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### **MODELING OF THE OPTIMAL STRUCTURE OF MEAT PROCESSING ENTERPRISES**

**Abstract.** In today's economic conditions, problems of functioning of domestic enterprises are not limited by lack of sources of financing of assets, but also often associated with inefficient investment in specific components of property, which adversely affects the level of economic efficiency of Ukrainian enterprises and the development of the economy as a whole.

An important factor in making sound, rational and sound decisions about asset management is to improve existing or develop fundamentally new methods and models for optimizing the structure of assets of Ukrainian enterprises using criteria that are most relevant to current economic requirements, environmental challenges and internal objectives.

In view of the above, the article demonstrates a clear dependence of the structure of the assets of the enterprise and the key indicators that characterize the effectiveness of its management. The optimal structure of assets for the studied enterprises and possible ways of their achievement are offered taking into account the defined criteria. A comparative assessment of the assets structure of the surveyed enterprises before and after optimization was carried out and on this basis the latter was confirmed by comparing the key parameters of the enterprise performance — profit and market value.

A clear sequence of stages of the asset structure optimization model is proposed and described, along with methodological aspects of determining the effective structure of assets, the feasibility of its practical application at Ukrainian enterprises is proved through the achievement of the key goal of the enterprise activity — maximization of market value and profit.

**Keywords:** assets, asset structure, optimization, factor analysis, econometric model, profit growth, increase in market value

**JEL Classification** C3, G31, L66

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## МОДЕЛЮВАННЯ ОПТИМАЛЬНОЇ СТРУКТУРИ АКТИВІВ ПІДПРИЄМСТВ М'ЯСОПЕРЕРОБНОЇ ПРОМИСЛОВОСТІ

**Анотація.** У сучасних умовах господарювання проблеми функціонування вітчизняних підприємств не обмежуються браком джерел фінансування активів, але часто пов'язані з неефективним вкладенням коштів у конкретні складові майна, що негативно позначається на рівні ефективності господарювання підприємств України та розвитку економіки в цілому.

Вагомим чинником ухвалення зважених, раціональних та обґрунтованих рішень щодо управління активами є удосконалення наявних або розроблення принципово нових методів і моделей оптимізації структури активів підприємств України з використанням критеріїв, які найбільше відповідають сучасним економічним вимогам, викликам зовнішнього середовища та внутрішнім цільовим орієнтирам діяльності підприємства.

Зважаючи на вищезазначене, продемонстровано чітку залежність структури активів підприємства і ключових показників, що характеризують ефективність його господарювання. Запропоновано оптимальну з урахуванням визначених критеріїв структуру активів для досліджуваних підприємств та можливі способи їх досягнення. Проведено порівняльну оцінку структури активів досліджуваних підприємств до і після оптимізації та на цій основі підтверджено ефективність останньої шляхом порівняння ключових параметрів ефективності діяльності підприємства — прибутку та ринкової вартості.

Запропоновано та описано послідовність етапів моделі оптимізації структури активів із зазначенням методичних аспектів визначення оптимальної структури активів, доведено доцільність її практичного застосування на підприємствах України через досягнення ключової цілі діяльності підприємства — збільшення ринкової вартості та прибутку.

**Ключові слова:** активи, структура активів, оптимізація, факторний аналіз, економетрична модель, приріст прибутку, зростання ринкової вартості.

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## МОДЕЛИРОВАНИЕ ОПТИМАЛЬНОЙ СТРУКТУРЫ АКТИВОВ ПРЕДПРИЯТИЙ МЯСОПЕРЕРАБАТЫВАЮЩЕЙ ПРОМЫШЛЕННОСТИ

**Аннотация.** В современных условиях хозяйствования проблемы функционирования отечественных предприятий не ограничиваются нехваткой источников финансирования активов, но и часто связаны с неэффективным вложением средств в конкретные составляющие имущества, что отрицательно сказывается на уровне эффективности хозяйствования предприятий Украины и на развитии экономики в целом.

