

# PRAXEOLOGY OF THE ENGINEERING THEORY OF MANAGEMENT ACCOUNTING IN ENTERPRISES OF THE AGRICULTURAL SECTOR: A SYSTEM OF DERIVED BALANCES (IN UKRAINIAN CONTEXT)

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**Abstract:** The article examines the application of praxeological principles to the engineering theory of management accounting at enterprises in the agricultural sector. A system of derivative balance sheets is proposed, which enables effective management of financial resources and risks in the agricultural sector. Management accounting methods and tools are analyzed, taking into account the specifics of the agricultural sector. The results of the study allow agricultural enterprises to improve the efficiency of management accounting and make informed decisions.

**Keywords:** management accounting; agricultural enterprises; accounting theory; derivative balance sheets.

## 1 Introduction

Investigating the effectiveness of the engineering theory of management accounting, it is appropriate to talk about its practical manifestations, that is, its suitability for practical adaptation of scientifically based hypotheses and unproven assumptions [2; 15]. The emergence and fairly wide spread of strategic management accounting should be considered one of such manifestations.

Thus, transformative changes in the economy and the complication of the orientation of agricultural enterprises in the system of market relations determined the growing importance of the construction of strategic accounting as an effective tool for improving the quality of management decisions made in the conditions of increased competition, risk, and instability of the market environment [14].

Practically all studies devoted to the issue of strategic management accounting are based on the creation and use of a wide variety of accounting models, standards, methods, layouts, and computer programs.

The considered sectoral and accounting-analytical aspects of agricultural enterprises, which affect the methodology and expediency of implementing certain areas of strategic management accounting, objectively lead to the need to develop an appropriate accounting model based on the provisions of engineering theory.

## 2 Literature Review

In recent years, Ukrainian practicing accountants and researchers have begun to pay considerable attention to the problems of modelling strategic accounting. In particular, it is about:

- Models of fractal derivatives of balance sheets taking into account fractals of space and time [19-21];
- Strategic management accounting models [25-27];
- Situational model of strategic accounting and risk management [23; 24];
- Accounting model of strategic property accounting [6];
- Situational model of strategic management accounting, organizational model of strategic accounting [7-14];
- Accounting models for estimating the value of the firm [28].

Modelling is widely used in accounting, and according to various estimates, more than 500 accounting models have been developed and are currently in use. This is due to the fact that accounting is an artefact, that is, a mentally reproduced process, which for the purposes of research and improvement can be presented in the form of a model.

From the standpoint of the engineering theory of management accounting, the modelling function is enriched through the use of tools, methods, and models of related sciences. In particular, the development of basic structures (of the engineering type) with predetermined support points is quite effective.

We present the toolkit of accounting engineering in the form of creating a system of derivative balance sheets. Derivative means secondary transformation taking into account any, as a rule, price and specific (determined by management goals) features, and balance.

For the first time, the possibility of compiling derivative balance sheets was identified by Dutch professor Theodore Limperg. He developed a concept of value based on the principle of hypothetical withdrawal and proposed to calculate the value of an enterprise by determining the loss (or profit) upon the withdrawal of its assets [17].

Also, T. Limperg proposed for the first time to make hypothetical entries in accounting as a result of hypothetical business processes (operations). The appearance of hypothetical records served the development of derivative balance sheets and prompted a revision of established views on the static nature of accounting, in particular managerial accounting [17].

## 3 Materials and Methods

In our research, we used the main provisions of economic theory, the economics of agrarian formations, management and regulation of their development, modern organizational and managerial scientific ideas about their mechanisms and tools both in Ukraine and abroad, and relevant regulatory and legislative acts at the national and European levels.

Based on the results of the research, we used a complex of modern general scientific and special methods of scientific knowledge. Among the methods of research, the method of generalization, systematization, as well as the monographic method was used. Also, in the process of conducting the research, we used the methods of deduction and induction, dialectical unity and contradiction, historical, system-structural analysis, and synthesis – when performing scientific abstractions and theoretical generalizations. In order to visualize the results of our research, we use the graphic method and the method of schematic visualization.

## 4 Results and Discussion

It is important that the most essential prerequisites for the development of a constructive model of derivative strategic balances are the following:

- Firstly, the economic processes of the functioning of economic entities are largely related to the existence of contradictory information, the assessment of the reliability and relevance of which makes a significant contribution to solving the problem of strategic decision-making and is a prerequisite for the development of accounting and analytical support for production and implementation strategies of sustainable development of organizations;
- Secondly, when choosing options for constructive models of derivative strategic balances, the determining factor is the relationship and interaction with other accounting

subsystems - operational, primary accounting, financial, tax, etc.;

- Thirdly, there is a need to carefully study and determine the level of influence of external institutions, which is expedient to calculate when developing an optimal strategy for the behaviour of an economic entity as a clear direction and appropriate choice. At the same time, a certain system of derivative balance sheets is formed with clarification of their structure, content, and technology for calculating indicators during the transformation from different angles [1];
- Fourthly, the process of developing derivative balance sheets is based on strategic management technology, which is formed taking into account internal and external institutional factors, the policy of the accounting institute, and the corresponding internal accounting policy;
- Fifthly, the construction of the methodology for forming a constructive model of derivative strategic balances depends on the state of the external environment and is determined by a complex of factors: the political line of the state; labour market; conjuncture; bank policy; professional groups; NGOs; clients; suppliers; technologies; owners; positions of social life (Figure 1).

