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METHODS OF DEPRECIATION AND THEIR EFFECT ON BREAK-EVEN POINT OF SALES

This Article includes introduction, two parts and conclusion. It presents a study on the effect of methods of fixed assets depreciation and intangibles amortisation on break-even point of sales (volume of identical products sold by a company where the financial result is zero) – a company reports sales profit upon sale of product volume above the even-break point and sales loss upon sale of product volume below the break-even point. In this Article, "depreciation" will be used instead of both terms "depreciation" and "amortisation" for convenience purposes.

The presented research work is based on the Bulgarian legal framework regulating fixed assets depreciation and intangibles amortisation and current knowledge of break-even point.

We consider the discussed issue materially important as break-even point of sales is directly related to the profit of a company while that profit concerns the interests of company owners, i.e. they may allocate it or any portion of it as dividends. A company may retain such profit or any portion of it to optimise its economic growth.

The issues related to break-even point of sales are the subject of a number of research works and we think that the present study will contribute to that topic.

Jel: L20; M20

INTRODUCTION

At the end of 1989, Bulgaria made its first steps to an overall public and political and economic change. Economy made a gradual transition from centralised to market economy. Market economy conditions give rise to many issues concerning the economic activities of a company as well. The effect of depreciation of production company assets on break-even point of sales is one of these issues. That issue has not been studied in Bulgaria yet. Therefore, this Article focuses on it as we consider it material to the economy of real sector companies. Break-event point is the volume of products sold over a particular period where the financial result is zero. A company reports sales profit upon sales volume above the break-even point over a particular period. And it reports sales loss upon sales volume below the break-even point. Break-even point may be also applied to goods traded by commercial

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companies and to certain services rendered by service segment companies in some cases. In these cases, it is the volume of goods or services sold where the financial result is zero.

Sales profit and loss have effect on corporate profit that forms a portion of equity (corporate profit derives from sales profit or loss and financial income and expenses reported for a particular period).

Sales profit boosts the realisation of higher profit by a company, while sales loss results in the realisation of lower profit.

Therefore, sales profit and loss are directly related to a company and its owners as a portion of it is usually allocated as dividends among owners while the remainder is retained by the company and used in its economic activities.

Break-event point calculation (discussed in detail further in this Article) involves various data, including fixed costs. Depreciation effect on break-event point is particularly crucial as depreciation costs usually form the major relative share of fixed costs. Higher depreciation costs under equal other conditions means a value of break-even point (over a particular period) that is higher than the same value calculated on the basis of lower depreciation costs.

Depreciation costs over a particular period also have effect on the amount of accrued depreciation for that period. Higher depreciation costs over a particular period presuppose a bigger amount of accrued depreciation that a company may use, together with its other available cash, for renovation of its facilities (machinery, equipment, etc.). Lower depreciation costs over a particular period mean a smaller amount of accrued depreciation over that period and less funds for renovation of company facilities. The amount of accrued depreciation for a particular period is the portion of sale proceeds that equals depreciation costs and forms a depreciation reserve, i.e. such amount may be kept in a designated bank account of a company. This issue is explained further in this Article.

Depreciation costs are charged using certain methods of depreciation. In consideration of the effect of these methods and depreciation costs on material issues such as break-even point and cash accrual in depreciation reserves, we regard the study subject topical and important.

In Bulgaria, the issues related to assets depreciation applied by companies other than budget-funded enterprises are currently treated in a number of national and international accounting standards, i.e. these standards form the presently effective legal framework regulating the application of certain depreciation methods. In particular, the International Accounting Standards on depreciation apply not only in Bulgaria but in the other 27 Member States of the European Union as well.

The application of these methods affects the financial result of a company that concerns the interests of its owners. As we know, a portion of this result is usually allocated as dividends while another portion is reinvested that predetermines the successful company functioning in the future. This fact makes us think that the study subject is topical and important.

The study object covers the depreciation methods applied by real sector companies (industrial and commercial companies and service segment companies rendering repair,

transportation and other services). The study subject is the effect of assets depreciation on the break-even point and depreciation reserve of a company. There is a link between break-even point and depreciation reserve and depreciation, as mechanism, have certain effect on that link.

According to the survey thesis, the depreciation methods applied by real sector companies to newly acquired depreciable assets have effect on the value of break-even point of sales over the first years as of asset acquisition date. The value of break-even point affects the profit of a company that forms a portion of its equity, i.e. the profit received by company owners.

The survey purpose is to reveal the opportunities to achieve one of the following two objectives by applying certain depreciation methods to newly acquired depreciable assets, and namely a lower value of break-even point and higher sales profit over the first years as of acquisition date that is a prerequisite for higher company profit for these years (that means bigger dividends to owners) or a higher value of break-even point and respectively lower sales profit but a bigger amount of accrued depreciation over the first years as of acquisition date that is a prerequisite for realisation of overall technical and technological renovation as a company may use it, together with its other cash, to invest in renovation.

The owners of a company may require from it (its management in practice) bigger profits over the first years as of asset acquisition date. This means a lower value of break-even point of sales and respectively higher sales profit over the first years as of acquisition date that boosts the realisation of higher profit of a company, which is a portion of equity and utilised based on a decision made by the owners. In this case, the focused objective is higher profit realisation over the first years as of asset acquisition date that satisfies company owners taking into account the considerable funds invested by the company in assets acquisition. Owners logically strive for rapid results, i.e. higher profit over the first years as of assets acquisition date with a view to the considerable funds invested in that acquisition. This means a lower value of break-even point of sales that is achieved through lower fixed costs, of which depreciation costs represent a large share. It is possible to apply depreciation methods to acquired depreciable assets that result in the lowest depreciation costs (and lowest possible fixed costs) over the first years of using these assets compared to depreciation costs that would be incurred if using other depreciation methods.

The owners of a company may require from it, i.e. its management, to focus on overall technical and technological renovation in the future upon acquisition of certain depreciable assets. In this case, a company will strive to realise a bigger amount of accrued depreciation on these assets, i.e. to form a larger depreciation reserve (including the amount of accrued depreciation on the other depreciable assets as well), over the first years of using the new assets. A larger depreciation reserve is a prerequisite for overall renovation of company equipment and technologies. It is about the use of the amount of accrued depreciation plus the proceeds from sales of fixed assets and other cash held by a company to renovate equipment and technologies that results in business growth and considerable profit increase in the future, which is the wish of owners. A bigger amount of accrued depreciation over the first years of depreciable assets use means higher depreciation and fixed costs and a larger value of break-even point respectively. The result is lower sales profit that means lower company profit over the first years of new assets use.

We have discussed two possible options as to company profit that differ by the time of higher profit realisation – over the first years as of the date of depreciable assets acquisition (such acquisition involves spending considerable amount of funds) or over a future period where the amount of depreciation reserve and other cash are invested in material renovation of company equipment and technologies.