Продемонстрировано четкую зависимость структуры активов предприятия и ключевых показателей, характеризующих эффективность его хозяйствования. Предложена оптимальная с учетом определенных критериев структуры активов для исследуемых предприятий и возможные способы их достижения. Проведена сравнительная оценка структуры активов исследуемых предприятий до и после оптимизации и на этой основе подтверждена эффективность последней путем сравнения ключевых параметров эффективности деятельности предприятия — прибыли и рыночной стоимости.

**Ключевые слова:** активы, структура активов, оптимизация, факторный анализ, эконометрическая модель, прирост прибыли, рост рыночной стоимости.

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**Introduction.** Ever-increasing efficiency of domestic enterprises is a prerequisite and key factor in ensuring the dynamic development of the Ukrainian economy, increasing of the population employment, growing in budget revenues, rising of social protection of the population. Functioning of Ukrainian enterprises occurs in the face of significant challenges and transformational changes, which are often accompanied by crisis phenomena, instability of external and internal environmental factors.

Given the limited ability of enterprises to respond promptly to the influence of external factors, the need for a significant change in the traditional guidelines of financial analysis, search for new management tools for stability, competitiveness and economic growth of domestic enterprises, which is achieved by optimizing the asset structure, rises.

Acting as the basis for the business operation, assets directly affect the labor productivity, economic efficiency, determine the level of solvency and financial stability of enterprises.

The above determines the urgency of finding specific methods for optimizing the structure of assets, taking into consideration the latest requirements for the functioning of enterprises, tools for capital mobilization, strengthening the role of financial and investment operations in improving the level of the economic efficiency.

There is an urgent need to develop a methodology for the formation of an optimal asset structure that would allow establishing the correlation between individual components of the enterprise assets that will maximize the efficiency of operation under the given economic conditions, without reducing the level of its financial stability.

Modeling the processes of forming the optimal structure of enterprise assets based on the profit maximization creates additional reserves for the economic growth of both an individual enterprise and the state.

**Research analysis and problem statement.** A considerable amount of research on the evaluation and optimization of the assets structure and, on this basis, improving the efficiency of enterprises is presented in the scientific literature. In particular, the following scientists have made a significant contribution to the study of these issues: Bolgar T.M., Kalchenko A.O. (2018) [1], Boronos V.G., Plikus I.Yo. (2011) [2], Voronin A.V. (2016) [3], Dekhtiar N.A., Deyneka O.V., Golyk D.V. (2018) [4], Drobetz W., Schillhofer A., Zimmermann H. (2014) [5], Gonchar O.I. (2017) [6], Grigoraş-Ichim C.E., Cosmulese C.G., Savchuk D., Zhavoronok A. (2018) [7], Grosu V., Socoliuc M., Hlaciuc E. (2017) [8], Kovalenko L.O., Remniova L.M. (2005) [9], Podolska V.O., Yarish O.V. (2007) [10], Sosnovska O., Zhytar M. (2018) [11].

Despite the considerable amount of research on improving the structuring of assets, the scientific literature has not yet identified a clear sequence of assets optimization process, specifying the specific methodology, steps, methods for calculating and evaluating indicators. Moreover, the level of absolute liquidity, acceleration of the property turnover, improvement of the level of

financial stability are usually offered as the main optimization criteria. At the same time, in our opinion, it is worth focusing on rising profits and increasing the market value as the main factors for increasing the investment attractiveness of the enterprise, sustainable development in the long run.

The purpose of the article is to develop a scientific and methodological approach to determine the optimal structure of assets of Ukrainian enterprises using the methods of correlation-regression analysis to improve the quality and effectiveness of managerial decision-making.

The research is developed using analysis and synthesis methods, the regression and factor analysis, horizontal and vertical analysis, modeling, the method of construction of analytical tables, method of comparison and generalization, economic-mathematical and logical method, statistical method. These methods made it possible, based on the estimation and generalization of the above calculations, as well as some theoretical provisions, to propose a model of optimizing the structure of assets according to the criteria of net income growth (decrease of loss) and increase of the market value of shares.

**Research results.** Enterprise assets are one of the most important factors in any production, their composition and efficiency of use directly influences the final results of the economic activity of Ukrainian enterprises, determines possibilities of growth of the national economy.

