic and static)

\[ DFL_d = \frac{\% \Delta ROE}{\% \Delta EBIT} \quad ; \quad DFL_d = \frac{\% \Delta netprofit}{\% \Delta EBIT} \]

\[ DFL_s = \frac{EBIT}{EBIT - I} = \frac{EBIT}{EBT} \]

where:
- \( DFL_d \) - financial leverage is determined dynamically,
- \( \% \Delta ROE \) - percentage increase in return on equity,
- \( \% \Delta EBIT \) - percent increase in operating profit,
- \( DFL_s \) - leverage is determined statically,
- \( I \) - interest (financing costs).


The degree of leverage depends on:
- capital structure and size of external capital in financing the assets,
- interest rate of debt,
- the size of profit before interest and taxes.

The use of debt can increase sales revenue compared to what is feasible only through financing with the business’ own funds.

Until the moment when the cost of external capital is lower than the return on assets, the company achieves additional benefits expressed by the increase in return on equity. This phenomenon is referred to as leverage.

The cost of debt for the company is generally less than the cost of equity. Investors, engaging equity, incur a much higher risk on invested capital than the lender, and consequently expect a higher return on capital employed. Additionally, the lower cost of debt in relation to the cost of equity influences the effects of the tax shield. The impact of leverage is possible because the effective cost of debt used is less than the interest payments. They are, in fact, deductible and reduce the income tax base.
Financing of business with debt causes positive effects only to a certain level of debt. Excessive debt burden reduces the company's financial flexibility and increases the risk. Striving for the maximum use of leverage is associated with increasingly higher risk. Excessive levels of external capital may, in fact, result in a loss of control over the company, and sometimes lead to its bankruptcy.\(^\text{15}\)

There also exists a limit on the level of operating profit, called break-even capital. At this level of operating profit, gross profit is independent of the financing structure used. If the level of operating profit is less than the limit, the increased use of debt will reduce the return on equity. Above the profit - operating profitability ceiling, total capital is higher than the cost of credit. The operating profit ceiling can be calculated from the following two formulas.

**Model 21. EBIT limit**

\[
\text{EBIT}^* = I \cdot \frac{N}{N - n}
\]

\[
\text{EBIT}^* = i \cdot \text{Total Capital}
\]

where:

- \(I\) - the amount of interest on debt,
- \(N\) – the number of shares when equity is the only source of funding,
- \(n\) – the number of shares when the sources of financing are equity and debt,
- \(i\) - interest rate debt.


The leverage effect is greater, when higher financing costs are constant, i.e. a greater change in earnings per share (EPS) obtained from one percent change in operating profit (EBIT). However, the financial risk associated with the business is now greater. The closer the degree of leverage is to total capital, the lower the risk of financing the business. The larger the share of total debt in total capital and relatively higher financing costs, the stronger are the multiplier effects of leverage (higher the value of DFL).

If the increase in debt results in a lowering of return on equity, then the so-called ‘financial bludgeon’ phenomenon occurs - the negative effect of leverage. In this case, the profit earned by the debt will be lower than the interest due, which will cost an additional portion of the profits generated by equity, reducing its profitability.

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Financial leverage is used to manage the capital structure of a company. It indicates the effects of income on the changing return on equity, which is obtained due to the changing of the capital structure dependant on the use of external capital.

Both types of leverage can occur together, if at a certain share of the debt the company, there is an increase in production and sales. The leverage effect is the product of the total effects of operating leverage and financial leverage.\(^\text{16}\)

**Model 22 . Degree of total leverage**

\[
DCL = DOL \cdot DFL
\]
\[
DCL = \frac{MB}{EBT}
\]
\[
DCL = \frac{\% \Delta EBT}{\% \Delta S}
\]
\[
DCL = \frac{\% \Delta \text{netprofit}}{\% \Delta S}
\]

where:

DOL - degree of operating leverage,
MB - the gross margin,
DFL - the degree of leverage;
GM - gross margin,
EBT - gross profit (Sales - Variable cost - Fixed cost - Interest),
S - Revenue from sales.


Operating leverage is connected with the structure of assets and its use in the existing conditions of the company. It tests the impact of changes in sales volume on operating profit. Financial leverage tests the impact of growth in operating profit on gross profit, while total leverage, and determines the influence of sales growth on gross profit.

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Knowing the basic levels of leverage distinguished, you can calculate the appropriate level of profit.\(^{17}\)

**Model 23. Process of calculation appropriate of profit with respect degree of operating, financial and total leverage**

\[
\% \Delta EBIT = DOL \cdot \% \Delta S \\
\% \Delta EBT = DFL \cdot \% \Delta EBIT \\
\% \Delta EBT = DTL \cdot \% \Delta S
\]


You can also determine the percentage growth in net profit, earnings per share or increase in return on equity.

Since operating leverage measures the level of operational risk, financial leverage - the level of financial risk, therefore the total leverage tells us about the general risks associated with the activities of the company. Its high and growing rate can be a measure of the decreasing functional security of the company.

Therefore, if leverage measures operational and financial risks - than every fall in production sales, causes more than a proportional decline in operating profit, and an even greater decrease (if using interest-bearing external capital-), in net gross profit, EPS, and ROE.

**Example 3**

Using the data from Example 1, we assume that production sales increased by 15%.