We set the following tasks to achieve the survey objective:

1. general description of the Bulgarian legal framework regulating depreciation of company assets;

2. clarification of the effect of depreciation costs on break-event point and sale and corporate

3. profits, including examples of applied depreciation methods that are in line with the two objectives.

4. statement of reasons for selection of a set of depreciation methods to apply to newly acquired depreciable assets to achieve any of the two objectives discussed in the survey objective presentation;

5. formation of models related to the depreciation effect on break-even point and corporate profit.

This Article is based on traditional research methods such as analysis, synthesis, induction and deduction and the logical, systematic, comparative and regulatory approaches. Appropriate mathematical and graphic tools have been used as well.

PART ONE. LEGAL CONCEPTS OF DEPRECIATION AND METHODS OF DEPRECIATION IN BULGARIA

1. Past Legal Concepts of Depreciation and Methods of Depreciation

For the purposes of this Article, legal concepts of depreciation mean the provisions of the Bulgarian legal framework that regulate depreciation. These concepts are set forth in the regulatory acts promulgated in the State Gazette, the official publication of the Republic of Bulgaria issued by the National Assembly.

Until 1991, straight-line depreciation method was the only one applied in Bulgaria. However, the Accountancy Act passed by the National Assembly on 3 January 1991 (effective from 1 April 1991 until 31 December 2001) and promulgated in the State Gazette later in 1991 has provided companies with the option to apply non-linear depreciation methods as well. Specifically, in accordance with Article 20, Paragraph 4 of that Act, annual depreciation amount should be determined by the management of an entity that is to systematically apply a straight-line method or a non-linear method. Article 20 also treated many other depreciation issues. That became necessary due to the transition to market economy. Of course, the legal framework also underwent a number of amendments related to issues concerning the economic activities of companies to build market economy in the

country. And these amendments have brought success – in its 2002 Report on Bulgaria, the European Commission stated that the country enjoys functioning market economy. This was crucial for Bulgaria in order to become a member of the European Union, which happened on 1 January 2007.

Decree No 276/30 December 1992 of the Council of Ministers introduced a number of National Accounting Standards (NAS). Later, it was promulgated in the State Gazette (1993). These NAS were effective from 1 January 1993 until 30 September 1996. NAS 4. Reporting of Depreciation of Tangible Fixed Assets was one of them. In accordance with it, depreciation should be the portion of value of a depreciable asset taken to costs over the period of factual use.

Decree No 192/1 August 1996 of the Council of Ministers adopted new NAS. It was promulgated in the State Gazette later in 1996. These NAS were effective from 1 October 1996 until 31 December 1997. NAS 4. Reporting of Depreciation of Tangible Fixed Assets was one of them. It kept unchanged the depreciation definition set forth in the previous NAS 4. Reporting of Depreciation of Tangible Fixed Assets that was effective until 30 September 1996.

Decree No 65/25 March 1998 of the Council of Ministers enforced new NAS (effective from 1 January 1998 until 31 December 2001). It was promulgated in the State Gazette later in 1998. NAS 4. Reporting of Tangible Fixed Assets was one of them. In accordance with it, depreciation should be the reporting of the amount that is a portion of depreciable asset value as an item of costs over the period of factual use.

Over the period 1 April 1991 – 31 December 2001, real sector companies were obligated to report income, expenses, equity, assets and liabilities through accounts that formed their individual charts of accounts that had to be in line with the National Chart of Accounts, which provided for conditions for a unified approach to the organisation and performance of accounting of real sector companies.

Decree No 27/20 February 1991 of the Council of Ministers ratified the National Chart of Accounts that was effective from 1 April 1991 until 30 September 1996. It was promulgated in the State Gazette later in 1991.

As mentioned above, Decree No 192/1 August 1996 of the Council of Ministers (effective from 1 October 1996) adopted certain NAS. It also ratified the National Chart of Accounts effective from 1 October 1996 until 31 December 1997.

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All the three National Charts of Accounts, ratified by the said Decrees issued by the Council of Ministers in 1991, 1996 and 1998, included the following text:

"Basic depreciation methods shall be the straight-line method and the non-linear method. 1. Straight-line depreciation method

It applies to fixed assets and intangibles where useful life can be measured quite precisely.
....

2. Non-linear depreciation methods

When applying a non-linear depreciation method, depreciation charge may increase or decrease over individual periods on regular or irregular basis.

2.1. Degressive non-linear methods

When applying a degressive depreciation method, depreciation charge decreases over the depreciation period. These methods are appropriate to apply to fixed assets subject to quicker obsolescence and physical wear and tear.

2.1.1. Reducing balance method

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2.1.2. Irregular degressive method

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2.1.3. Sum-of-year-digits method

……………………………………….....................................

2.2. Progressive non-linear method

When applying this method, depreciation charge is the lowest over the first year and increases over the other periods of asset use. This method may be used to reach maximal use of an asset. It is usually applied by newly established enterprises that have not reached maximal production capacity yet".

Over the period 1 January 2002 – 31 December 2015, the Accountancy Act superseding the previous one applied. It was promulgated in the State Gazette in 2001. In accordance with Article 15, Paragraph 1 of that Act, enterprises should charge depreciation of depreciable fixed assets/intangibles in line with applicable accounting standards.

Decree No 37/13 February 2002 of the Council of Ministers introduced new NAS. It was promulgated in the State Gazette in 2002. These NAS were effective from 1 January 2002 until the end of 2004. NAS 4. Depreciation Accounting was one of them. It treated depreciation issues from the beginning of 2002 until the end of 2004 and defined depreciation as being an item of expenses reported for a reporting period that is calculated by spread of the depreciable amount of an asset over its useful life. It also set forth the depreciation methods to be applied by companies.

As of the beginning of 2002, no binding National Chart of Accounts has been effective in Bulgaria. From the beginning of 2002 until the end of 2004, Sample National Chart of Accounts drafted and approved by the then existing State Board of Accountancy (an advisory body of the Ministry of Finance) existed. It was recommendable but not binding on companies. The Sample National Chart of Accounts provided for accounts to be used by companies, including accounts to report depreciation. However, it included no explanations

on depreciation methods in contrast to the three binding National Charts of Accounts mentioned above.

2. Present Legal Concepts of Depreciation and Methods of Depreciation

Decree No 46/21 March 2005 of the Council of Ministers introduced the National Financial Reporting Standards for Small and Medium-Sized Enterprises effective as of 1 January 2005. It was promulgated in the State Gazette in 2005. They are still in force (although they have undergone a number of amendments as of the effective date). It should be noted that they are called National Accounting Standards as of the beginning of 2016 based on Decree No 394 promulgated in the State Gazette (2016).