An important prerequisite for increasing the profit of the enterprise is ensuring its production process with adequate assets in the required amount and their efficient use.

The main purpose of the formation of the enterprise assets is to identify and meet the need for their individual types to provide the operating process, as well as the composition optimization to ensure conditions for the effective business activity.

The algorithm for forming the optimal asset structure is proposed to be developed based on the financial statements of three domestic meat processing and packing companies.

Meat production in different countries of the world has always been and remains one of the priority areas of the food market provision. Situation in the market of meat and meat product is subject of constant monitoring and is under analysis since it is always relevant.

It is worth noting that among many criteria, that can be applied by domestic enterprises to improve the structure of assets, there are two main:

-increasing the market value of shares. It assumes that the owner has a strategic goal to maximize his well-being by increasing the value of the company, that is, the market price of the company. It means that the profit obtained by the company is reinvested in business;

-increasing the net income. It assumes the goal of the owner is tactic, i.e., to get current revenue. The net income received by the company is distributed in the form of dividends.

Based on the criteria chosen, available information and source data, it is worth assessing the existing asset structure by performing a vertical analysis of the balance sheet asset and to rank the constituent assets on a weight basis, assuming that they account for more than 1% of the balance sheet total.

Relative values are used in calculations, since the absolute value of the indicator itself does not give a complete picture of the phenomenon under study, its development over time, we use in our calculations relative values that characterize the development trend of the indicator.

Next stage of the study is to determine the rate of return of each asset type by forming matrices of the calculation of the multi-factor regression (*Table 1*), where  $X_i$  — growth rate of «significant» assets of the enterprise,  $Y_1$  — growth rate of the net income,  $Y_2$  — growth rate of the market value of shares (capitalization) of the company.

**Table 1**

**System of matrices of multi-factor regression calculations of the batch of meat industry enterprises of Ukraine**

PJSC Bogodukhiv meat processing and packing plant						
Period	$Y_1$ (Net income)	$Y_2$ (Valuation)	$X_1$ (Monetary funds and their equivalents)	$X_2$ (Receivables for goods, works, services)	$X_3$ (Stores)	$X_4$ (Fixed assets)
2016	1	1	1	1	1	1
2017	1,693	1	0,041	0,951	1,872	1,013
2018	0,939	1	16,714	1,132	1,183	1,121

PJSC Berdychiv meat processing and packing plant						
Period	$Y_1$ (Net income)	$Y_2$ (Valuation)	$X_1$ (Monetary funds and their equivalents)	$X_2$ (Receivables for goods, works, services)	$X_3$ (Stores)	$X_4$ (Fixed assets)
2016	1	1	1	1	1	1
2017	0,632	1	0,981	0,745	0,567	0,764
2018	2,639	1	1,086	1,223	2,278	1,017
PJSC Melitopol meat processing and packing plant						
Period	$Y_1$ (Net income)	$Y_2$ (Valuation)	$X_1$ (Monetary funds and their equivalents)	$X_2$ (Receivables for goods, works, services)	$X_3$ (Stores)	$X_4$ (Fixed assets)
2016	1	1	1	1	1	1
2017	1	1	1	0,818	2,129	0,756
2018	0,814	1	0,831	1,064	1,432	0,982

Source: own calculations.

Next step is conducting of the regression analysis and construction of the regression model. In our sample, the regression analysis of the batch of meat industry enterprises of Ukraine showed the following results (Table 2).

