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INTEGRATED DEPRECIATION MANAGEMENT SYSTEM

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Abstract

To solve the problem of separation of financial and tax accounting in terms of depreciation, the authors of the paper propose to use an integrated depreciation system. An integrated depreciation system is a system that combines various methods of depreciation aimed at decrease of the income tax and property tax in the initial periods with the intention of investment of the released funds into the reconstruction and modernization of machinery fleet and equipment with unconditional refund of unpaid tax sums in the following periods. The article describes an optimization mathematical model to substantiate the advantages of the proposed integrated depreciation system. As a depreciation method, the model involves a combination of such methods as: linear method, the method of the sum of the number of years (decreasing depreciation option) and the method of the sum of the number of years (increasing depreciation option). It is noted that these depreciation methods do not contradict the current legislation on taxes and charges. To prove feasibility of the proposed optimization model, a number of limitations were specified. The mathematical model presented in the paper led to the conclusion that only a combination of the method of the sum of years (decreasing depreciation option) and the method of the sum of years (increasing depreciation option) can give the greatest economic effect, consisting in increasing revenues to the budget of the profit tax and the property tax. It should be noted that the use of a linear depreciation method ultimately leads to lower budget revenues.

Keywords: Depreciation methods, mathematical optimization mode.

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1. Introduction

Currently, in the Russian accounting practice, there are a number of problems in terms of depreciation, arising from the separation of financial and tax accounting, as well as inconsistencies of the latter with the western European and North American accounting standards (Ilina, & Tyapkina, 2018; Wagenhofer, 2003; Demina, Larionova, & Chinaeva, 2017; Nechaev, Antipin, & Antipina, 2014).

In the opinion of the authors of the article the problem of combining financial and tax accounting for the purpose of managing funds withdrawn from taxation during the depreciation accrual period can be resolved if an integrated depreciation accrual system is created.

An integrated depreciation system is a system that combines various methods of depreciation, which in the initial periods would minimize the amount of property tax and income tax, with the goal of investing the released funds into the reconstruction and modernization of machinery fleet and equipment with unconditional refund of unpaid tax sums in the following periods (Tyapkina, Ilina, & Ilyashevich, 2017; Madhav, & Reichelstein, 2009; Parasotskaya, 2016).

2. Problem Statement

Since the purpose of optimization is to maximize the amount of depreciation in the initial periods of equipment operation, which would make it possible for the enterprise to maximize the amount of funds for the modernization of fixed assets with a subsequent increase in the amount paid for income and property taxes, the following limitations should be taken into account:

- funds received through the minimization of taxes on income and property are allocated for the purchase of additional equipment;

- depreciation accruing on newly purchased fixed assets should be made in the manner that minimizes the amount of depreciation in the initial operation periods.

So, the introduced limitations or restrictions will allow the enterprise to increase taxes on profits and property after commissioning of newly acquired fixed assets, which were reduced by applying methods that maximize the amount of depreciation in the initial periods of depreciation of operated equipment, thereby, contributing to the return of taxes on profits and property not paid in the first years of operating fixed assets to the budget.

3. Research Questions

The subject of the study is the process of calculating depreciation and its impact on the size of the enterprise tax payments.

4. Purpose of the Study

The purpose of the study is to substantiate the advantages of an integrated system of depreciation by determining the optimal combination of various methods of calculating depreciation with an assessment of corresponding amount of payments on income and property taxes

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5. Research Methods

To prove feasibility and expediency of the proposed optimization, calculations were made according to the proposed concept. For this purpose, a mathematical model was built and all necessary calculations were performed in the following sequence:

- calculation of depreciation on operating fixed assets in a linear way;
- calculation of depreciation on the same fixed assets by the method of the sum of the number of years (decreasing depreciation option);
- calculation of difference between the released amount of income tax and property tax as a result of applying various methods of depreciation;
- calculation of the number of fixed assets that can be acquired through deferred taxation;
- assessment of potential valuof depreciation on newly acquired fixed assets in a linear way;
- assessment of potential value of depreciation on newly acquired fixed assets by the method of the sum of the number of years (increasing depreciation option);
- calculation of possible amount of income tax and property tax from the introduction of additional fixed assets;
- identification of optimal method and corresponding depreciation rate

6. Findings

Before constructing the model, the formalization of procedures for calculating taxes on property and profits took place. For this purpose, the following legend was introduced:

$И_{1_t}$ - property tax for a year using the linear method of depreciation;

$И^*_{1_t}$ - property tax for a year using the linear method of depreciation for new fixed assets purchased at the expense of funds received in the period of deferred taxation;

$И_{2_t}$ – property tax for a year using the depreciation method of the sum of the number of years (decreasing depreciation option);

$И^*_{3_t}$ – property tax for a year using the depreciation method of the sum of the number of years (increasing depreciation option) to newly acquired fixed assets purchased with funds received during the deferred tax period.