One of them is NAS 4. Depreciation Accounting that defines depreciation as being an item of expenses reported for a reporting period that is calculated by spread of the depreciable amount of an asset over its useful life. Therefore, depreciation has the same definition given in both the previous NAS 4. Depreciation Accounting (effective from the beginning of 2002 until the end of 2004) and the currently effective NAS 4. Depreciation Accounting.

The depreciation methods set forth in the currently effective NAS 4. Depreciation Accounting include the straight-line method and seven non-linear methods (four degressive and three progressive). Moreover, NAS 4 provides enterprises with the option to apply the unit of production method as well.

The application of non-linear methods in USA as of 1940, in West Germany as of 1940 and in France as of 1960 represents a fact of interest.

In accordance with NAS 16. Tangible Fixed Assets, an item of tangible fixed assets, which consists of identifiable distinct components that individually meet the criteria for a tangible fixed asset, can be divided into its constituent parts, each of which to be treated as a separate item of assets and that is necessary where component assets have different useful lives or generate economic benefits to an entity in different manners that require the use of different methods and depreciation rates. In addition, it sets forth that an item of tangible fixed assets should be depreciated in line with NAS 4. Depreciation Accounting.

NAS 38. Intangible Assets is also an effective accounting standard. In accordance with it, a recognised item of intangible assets related to research and development should be depreciated within 5 (five) years as of origination date.

A number of other NAS treat the depreciation of depreciable assets by companies that apply them.

A part of the Bulgarian companies applies the International Accounting Standards (IAS). How do the International Accounting Standards treat depreciation at present?

Commission Regulation (EC) No 1126/2008 of 3 November 2008 adopted certain International Accounting Standards in accordance with Regulation (EC) No 1606/2002 of the European Parliament and of the Council. That Regulation became effective on the third day as of its publication in the Official Journal of the European Union (2008). In general, it

is binding on and applied directly by all Member States of the European Union, including Bulgaria. This Regulation adopted certain International Accounting Standards, many of which include texts treating depreciation.

IAS 16. Property, Plant and Equipment defines depreciation as being the allocation of the depreciable amount of an asset on a systematic basis over its useful life (Paragraph 6). In accordance with IAS 16, the depreciation method used should reflect the pattern in which the asset's economic benefits are consumed by an entity (Paragraph 60) and different methods may be used to allocate the depreciable amount on a systematic basis over the asset's useful life, including the straight-line method, the reducing balance method and the unit of production method (Paragraph 62).

In accordance with IAS 38. Intangible Assets, different depreciation methods may be used to allocate the depreciable amount of an asset on a systematic basis over its useful life, including the straight-line method, the reducing balance method and the unit of production method, and the used method should be selected so as to reflect the pattern in which the asset's future economic benefits are expected to be consumed by an entity and be consistently applied over the individual periods except for any change in the estimated pattern of consumption of such future economic benefits (Paragraph 98).

Other IAS also treat the depreciation of depreciable assets of entities.

As of 1 January 2016, the third version (since 1989) of the Accountancy Act has been effective. It was promulgated in the State Gazette in 2015. It treats only depreciation applied by state-funded enterprises that have to charge it based on an act issued by the Council of Ministers (Article 65).

Depreciation policy is incorporated in the general business policy of a company. Its material importance is the objective to provide financial resources for technical renovation of depreciable fixed assets as the functionality of such assets is subject to continuous decrease as a result of use in the course of business activity. On the one hand, they report physical wear and tear and gradually decreasing productivity and efficiency. On the other hand, the penetration of new fixed assets of higher efficiency (naturally resulting from science and technology development) leads to obsolescence of existing depreciable fixed assets.

Companies develop their own depreciation policies, including a number of components. One of these components is the adoption of a specific approach to classifying assets as fixed tangible and intangible and as depreciable and non-depreciable. Another component is the adoption of an approach to determining the useful life of a depreciable asset and of an approach to calculating the residual value of such asset. Of course, the adoption of methods of depreciation is also an integral part of depreciation policy. Depreciation policy incorporates other components as well.

Depreciation ensures accruals and opportunities for domestic investments no matter whether the reported financial result is positive or negative. At the same time, it also affects corporate financial results, including the financial result prior to taxation and the financial result following taxation. Therefore, depreciation policy is related to the national interests

in the form of corporate taxes and the interests of owners in the form of financial results that impact their fortune (equity).

PART TWO. EFFECT OF METHODS OF DEPRECIATION ON BREAK-EVEN POINT OF SALES

The concept of break-even point was developed over the first 25 years of the last century. It is a method of sales volume, cost and profit dependency analysis or cost-volume-profit analysis known as the method of break-even point.

According to a source of information (Trifonov, 2000), the English name of that method is BREAK-EVEN POINT and reflects the income-cost balance. The same source also gives the method names in French and German – POINT most de rentabile relating to zero-profit point and Kostendeckungpunkt relating to production costs coverage and sales income generation.

Practically, the three names concern the sales volume where production and sales costs equal sales income over a given period, i.e. the volume of products sold over a given period where the financial result is zero. If the volume of products sold over a given period is higher or lower than break-even point, sales profit or sales loss is reported respectively.

The issue of break-even point originated and became popular during the Second Industrial Revolution that spread over a period from the beginning of the last several decades of the 19th century until the 60s of the 20th century. Its predecessor is the First Industrial Revolution that started in Great Britain at the end of the 18th century with textile manufacture mechanisation (that period is characterised by construction of factories where activities carried out through manual work began to be performed).

During the Second Industrial Revolution, the concept of science and engineering being the road to human welfare predominated. Electric power boosted metallurgy and engineering industry development. Conveyor system was introduced in the manufacture of a wide range of products. Cosmetics and pharmaceutics appeared as new segments of chemical industry due to new oil processing technologies. Machine building and automotive and aircraft industries boomed. Stainless steel, plastics, nylon, chemical fertilisers, refrigerators and others were discovered thanks to the research work of famous scientists. Most of them, however, became popular in the second half of the 20th century. The Second Industrial Revolution transformed USA, Great Britain, France and Italy in developed industrial countries. There were established cities of megalopolis type populated by millions of people.

Large-scale production brought forward the issue of considerable costs coverage by sale proceeds. Respectively, the concept of manufactured and sold products volume over a given period where the financial result is zero, i.e. zero sales profit and loss, has been logically formed. If such volume is known, it is clear that any sold quantity above or below it will result in sales profit or loss over the particular period. For example, in case that break-even point is found to equal 1200 product units over a given period, it means that the financial result will be zero if 1200 product are actually sold over such period. If more than

1200 (1350 for example) product units are sold over the period, sales profit will be reported for such period. If less than 1200 (1100 for example) product units are sold over the period, sales loss will be reported for such period.