Table 2

Results of the regression analysis of the batch of meat industry enterprises of Ukraine

	$X_1$ (monetary funds)	$X_2$ (receivables)	$X_3$ (stores)	$X_4$ (fixed assets)
PJSC Bogodukhiv meat processing and packing plant				
Regression coefficients ( $Y_1$ — net income)	-0,011	0,219	0,791	0,001
Regression coefficients ( $Y_2$ — valuation)	-0,011	0,959	0,051	0,001
Regression equation	$Y_1 = -0,011X_1 + 0,219X_2 + 0,791X_3 + 0,001X_4$			
	$Y_2 = -0,011X_1 + 0,959X_2 + 0,051X_3 + 0,001X_4$			
PJSC Berdychiv meat processing and packing plant				
Regression coefficients ( $Y_1$ — net income)	0,563	0,001	0,435	0,001
Regression coefficients ( $Y_2$ — valuation)	0,719	0,079	0,201	0,001
Regression equation	$Y_1 = 0,563X_1 + 0,001X_2 + 0,435 + 0,001X_4$			
	$Y_2 = 0,719X_1 + 0,079X_2 + 0,201X_3 + 0,001X_4$			
PJSC Melitopol meat processing and packing plant				
Regression coefficients ( $Y_1$ — net income)	0,858	0,130	0,011	0,001
Regression coefficients ( $Y_2$ — valuation)	0,390	0,528	0,081	0,001
Regression equation	$Y_1 = 0,858X_1 + 0,130X_2 + 0,011X_3 + 0,001X_4$			
	$Y_2 = 0,390X_1 + 0,528X_2 + 0,081X_3 + 0,001X_4$			

Source: own calculations.

Next step of optimization is determination of the correlation between separate components of assets and it assumes the calculation of weighted average rate of return on assets by selected criterion through multiplying the share of the chosen asset for the income coefficient (Table 3, 4).

Table 3

Calculation of the weighted average rate of return on assets by the criterion of net income growth of the batch of meat industry enterprises of Ukraine

	Share in assets	Profit margin of the asset (in order to increase the net income)	Calculation of the weighted average rate of return
PJSC Bogodukhiv meat processing and packing plant			
Monetary funds and their equivalents	0,010	-0,011	0,000
Receivables	0,209	0,219	0,046
Stores	0,119	0,791	0,094
Fixed assets	0,608	0,001	0,001
Weighted average rate of return	X	X	0,035
PJSC Berdychiv meat processing and packing plant			
Monetary funds and their equivalents	0,059	0,563	0,033
Receivables	0,020	0,001	0,000
Stores	0,009	0,435	0,004
Fixed assets	0,881	0,001	0,001
Weighted average rate of return	X	X	0,010
PJSC Melitopol meat processing and packing plant			
Monetary funds and their equivalents	0,048	0,858	0,043
Receivables	0,131	0,130	0,017
Stores	0,181	0,011	0,002
Fixed assets	0,592	0,001	0,001
Weighted average rate of return	X	X	0,016

Source: own calculations.

Table 4

Calculation of the weighted average rate of return on assets by the criterion of increasing the market value of shares of the batch of meat industry enterprises of Ukraine

	Share in assets	Rate of return on the asset (in order to increase the market value)	Calculation of the weighted average rate of return
PJSC Bogodukhiv meat processing and packing plant			
Monetary funds and their equivalents	0,010	-0,011	0,000
Receivables	0,209	0,959	0,200
Stores	0,119	0,051	0,006
Fixed assets	0,608	0,001	0,001
Weighted average rate of return	X	X	0,052
PJSC Berdychiv meat processing and packing plant			
Monetary funds and their equivalents	0,059	0,719	0,042
Receivables	0,020	0,079	0,002
Stores	0,009	0,201	0,002
Fixed assets	0,881	0,001	0,001
Weighted average rate of return	X	X	0,012
PJSC Melitopol meat processing and packing plant			
Monetary funds and their equivalents	0,048	0,390	0,019
Receivables	0,131	0,528	0,069
Stores	0,181	0,081	0,015
Fixed assets	0,592	0,001	0,001
Weighted average rate of return	X	X	0,026

Source: own calculations.

If we know the net profit margin of each type of assets, we can find their efficient structure, under which the weighted average profit margin will be maximal. At the same time, we impose restrictions on the maximum and minimum values of the share of the asset in the balance sheet total, taking into consideration the branch of the enterprise, financial stability and liquidity of the balance.

When looking for a solution for the weighted average return on assets, we set the maximum required value. By changing the assets share in the balance sheet total, establishing the range of deviations of the assets share according to the specifics of enterprises, requirements for financial stability and accounting liquidity, we can create the maximally efficient structure of assets, presented in *Table 5, 6*.