The procedure and the formula for calculating property tax are built on the basis of Chapter 30 ‘Property Tax of Organizations’ Part II of the Tax Code of the Russian Federation which was introduced by the Federal Law (2003). According to the Article 375 ‘Tax Base’ the latter is defined as an average annual value of the property recognized as a taxable item. At the same time, when determining the tax base, the property recognized as an object of taxation is taken into account at its residual value in accordance with the established accounting procedure approved in the accounting policy of organization.

The average annual value of a property recognized as a taxable item for a tax (reporting) period is determined as a quotient of dividing the amount received as a result of adding the residual value of the property by the 1st day of each month of the tax (reporting) period and the 1st day of the next month for

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the tax (reporting) period by the number of months in the tax (reporting) period increased by one (Tax Code of the RF, 2004).

Taking into account the regulatory document, the formula should include the valuation of an enterprise property entering the taxable base minus depreciation charges accrued by one of the three selected methods: the linear method (β_1), the method of the sum of the number of years (decreasing depreciation option) (β_2) and the method of the sum of the number of years (increasing depreciation option) (β_3).

The coefficients β_i are the calculated value of depreciation rate for the i-th method of depreciation.

Let us introduce the following legend:

γ - property tax rate;

O_t – (initial) residual value of fixed assets in the t-th year (the residual value in the beginning of the first year of operation is equal to the initial value);

O_t^* – (initial) residual value of fixed assets purchased at the expense of funds accumulated during the period of deferred taxation in the t-th year;

β_1 - the depreciation rate for the linear method of depreciation in the i-th quarter of the t-th year;

β_2 - the depreciation rate in case of the method of the sum of the number of years (decreasing depreciation option) in the i-th quarter of the t-th year;

β_3 - the depreciation rate in case of the method of the sum of the number years (increasing depreciation option) in the i-th quarter of the t-th year;

V is the revenue;

S is the production cost;

Z is the sum of expenses excluding the depreciation on manufactured products;

A is the amount of depreciation on available fixed assets of an enterprise;

D is the profit before tax;

α is the income tax rate;

t is the year number;

k is the length of deferred taxation period (year-on-year).

Let us consider the regulation of calculation of income tax and property tax in the t-th year in the period of deferred taxation.

Income tax:

$$Ht = Dt * \alpha \quad (1)$$

Profit before tax:

$$Dt = Vt - St \quad (2)$$

Cost price:

$$St = Zt + At \quad (3)$$

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The amount of depreciation in the linear method of depreciation:

$$At = Ot * \beta \quad (4)$$

Using the above mentioned legend and formulas (1) - (4), one may calculate income taxes depending on the depreciation method used.

Formula for calculating income tax H_{1_t} using the linear method of depreciation:

$$H_{1_t} = \left[V_t - (Z_t + (O_t\,\beta_1)) - И_{1_t}\right] * \alpha \quad (5)$$

Formula for calculating income tax (for the linear method of depreciation) using newly acquired fixed assets:

$$H^*_{1_t} = \left[V_t - (Z_t + (O^*_t\,\beta_1)) - И^*_{1_t}\right] * \alpha \quad (6)$$

Formula for calculating income tax using the depreciation method for the sum of the number of years (decreasing depreciation option):

$$H_{2_t} = \left[V_t - (Z_t + (O_t\,\beta_2)) - И_{2_t}\right] * \alpha \quad (7)$$

Formula for calculating income tax based on the method of depreciation on the sum of the number of years (increasing depreciation option) using newly acquired fixed assets:

$$H^*_{3_t} = \left[V_t - (Z_t + (O^*_t\,\beta_3)) - И^*_{3_t}\right] * \alpha \quad (8)$$

To determine the difference between the amount of taxes on profits, let us calculate the following:

d_{1_t} - the difference between the amount of income tax at the depreciation rates β_1 and β_2:

$$d_{1_t} = (H_{1_t} - H_{2_t}) \quad (9)$$

Plugging formulas (5) and (7) into formula (9), the following equation is obtained:

$$d_{1_t} = \left[V_t - (Z_t + (O_t\ \beta_1)) - И_{1_t}\right] * \alpha - \left[V_t - (Z_t + (O_t\,\beta_2)) - И_{2_t}\right] * \alpha \quad (10)$$

This formula shows that the final amount of income tax is affected by the amount of depreciation generated by the difference in depreciation rates using the method based on the sum of the number of years (decreasing depreciation option) (β_2) and the linear method (β_1).

The amount of income tax is also influenced by the property tax, the sum of which is equal to the difference in property taxes $И_{1_t}$ and $И_{2_t}$.