Before 95 years, the American engineer Walter Rautenstrauch (1922) published its Break-Even Point Chart specifying that the point of sale and total cost lines intersection shows the sales volume where a company reports equal income and costs. Simple chart version is presented on Figure 1.

Figure 1

Break-even point chart (simple version)
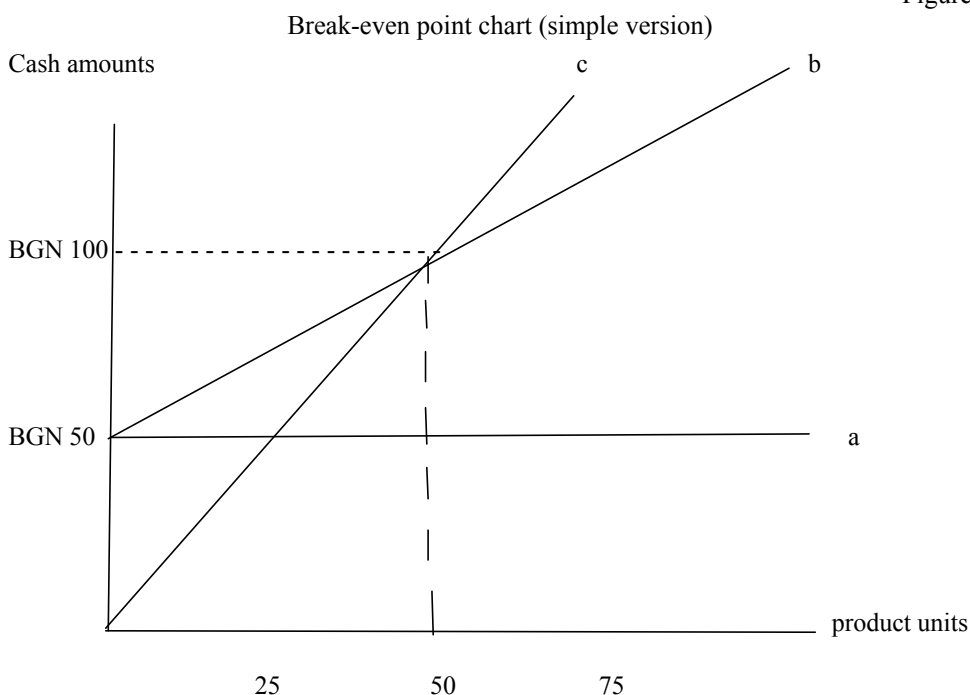
Source: Paper work by the author based on the break-even point chart.
Note: a – line of fixed costs
    b – line of total costs
    c – line of net sales income

The chart shows that in case of fixed costs of BGN 50, unit sale price of BGN 2 and unit variable costs of BGN 1, break-even point will be 50, i.e. a company reports net sales income of BGN 100 (50 units x BGN 2) and total costs of BGN 100 (fixed costs of BGN 50 + 50 units x variables costs of BGN 1) for 50 sold units.

Rautenstrauch treats the issue of break-even point, which he calls break point, in many of his works and specifies its calculation as the result of dividing fixed costs by the difference between unit price and unit variable costs. Formula:

$$\text{Break-event point} = \frac{\text{Fixed costs}}{\text{Unit price} - \text{Unit variable costs}}$$

Fixed costs are costs that not vary depending on production and sales volume. They include depreciation costs, payroll costs calculated on time-based remuneration system, i.e. costs related to salaries and wages based on worked off hours that do not depend on production and sales volume, etc. Variable costs depend on production and sales volume. Where such volume reports increase or decrease, such costs rise or fall respectively. Using the break-even point method is based on the assumption that variable costs change depending on production and sales volume variation so that they remain the same, i.e. constant, per unit. For example, unit variable costs amount to BGN 3 no matter whether 40,000 or 50,000 units are produced or sold over the period of calculation of break-even point of sales.

A number of other scientists have worked on break-even point method, including Hess (1903), Mann (1903), Williams (1922), Georgiev (1941), Machlup (1952), Simmons (1963), Keith (1980), Mansfiled (1988) and others. The publication of Hess in 1903 is considered to be among the major works treating these issues. This publication presents the Cost, Income and Profits Chart.

Depreciation materially affects break-even point, particularly depreciation costs as they usually occupy a significant share of fixed costs. Further in this Article, we present exemplary variants illustrating the different depreciation methods based on certain assumptions and discuss depreciation effect on break-even point.

Let us assume that a company has acquired two items of depreciable assets, each with acquisition price (carrying amount) of BGN 200,000 and depreciable amount of BGN 200,000. Depreciable amount is the depreciable asset value that is subject to depreciation over its expected depreciation period. This value is the difference between the asset carrying amount (book value, i.e. the value reported in the accounts of a company) and the asset residual value. In accordance with NAS 4. Depreciation Accounting, when the residual value of a depreciable asset is insignificant in size or percentage compared to its carrying amount, it can be ignored. In such case, the depreciable amount of an asset equals its carrying amount. Significance level is determined by an enterprise and disclosed in its accounting policy (Item 4.2). Again, the carrying amount and depreciable amount of the acquired assets are equal.

The depreciation period (the period over which a depreciable asset is expected to be used by a company) of both assets is eight years.

We also assume that depreciation and calendar years are the same, i.e both assets are acquired at the end of December and depreciation is charged as of January of the first year. For example, if the assets are acquired at the end of 2015 and charged depreciation as of the beginning of 2016, the 2016 calendar year is the first depreciation year. In case of 8-year depreciation period, the last depreciation year is 2023.

These are the assumptions used to present the depreciation methods that may apply to both assets, the depreciation effect on break-even point of sales respectively, further in this Article.

One of the assets is estimated to generate progressive benefit for the company, i.e. benefit that grows over time. In this case, a progressive depreciation method is to apply in accordance with NAS 4. Depreciation Accounting. In this manner, the estimated economic benefit from the asset corresponds to related depreciation costs.

NAS 4 also defines progressive non-linear depreciation methods as being the methods where depreciation over a period is higher compared to the previous period within the estimated useful life of an asset (Item 5.2.) Such methods are the progressive sum-of-year-digits method, the regular progressive method and the irregular progressive method.

Table 1 presents the progressive sum-of-year-digits method based on the made assumptions.