**Table 1. Income statement for the sample Limited Liability Company (before - after changes in income)**

<table>
<thead>
<tr>
<th>No.</th>
<th>Categories</th>
<th>Before the change</th>
<th>After the change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Revenue</td>
<td>400,000</td>
<td>460,000</td>
</tr>
<tr>
<td>2.</td>
<td>Variable cost</td>
<td>250,000</td>
<td>287,500</td>
</tr>
<tr>
<td>3.</td>
<td>Fixed cost</td>
<td>90,000</td>
<td>90,000</td>
</tr>
<tr>
<td>4.</td>
<td>EBIT</td>
<td>60,000</td>
<td>82,500</td>
</tr>
<tr>
<td>5.</td>
<td>Financial cost</td>
<td>33,280</td>
<td>33,280</td>
</tr>
<tr>
<td>6.</td>
<td>EBT</td>
<td>26,720</td>
<td>49,220</td>
</tr>
<tr>
<td>7.</td>
<td>Tax</td>
<td>5,344</td>
<td>9,844</td>
</tr>
<tr>
<td>8.</td>
<td>Net result</td>
<td>21,376</td>
<td>39,376</td>
</tr>
<tr>
<td>9.</td>
<td>ROE</td>
<td>0.056=5.6%</td>
<td>0.1025=10.25%</td>
</tr>
</tbody>
</table>


DOL = 150,000/60,000 = 2.5

Increase revenue by 15% caused an increase in EBIT of 2.5 x 15%, or 37.5%,

DFL = 60,000/26,720 = 2.24

Operating profit up 37.5% resulted in an increase in gross profit and net profit of about

2.24 x 37.5% or by 84%.

DTL = 2.5 x 2.24 = 5.6

Determination of the EBIT ceiling

$EBIT^* = 0.13 \cdot (384,000 + 256,000) = 83,200$

Debt cost is lower than the 13% level rate:

$Cost_d = 13\% \cdot (1 - 19\%) = 10.53\%$

Return on assets (total capital)

$ROA = \frac{82,500 \cdot 100\%}{640,000} = 12.89\%$

Lower cost of Debt from the rate of return on total capital, means the positive effect of the use of debt, or any increase in debt at the same rate, which would increase production, will be associated with an increase in return on equity, or ROE.

If the interest rate on debt would increase to 20%, then

$Cd = 20\% \cdot (1 - 19\%) = 16.20\%$

Financial leverage gives a negative effect. Any increase debt will be associated with a decrease in return on equity.

Knowledge of total leverage is useful, among others, in calculating the impact of planned changes in sales revenue to gross profit. It also helps potential investors form an idea of the future situation of the company, depending on the expected changes in a given industry or market, in which the company operates. It should be remembered that there are a number of assumptions necessary to calculate all the types of leverage.

5. CONCLUSIONS

Therefore, in assessing the sensitivity of profit we use:

- models with one explanatory variable (used e.g. for determining the break-even point and profit sensitivity analysis by setting limits on the size of the sales price, variable costs and fixed costs),
• cause-effect models, in which all explanatory variables can be considered as a cause of formation of the response variable (for example, depending on the model of the cost of production, dependence on operating profit and gross margin from the size of fixed costs in operating leverage or the relationship of gross profit to operating profit and financial costs of leverage),

• linear models occurring where the relationship between the response variable and explanatory variables is linear - visible in cases of straight total costs, variable costs and straight revenue from sales,

• non-linear models (where the relationship takes a non-linear form, for example, hyperbole, parabola, etc.) - the break-even point at non-linear relationships, break-even point in conditions of uncertainty.

• dynamic models in which there is time variable, or where there are time-delayed variables – financial leverage, operating leverage – the dynamic approach is based on increases or decreases in the position of the results,

• static models - operating and financial leverage calculated as a ratio of the income statement.

Econometric and statistical methods are an invaluable tool used in the management and planning. Every financial decision should be supported by previous analysis, which uses multipliers, including operating, financial and combined leverage and the results of the margin of safety.

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METODY WYKORZYSTYWANE W OCENIE WRAŻLIWOŚĆ ZYSKU

Wykorzystanie ekonometrycznych jest przydatne w ocenie wrażliwości zysku. W przypadku ustalania progu rentowności przy zależnościach nieliniowych oraz progu rentowności w warunkach niepewności. Wartość średnią wyniku finansowego jest funkcją średniej wielkości sprzedaży a odchylenie standardowe wyniku finansowego zależy od odchylenia standardowego wielkości sprzedaży. Aby wyznaczyć prawdopodobieństwo osiągnięcia progu rentowności oraz prawdopodobieństwo zrealizowania zysku na określonym poziomie należy dokonać standaryzacji wyniku finansowego. W przypadku ustalania stopnia dźwigni operacyjnej i finansowej w ujęciu dynamicznym wykorzystuje się wskaźniki tempa zmian przychodu ze sprzedaży, zysku operacyjnego, zysku brutto, zysku netto czy EPS lub ROE. W przypadku statycznym stopnie dźwigni ustala się z ilorazu wartości przed i po uwzględnieniu ryzyka operacyjnego i finansowego. W ocenie pozytywnego efektu dźwigni finansowej ważne jest zachowanie układu nierówności Op – (1-T) < ROA i wypracowanie zysku operacyjnego powyżej poziomu granicznego EBIT* określonego jako iloczyn stopy procentowej zadłużenia (po uwzględnieniu osłony podatkowej) i łącznego kapitału. Efekty dźwigni wykorzystane jest w zarządzaniu i planowaniu. Znając stopnie dźwigni finansowej i operacyjnej oraz planując wzrost lub spadek produkcji sprzedanej możemy wyliczyć przyrosty i spadki procentowe poszczególnych wyników oraz ustalić zmiany stopy zwrotu z kapitałów własnych.

Słowa kluczowe: wrażliwość zysku, próg rentowności, сфера безопасности - margines bezpieczeństwa, dźwignia operacyjnej, dźwignia finansowa, dźwignia całkowita, metody ekonometryczne.