Formula (10) makes it possible to calculate the amount of income tax exempt due to changes in the cost value using a combination of the linear method of depreciation and the method of the sum of the number of years (decreasing depreciation option).

Let us now calculate the value of difference between the amount of income tax at the depreciation rate β_1 and β_3:

$$d_{2_t} = (H^*_{1_t} - H^*_{3_t}) \quad (11)$$

Plugging formulas (6) and (8) into formula (11), the following equation is obtained:

$$d_{2_t} = \left[V_t - (Z_t + (O^*_t\,\beta_1)) - И^*_{1_t}\right] * \alpha - \left[V_t - (Z_t + (O^*_t\,\beta_3)) - И^*_{3_t}\right] * \alpha \quad (12)$$

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Regularities similar to those in formula (10) are observed in formula (12).

With the help of formula (12) it is possible to calculate the amount of income tax exempt due to changes in the cost value using a combination of the linear method of depreciation and the method of the sum of the number of years (increasing depreciation option).

The value of the potential payment of both property and income taxes in the period of deferred taxation can be calculated as follows:

$$d_{3_t} = d_{1_t} + d_{2_t} \quad (13)$$

Plugging formulas (9) and (11) into formula (13), the following equation is obtained:

$$d_{3_t} = (H_{1t} - H_{2t}) + (H^*_{1_t} - H^*_{3_t}) \quad (14)$$

Let us transform formula (14) plugging the expressions (5), (7) and (6), (8) into it. As a result the following is obtained:

$$d_{3_t} = \left[V_t - (Z_t + (O_t\,\beta_1)) - И_{1_t}\right] * \alpha - \left[V_t - (Z_t + (O_t\,\beta_2)) - И_{2_t}\right] * \alpha +$$
$$+ \left[V_t - (Z_t + (O^*_t\,\beta_1)) - И^*_{1_t}\right] * \alpha - \left[V_t - (Z_t + (O_t\,\beta_3)) - И_{3_t}\right] * \alpha \quad (15)$$

Let us simplify the formula (15):

$$d_{3_t} = \alpha\left[(\beta_2 - \beta_1)C_t + (\beta_3 - \beta_1)O^*_t - (И_{1_t} - И_{2_t}) - (И^*_{1_t} - И^*_{3_t})\right] \quad (16)$$

This formula can be used to calculate both income and property taxes in the period of deferred taxation and for the entire taxation period until the value of fixed assets is fully depreciated. Formula (16) makes it possible to calculate the time needed to accumulate the amount of tax credit from the amount of property and profit taxes for the purchase of additional units of fixed assets.

With the help of this formula one may also calculate the amount of tax deductions on income tax and property tax for newly purchased fixed assets.

When considering formula (16), the following patterns and interrelations become visible.

Using formula (16) one may calculate the comparative characteristics of different methods of calculating depreciation such as the linear method using the coefficient β1, the method of the sum of the number of years (decreasing depreciation option) - β2, the method of the sum of the number of years (increasing depreciation option) - β3 owing to which one can judge on their impact on these taxes, for example, on property and on profits.

The analysis of formulas (5), (7) and (6), (8), including formula (16) shows that with an increase in the depreciation rates of β2 and β3 the taxable base for income tax decreases and the difference in income tax decreases accordingly which arises as a result of difference in the amount of depreciation. If β2 and β3 decreased, then there would be a reverse increase in the difference of deductions from profit tax.

A decrease or an increase in depreciation rates also lead to a change in property tax. So, in the period of deferred taxation using the method at the rate of β2, compared with the method at the rate of β1, there observed a decrease in the difference in property tax amount between $И_{1_t}$ and $И_{3_t}$, which leads to an increase in taxable income; and vice versa, application of the depreciation method β3, compared with the

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method β1, leads to a decrease in taxable income as there is an increase in the difference between the amount of property tax $И_{3_t}$ and $И_{1_t}$.

Formula (16) is universal as it allows to adapt it to new methods of calculating depreciation, when plugging other values of the coefficient βi into it, and, consequently, to new norms of depreciation deductions. It also makes it possible to predict how these changes would affect the taxable base of both property and income taxes.

7. Conclusion

With the help of the developed mathematical model, it is possible to calculate the amount of funds released at the enterprise during the period of deferred taxation for the modernization of fixed assets and the amount of taxes on income and property to be paid.

The mathematical model makes it possible to conclude that only a combination of the method of the sum of the numbers of years (decreasing depreciation option) through the coefficient - (β2) and the method of the sum of the numbers of years (increasing depreciation option) - (β3) can give the greatest economic effect, including the increasing revenues to the budget of the income and property taxes.

It should be noted that the use of a linear depreciation method ultimately leads to lower budget revenues.

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