Table 1

Progressive sum-of-year-digits method

Years	Depreciation basis (BGN)	Depreciation rate (%)	Depreciation charge (BGN)
First year	200,000	(1/36) x 100 = 2.8%	5,600
Second year	200,000	(2/36) x 100 = 5.6%	11,200
Third year	200,000	(3/36) x 100 = 8.3%	16,600
Fourth year	200,000	(4/36) x 100 = 11.1%	22,200
Fifth year	200,000	(5/36) x 100 = 13.9%	27,800
Sixth year	200,000	(6/36) x 100 = 16.7%	33,400
Seventh year	200,000	(7/36) x 100 = 19.4%	38,800
Eighth year	200,000	(8/36) x 100 = 22.2%	44,400

Total: BGN 200,000

Source: Paper work by the author based on the given assumptions.
Note: Depreciation basis – the amount multiplied by the depreciation rate for a given year to calculate the depreciation charge for that year

Depreciation rate – the percentage multiplied by the depreciation basis for a given year to calculate the depreciation charge for that year

Depreciation charge – the portion of depreciable amount allocated over individual reporting periods.

As to progressive depreciation methods, depreciation basis equals depreciable amount.

If the progressive sum-of-year-digits method is applied to an asset with 8-year depreciation period, the eight-year digits are to be summed up, i.e. $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 36$. First-year depreciation rate is calculated through dividing 1 by 36 and multiplying the result by 100. Second-year depreciation rate is calculated through dividing 2 by 36 and multiplying the result by 100. Next-year depreciation rates are calculated in the same manner.

Table 2 presents the regular progressive method based on the made assumptions.

A company sets the first-year depreciation rate to apply this method. For example, it sets a depreciation rate of 5.5%. Prior to next-year rate calculation, progression rate is determined using the following formula:

$$K = \frac{200 - 2 \times T \times AH_1}{T \times (T - 1)}$$

where:

К – progression rate

Т – depreciation period

AH_1 – first-year depreciation rate

Table 2

Regular progressive method

Years	Depreciation basis (BGN)	Depreciation rate (%)	Depreciation charge (BGN)
First year	200,000	5.5	11,000
Second year	200,000	7.5	15,000
Third year	200,000	9.5	19,000
Fourth year	200,000	11.5	23,000
Fifth year	200,000	13.5	27,000
Sixth year	200,000	15.5	31,000
Seventh year	200,000	17.5	35,000
Eighth year	200,000	19.5	39,000

Total: BGN 200,000

Source: Paper work by the author based on the given assumptions.

Progression rate calculation:

$$К = \frac{200 - 2 \times T \times AH1}{T \times (T-1)} = \frac{200 - 2 \times 8 \times 5.5}{8 \times (8-1)} = \frac{200 - 88}{8 \times 7} = \frac{112}{56} = 2$$

Now, second-year rate is calculated by summing up 5.5 and 2, i.e. it is 7.5%. Third-year rate is calculated by summing up 7.5 and 2, i.e. it is 9.5%. Similarly, next-year rates are calculated.

Table 3

Irregular progressive method

Years	Depreciation basis (BGN)	Depreciation rate (%)	Depreciation charge (BGN)
First year	200,000	4	8,000
Second year	200,000	7	14,000
Third year	200,000	9	18,000
Fourth year	200,000	12	24,000
Fifth year	200,000	13	26,000
Sixth year	200,000	16	32,000
Seventh year	200,000	17	34,000
Eighth year	200,000	22	44,000

Total: BGN 200,000

Source: Paper work by the author based on the given assumptions.

A company sets depreciation rates to use this method, i.e. no rate calculation algorithm applies. This method requires that each following rate be higher than the last one and the rates total be 100.

Table 3 shows that each following depreciation rate is higher than the last one and 4 + 7 + 9 + 12 + 13 + 16 + 17 + 22 = 100.

As mentioned, one of the acquired depreciable assets is expected to generate increasing economic profit.

The other acquired depreciable asset is expected to generate decreasing economic benefit. In this case, a degressive depreciation method is to apply in accordance with NAS 4. Depreciation Accounting. When applying such method, each following depreciation charge is lower than the last one. In practice, the application of such method ensures correspondence between decreasing economic benefits and decreasing depreciation costs. Such methods are the degressive sum-of-year-digits method, the regular degressive method, the irregular degressive method and the reducing balance method. In particular, the reducing balance method uses a depreciation rate of over 50% that results in significant reduction of depreciation costs over the second year compared to the first year and over the third year compared to the second year. Let us assume that a company expects slightly decreased economic benefit associated with an asset over the second and third years compared to the first and second years respectively. In this case, the said method is not applicable.

But one of the other three degressive depreciation methods may apply to the acquired asset. Depreciation basis equalling depreciable amount is used when applying these three methods.

Table 4 presents the degressive sum-of-year-digits method based on the made assumptions.

Table 4

Degressive sum-of-year-digits method

Years	Depreciation basis (BGN)	Depreciation rate (%)	Depreciation charge (BGN)
First year	200,000	(8/36) x 100 = 22.2	44,400
Second year	200,000	(7/36) x 100 = 19.4	38,800
Third year	200,000	(6/36) x 100 = 16.7	33,400
Fourth year	200,000	(5/36) x 100 = 13.9	27,800
Fifth year	200,000	(4/36) x 100 = 11.1	22,200
Sixth year	200,000	(3/36) x 100 = 8.3	16,600
Seventh year	200,000	(2/36) x 100 = 5.6	11,200
Eighth year	200,000	(1/36) x 100 = 2.8	5,600

Total: BGN 200,000

Source: Paper work by the author based on the given assumptions.

If the degressive sum-of-year-digits method is applied to an asset with 8-year depreciation period, the eight-year digits are to be summed up, i.e. 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 36. First-year depreciation rate is calculated through dividing 8 by 36 and multiplying the result by 100. Next-year depreciation rates are calculated in the same manner.

Table 5 presents the regular degressive method based on the made assumptions.

Table 5

Regular degressive method

Years	Depreciation basis (BGN)	Depreciation rate (%)	Depreciation charge (BGN)
First year	200,000	16	32,000
Second year	200,000	15	30,000
Third year	200,000	14	28,000
Fourth year	200,000	13	26,000
Fifth year	200,000	12	24,000
Sixth year	200,000	11	22,000
Seventh year	200,000	10	20,000
Eighth year	200,000	9	18,000

Total: BGN 200,000

Source: Paper work by the author based on the given assumptions.

A company sets the first-year depreciation rate to apply this method. For example, a company sets a first-year depreciation rate of 16%. Then, degression rate is calculated by using the following formula:

$$K = \frac{2 \times T \times AH_1 - 200}{T \times (T - 1)}$$

where:

K – degression rate

T – depreciation period

AH_1 – first-year depreciation rate

Degression rate calculation:

$$K = \frac{2 \times T \times AH1 - 200}{T \times (T - 1)} = \frac{2 \times 8 \times 16 - 200}{8 \times (8 - 1)} = \frac{256 - 200}{8 \times 7} = \frac{56}{56} = 1$$

Second-year depreciation rate is calculated by deducting 1 from 16, i.e. it is 15%. Similarly, next-year rates are calculated.