Table 5

Optimal structure of assets of the batch of meat industry enterprises of Ukraine by the criterion of increasing the net income

	Share in assets	Rate of return on asset (in order to increase the net income)	Calculation of the weighted average rate of return
PJSC Bogodukhiv meat processing and packing plant			
Monetary funds and their equivalents	0,020	-0,011	0,000
Receivables	0,219	0,219	0,048
Stores	0,261	0,791	0,206
Fixed assets	0,500	0,001	0,001
Weighted average rate of return	X	X	0,064
PJSC Berdychiv meat processing and packing plant			
Monetary funds and their equivalents	0,081	0,563	0,046
Receivables	0,170	0,001	0,000
Stores	0,201	0,435	0,087
Fixed assets	0,548	0,001	0,001
Weighted average rate of return	X	X	0,033
PJSC Melitopol meat processing and packing plant			
Monetary funds and their equivalents	0,076	0,858	0,065
Receivables	0,158	0,130	0,021
Stores	0,225	0,011	0,002
Fixed assets	0,541	0,001	0,001
Weighted average rate of return	X	X	0,022

Source: own calculations.

Table 6

Optimal structure of assets of the batch of meat industry enterprises of Ukraine by the criterion of increasing the market value of shares

	Share in assets	Asset profitability ratio (in order to increase the market value)	Weighted average rate of return
PJSC Bogodukhiv meat processing and packing plant			
Monetary funds and their equivalents	0,020	-0,011	0,000
Receivables	0,218	0,959	0,209
Stores	0,211	0,051	0,011
Fixed assets	0,548	0,001	0,001
Weighted average rate of return	X	X	0,055
PJSC Berdychiv meat processing and packing plant			
Monetary funds and their equivalents	0,104	0,719	0,074
Receivables	0,136	0,079	0,011
Stores	0,239	0,201	0,048
Fixed assets	0,521	0,001	0,001
Weighted average rate of return	X	X	0,034

PJSC Melitopol meat processing and packing plant			
Monetary funds and their equivalents	0,079	0,390	0,030
Other receivables	0,191	0,528	0,101
Stores	0,211	0,081	0,017
Fixed assets	0,519	0,001	0,001
Weighted average rate of return	X	X	0,037

*Source:* own calculations.

With the asset structure recommended by us, the weighted average rate of return on assets is higher than the actual structure for all batch companies by all given criteria. Based on this, we conclude that the asset structure found is effective.

At the last stage, the appropriate optimal asset structure is achieved, i.e. actions are taken to redistribute the value into different types of assets before achieving the planned strategy for their effective structure. For example, in order to achieve the optimal assets structure, PJSC Bogodukhiv meat processing and packing plant should aim to increase credit sales (i.e. increase accounts receivable) to the maximum critical value of accounts receivable in the asset structure of 22%. The company should also strive to increase inventories in all their types, which also involves increasing production and sales. Cash balances and their equivalents should be at the minimum critical value (2% of the balance sheet total) to maintain the accounting liquidity. Fixed assets should be at their maximum level of 50—55% of the balance sheet total.

Therefore, there are no existing approaches to optimizing the structure of assets that would optimize the assets of an enterprise by the criterion of maximizing their effectiveness for the owner. Using the regression analysis function, you can find the structure of the assets of the company, in which they will bring maximum effect. Moreover, the effect in this method can be understood both as maximizing net profit and maximizing the market value of the company, which has recently become a strategic goal of business.

**Conclusions.** Using the economic-mathematical method based on the generalization of the output data of the financial and economic activity of the meat industry enterprises, an approach to model the optimal asset structure by the criteria of rising the net profit and increasing the market value of shares is proposed.

The result of the study demonstrated the effectiveness of the proposed model through the prism of changing key performance indicators in the existing property structure of the studied enterprises and the projected asset structure. The sequence of steps and methodology identified in this study will significantly improve the quality of forecasting at enterprises; enhance the redistribution of the value into certain types of assets at a particular enterprise and in the economy as a whole.

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