When applying the regular degressive method, the total of first and last rates should not exceed 50 (in this case, these depreciation rates are 16% and 9% respectively, i.e. 16 + 9 = 25)

Table 6 presents the irregular degressive method.

A company sets depreciation rates to use this method, i.e. no rate calculation algorithm applies. This method requires that each following rate be lower than the last one and the rates total be 100.

Table 6

Irregular degressive method

Years	Depreciation basis (BGN)	Depreciation rate (%)	Depreciation charge (BGN)
First year	200,000	20	40,000
Second year	200,000	17	34,000
Third year	200,000	16	32,000
Fourth year	200,000	15	30,000
Fifth year	200,000	11	22,000
Sixth year	200,000	9	18,000
Seventh year	200,000	7	14,000
Eighth year	200,000	5	10,000

Total: BGN 200,000

Source: Paper work by the author based on the given assumptions.

Table 6 shows that each following depreciation rate is lower than the last one and 4 + 7 + 9 + 12 + 13 + 16 + 17 + 22 = 100.

The given example clarifies individual depreciation methods. Non-linear methods were used in USA in 1940 for the first time and then in West Germany and in France in 1948 and 1960 respectively (Bonev, 1996).

When studying depreciation effect on break-even point of sales, we make a number of assumptions:

1. the other fixed costs (fixed costs other than the costs related to assets depreciation such as other asset depreciation costs, payroll costs calculated on time-based remuneration, i.e. costs related to salaries and wages based on worked off hours that do not depend on production and sales volume, etc.) total BGN 60,000 on an annual basis over the eight-year period;

2. the annual price per produced and sold product is BGN 5 and the unit variable costs total BGN 3.

Company owners may require maximal profit over the first years as of assets commissioning (the corporate profit as a final result). The company has invested considerable funds in these assets so the owners logically strive for maximal corporate profit over the first years as of asset acquisition. That purpose requires the lowest break-even point possible to generate maximal sales profit. Maximal sales profit boosts the realisation of higher corporate profit.

As mentioned, the company is to apply a degressive depreciation method to one of the newly acquired assets and a progressive depreciation method to the other.

As to degressive methods, the regular degressive method calculates the lowest first-year depreciation charge, i.e. BGN 32,000. As to progressive methods, the progressive sum-of-year-digits method calculates the lowest first-year depreciation charge, i.e. BGN 5,600. First-year break-even point calculation:

$$\text{Break-even point} = \frac{\text{Fixed costs}}{\text{Unit price} - \text{Unit variable costs}}$$

$$\text{Break-even point} = \frac{32{,}000 + 5{,}600 + 60{,}000}{5 - 3} = 48{,}800 \text{ units}$$

The numerator includes the depreciation costs related to both assets (BGN 32,000 and BGN 5,600 respectively) and the other fixed costs (BGN 60,000). The combination of the two first-year lowest depreciation charges calculated using the said methods to apply to both assets results in the lowest break-even point – in this case, 48,800 units form the minimal volume where the financial result will be zero. Each subsequently sold unit over the break-even point of 48,800 will generate sales profit of BGN 2 (the difference in the denominator is the profit generated through each subsequently sold unit over the break-even point).

The application of other methods or one of the said methods and another one will result in a higher value of break-event point of sales as the total of first-year charges, depreciation costs related to the newly acquired assets respectively, and fixed costs will be higher.

If it has been planned to sell 60,000 units over the first year and break-even point is 48,800 units, the sales profit generated through the sale of 60,000 units is calculated in the following manner:

60,000 units – 48,800 units = 11,200 units

11,200 units x BGN 2 = BGN 22,400

In case of break-even point of 48,800 units, the first-year sales profit will be the highest, i.e. using these depreciation methods over the first year will result in the highest sales profit (if break-even point is 49,000, the profits from sale of 60,000 units will be lower or 11,000 units x BGN 2 = BGN 22,000). Sales profit boosts the realisation of higher corporate profit over the first year that is calculated using the following formula:

Corporate profit = Sales profit + (Financial income – Financial costs)

The realisation of higher profit is in the interest of owners as it forms income utilised at their discretion. In general, higher profit means higher dividend income. Moreover, higher profit is in the interest of a company as it may retain the larger portion of it to use it in its economic operations.

It is noted that financial costs over a given year may be so high that a company will report loss but this issue is beyond the scope of this Article.

As to degressive depreciation methods, the regular degressive method calculates the lowest second-year depreciation charge, i.e. BGN 30,000. As to progressive depreciation methods,

the progressive sum-of-year-digits method calculates the lowest second-year depreciation charge, i.e. BGN 11,200. Second-year break-even point calculation:

$$\text{Break-even point} = \frac{30,000 + 11,200 + 60,000}{5 - 3} = 50,600 \text{ units}$$

As to degressive depreciation methods, the regular degressive method calculates the lowest third-year depreciation charge, i.e. BGN 28,000. As to progressive depreciation methods, the progressive sum-of-year-digits method calculates the lowest third-year depreciation charge, i.e. BGN 16,600. Third-year break-even point calculation:

$$\text{Break-even point} = \frac{28,000 + 16,600 + 60,000}{5 - 3} = 52,300 \text{ units}$$

As to degressive depreciation methods, the regular degressive method calculates the lowest fourth-year depreciation charge, i.e. BGN 26,000. As to progressive depreciation methods, the progressive sum-of-year-digits method calculates the lowest fourth-year depreciation charge, i.e. BGN 22,200. Fourth-year break-even point calculation:

$$\text{Break-even point} = \frac{26,000 + 22,200 + 60,000}{5 - 3} = 54,100 \text{ units}$$

When applying the regular degressive method and the progressive sum-of-year-digits method over the first year (as of assets commissioning) and over the next three years, break-even point of sales is the lowest compared to that calculated using other methods or one of these methods and another one. This means that the sales profit over each of the four years (first, second, third and fourth) is the highest compared to that calculated using other depreciation methods or one of these methods and another one and respectively the effect of boosting corporate profit over each of these years is optimal, which is in the interest of company owners. In other words, the application of these methods results in depreciation effect on break-even point and corporate profit respectively that fulfil their wish to receive higher profits over the first years after investing a considerable amount of funds in the asset acquisition.

The above presentation of depreciation charge calculation using the regular degressive method and the progressive sum-of-year-digits method is illustrated on Figure 2.

Depreciation enables a company to accrue cash through setting aside the portion of yearly sale proceeds equalling depreciation costs via transfer to a designated corporate bank account (formation of a depreciation reserve). It is a well-known fact that each company sets product selling prices so as to ensure correspondence of sales income to incurred costs, including depreciation costs, and to a certain sales profit. In other words, a company considers the following equation:

Sales income = Production and sale costs + Sales profit

Figure 2

Effect of methods of depreciation upon minimisation of break-even point of sales

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┌─────────────────────────────────────────────────────────┐
│  Regular degressive method and progressive sum-of-year-   │
│  digits method                                            │
└─────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────┐
│  The total of depreciation charges on both assets         │
│  calculated using the said methods is the lowest over     │
│  each of the first four years as of asset commissioning   │
└─────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────┐
│  The lowest total of depreciation charges calculated      │
│  using the said methods results in the lowest value of    │
│  break-event point within each of the first four years    │
│  as of asset commissioning                                │
└─────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────┐
│  The lowest value of break-even point over each of the    │
│  first four years predetermines the highest sales profit  │
│  over each of the first four years as of asset            │
│  commissioning                                            │
└─────────────────────────────────────────────────────────┘
                            │
                            ▼
┌─────────────────────────────────────────────────────────┐
│  The highest sales profit over each of these four years   │
│  maximally boost the realisation of higher corporate      │
│  profits                                                  │
└─────────────────────────────────────────────────────────┘
```

Source: Paper work by the author based on the given examples.

It is possible that owners wish maximal depreciation accrual over the first years as of asset commissioning, both assets along with other depreciable assets are subsequently sold and the sale proceeds plus accrued depreciation as to both assets and other depreciable assets and other available company cash are used to acquire a number of other fixed assets, i.e. to materially renovate the company equipment and technologies, which will generate considerable profits and ensure company competitiveness in the future.

If a company decides to apply this scenario, both assets should be depreciated using methods calculating the highest depreciation charges over the first years.

As to degressive depreciation methods, the degressive sum-of-year-digits method calculates the highest first-year depreciation charge, i.e. BGN 44,400. As to progressive depreciation methods, the regular progressive method calculates the highest first-year depreciation charge, i.e. BGN 11,000.

Break-even point calculation:

$$\text{Break-even point} = \frac{44,000 + 11,000 + 60,000}{5 - 3} = 57,500 \text{ units}$$

The application of these depreciation methods to both assets results in the highest value of break-even point compared to that calculated using other depreciation methods or one of these methods and another one. Given that value of break-even point, the corporate profit over the first year as of asset commissioning will be the lowest possible compared to that calculated using other depreciation methods or one of these methods and another one. The amount of first-year accrued depreciation, however, will be the highest.

As to degressive methods, the degressive sum-of-year-digits method calculates the highest second-year depreciation charge, i.e. BGN 38,800. As to progressive methods, the regular progressive method calculates the highest second-year depreciation charge, i.e. BGN 15,000.

As to degressive methods, the degressive sum-of-year-digits method calculates the highest third-year depreciation charge, i.e. BGN 33,400. As to progressive methods, the regular progressive method calculates the highest third-year depreciation charge, i.e. BGN 19,600.

If using these methods, the values of second-year and third-year break-even point will be the highest and the second-year and third-year sale profits will be the lowest. And this will have the lowest effect of boosting corporate profit. The second and third years, however, will report the highest amount of accrued depreciation as to both assets to which these methods apply.

When using the said depreciation methods, the amount of accrued depreciation related to both assets will be the largest after the third year. It is possible to sell both assets along with other fixed assets after the third year and to materially renovate company equipment as described.

The above presentation of depreciation charge calculation using the degressive sum-of-year-digits method and the regular progressive method is illustrated on Figure 3.

Figure 3

Effect of methods of depreciation upon maximisation of break-even point of sales

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┌─────────────────────────────────────────────────────────────────────┐
│      Degressive sum-of-year-digits method and regular progressive     │
│                              method                                   │
└─────────────────────────────────────────────────────────────────────┘
                                   │
                                   ▼
┌─────────────────────────────────────────────────────────────────────┐
│  The total of depreciation charges on both assets calculated using    │
│  the said methods is the highest over each of the first three years   │
│                    as of asset commissioning                          │
└─────────────────────────────────────────────────────────────────────┘
                                   │
                                   ▼
┌─────────────────────────────────────────────────────────────────────┐
│  The highest total of depreciation charges calculated using the said  │
│  methods results in the highest value of break-event point within     │
│  each of the first three years as of asset commissioning              │
└─────────────────────────────────────────────────────────────────────┘
                                   │
                                   ▼
┌─────────────────────────────────────────────────────────────────────┐
│  The highest value of break-even point over each of the first three   │
│  years predetermines the lowest sales profit over each of the first   │
│  three years as of asset commissioning                                │
└─────────────────────────────────────────────────────────────────────┘
                                   │
                                   ▼
┌─────────────────────────────────────────────────────────────────────┐
│  The lowest sales profit over each of these three years maximally     │
│  minimise the realisation of higher corporate profits                 │
└─────────────────────────────────────────────────────────────────────┘
                                   │
                                   ▼
┌─────────────────────────────────────────────────────────────────────┐
│  The total amount of accrued depreciation as to both assets will be   │
│  the highest over the first three years as of asset commissioning if  │
│  using the degressive sum-of-year-digits method and the regular       │
│  progressive method.                                                  │
│                                                                       │
│  After the third year, company equipment and technologies may be      │
│  renovated, which predetermines higher level of competitiveness and   │
│  realisation of material profits in the future that will satisfy      │
│  owners.*                                                             │
└─────────────────────────────────────────────────────────────────────┘
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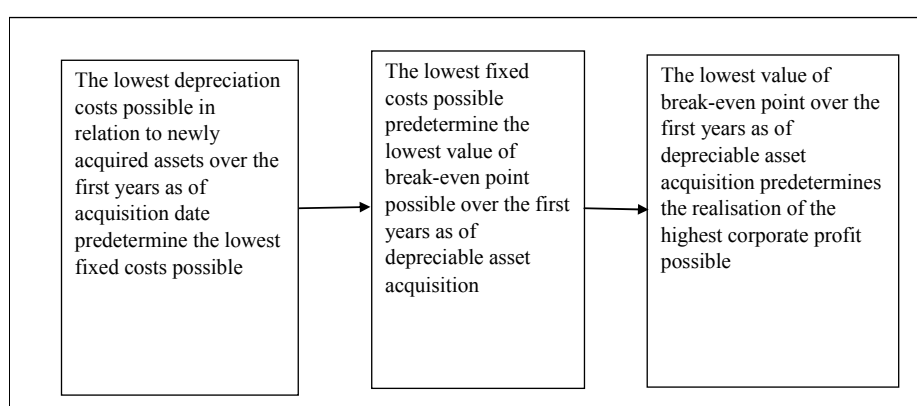Source: Paper work by the author based on the given examples.
* After the third year, it is possible to sell both assets along with other fixed assets and to use accrued depreciation as to both assets and other sold assets (depreciation reserve) plus the sale proceeds and other available company cash for equipment and technologies renovation.

Based on the given examples of depreciation effect on break-even point and corporate profit, certain models related to the depreciation of newly acquired assets may be developed.

We will present a model of effect of methods of depreciation on break-even point of sales and corporate profit where the depreciation of newly acquired assets minimises break-even point and maximises corporate profit. Model illustration is presented on Figure 4 and 5.

Figure 4

Model of effect of methods of depreciation minimizing break-even point of sales and maximizing corporate profit

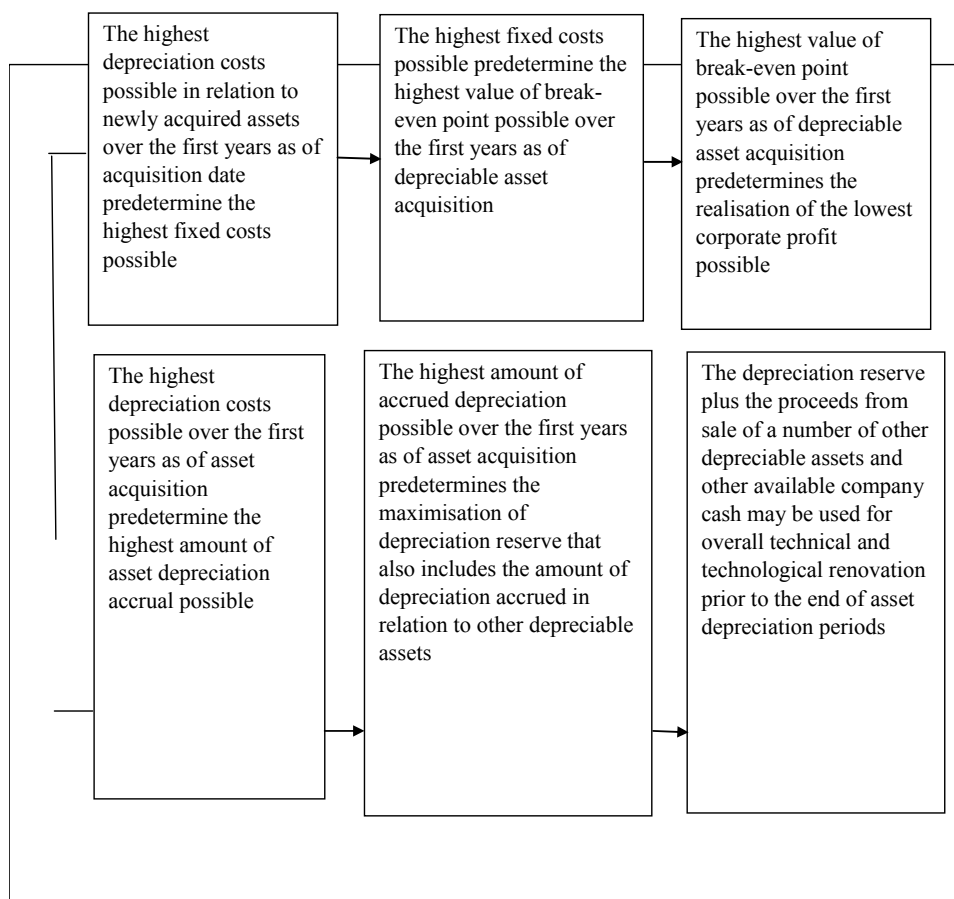| The lowest depreciation costs possible in relation to newly acquired assets over the first years as of acquisition date predetermine the lowest fixed costs possible | → | The lowest fixed costs possible predetermine the lowest value of break-even point possible over the first years as of depreciable asset acquisition | → | The lowest value of break-even point over the first years as of depreciable asset acquisition predetermines the realisation of the highest corporate profit possible |

Source: Paper work by the author.

Principally, corporate profit management is a function of the management of income and expenses forming corporate profit and of the decision of company owners on its allocation. In a competitive environment, hunting for opportunities to optimise income and expenses is crucial. In this context, the equipment and technologies of a company play an important role. Equipment and technologies of higher quality predetermine lower costs per production unit that enables the realisation of higher profit on each sold production unit above break-even point. Moreover, equipment and technologies of higher quality provide the opportunity for bigger volume of production and sale of more products over a particular period of time (where such demand is present). Each of these increases the final financial result of a company.

Profit allocation is another factor of material importance. Generally speaking, retaining a portion of realized profit by a company may allow for growing its business in the future. Company owners should apply precision in determining the profit portion to be allocated as dividends and the profit portion to be retained by the company.

Figure 5

Model of effect of methods of depreciation maximising break-even point of sales and minimising corporate profit

The highest depreciation costs possible in relation to newly acquired assets over the first years as of acquisition date predetermine the highest fixed costs possible	The highest fixed costs possible predetermine the highest value of break-even point possible over the first years as of depreciable asset acquisition	The highest value of break-even point possible over the first years as of depreciable asset acquisition predetermines the realisation of the lowest corporate profit possible
The highest depreciation costs possible over the first years as of asset acquisition predetermine the highest amount of asset depreciation accrual possible	The highest amount of accrued depreciation possible over the first years as of asset acquisition predetermines the maximisation of depreciation reserve that also includes the amount of depreciation accrued in relation to other depreciable assets	The depreciation reserve plus the proceeds from sale of a number of other depreciable assets and other available company cash may be used for overall technical and technological renovation prior to the end of asset depreciation periods

Source: Paper work by the author.

CONCLUSION

In this Article, we have presented the study of a material issue facing companies, i.e. the effect of methods of depreciation effect on break-even point, taking into consideration the Bulgarian legal framework regulating the methods of depreciation and depreciation. We are of the opinion that the financial management experts of a company should be well acquainted with that framework and have thorough knowledge of break-even point method.

The relation of method of depreciation, depreciation, break-even point of sales, sales profit and corporate profit has been described. In addition, the relation of depreciation and related amount accrual and depreciation and applied depreciation methods and opportunities for technical and technological renovation (acquisition of a number of new fixed assets and deployment of new technologies) has been ascertained. Such renovation boosts company competitiveness, which is quite significant in the conditions of market economy.

In general, a successful depreciation policy enables sustainable company functioning. The effect of depreciation and respectively used depreciation methods on break-even point of sales is one of the aspects of that policy. Finally, as presented in this Article, depreciation materially affects the corporate profit that forms a portion of equity and the depreciation reserve that is a source of funds for technical and technological renovation of a company as described above.

We do believe that the presented issues concerning one of the aspects of break-even point method expand the knowledge of that method.

This Article may be useful for practising experts and experts in the economics field who are interested in the issues related to break-even point method.

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