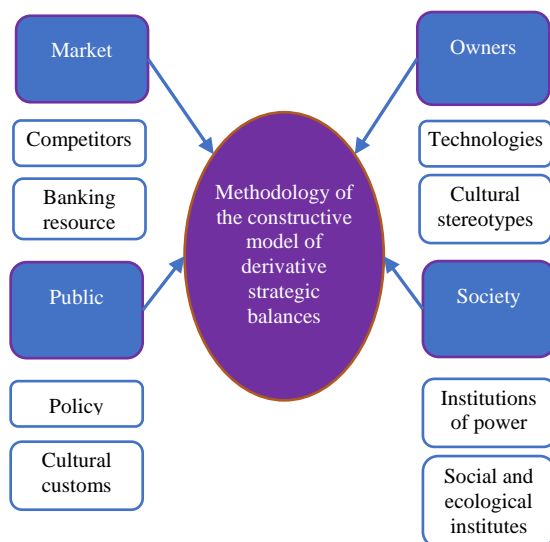


Figure 1. Formation of the methodology of the constructive model of derivative strategic balances taking into account the influence of the external institutional environment

Source: authors' own development.

The development of a constructive model of derivative balance sheets from the standpoint of the engineering theory of management accounting implies three options for the functioning of accounting systems:

- 1) An integrated system of engineering management accounting, which is a mutual interweaving (application of methods, tools, techniques, etc.) of financial, statistical, tax, operational, and strategic management accounting, built on the basis of the use of an aggregated (structured in a given construction) work plan of accounts and accounting tools engineering [3];
- 2) An independent system of engineering management accounting, the essence of which is the partial application of methods and tools of related sciences (economics, management, finance, marketing, riskology, informatics, etc.);
- 3) A combined ("floating", "flexible") system of engineering management accounting, which is formed on the basis of general methodological approaches inherent in accounting.

However, the database provides a set of various structures for established, most recurring economic situations (Figure 2).

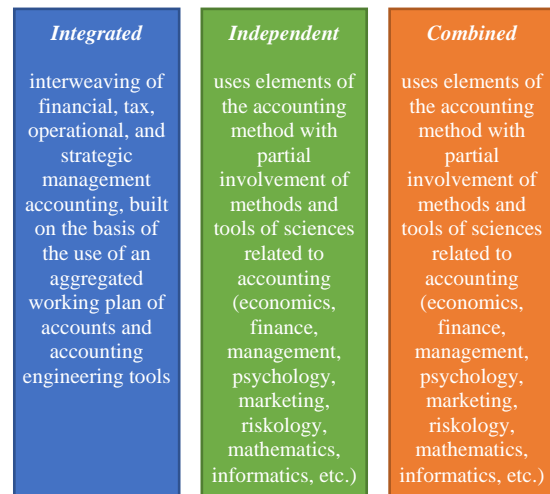


Figure 2. Variants of the functioning of the engineering management accounting system

Source: authors' own generalizations.

The main block of the constructive model of derivative strategic balances is the "Aggregated Chart of Accounts" structure, which forms the basis of strategic management accounting. This is due to the fact that the use of the principles of the architecture of the chart of accounts [16] allows the integration of objects and engineering mechanisms of strategic accounting into it:

- Property,
- Venture capital,
- Solvency,
- Backup system,
- Risks,
- Innovations,
- Value creation chain, etc.

The structural element of the aggregated chart of accounts is a fundamental accounting construct, which is considered a universal aggregate (element, particle, tool) for building engineering constructive models of derivative management balances.

A fundamental accounting structure is a functionally completed aggregate (node) of the chart of accounts, which ensures the independent functioning of strategic management accounting and the determination of results by accounting objects. The complex fundamental accounting structures guarantee the stable operation of the system and the focus of strategic management accounting on the final result.

The rapid development of innovative information systems and cloud technologies has led to the appearance of new modifications of the chart of accounts, built on the use of architectural principles, possessing exceptional information capabilities and properties of a complete system with the use of various modules, sections, computer programs in their structure in order to solve the most diverse information management tasks [19].

Architectonics makes it possible to insert and remove individual components, in addition to designing processes by connecting components together. The described systems are quite expensive, however, they provide flexibility and customization. Adaptive architecture implements a completely new approach to handling and managing constantly changing integrated tasks and processes, which can be internal or external [29]. The enterprise gets the opportunity to design components and use them in such a way as to ensure, if necessary, continuous successful engineering and re-engineering of new processes, and not just engineering at the design level. At the same time, the models of derivative strategic balances built using accounting engineering

tools are effective: actuarial, organic, substantive, venture, strategic, innovative, synergistic, situational, segmental, marketing, resource, sectional, and others.

By ensuring the connection of aggregated accounts with the structure of the agricultural enterprise, the analytical level of the accounting system increases to 50-100 thousand analytical positions.

The logical component of the construction of derivative balance sheets works according to the hypothetical principle. On the basis of the set tasks, a working hypothesis is formed, which boils down to the dependence and conditionality of the activity of the agricultural enterprise on the factors of the external environment, which by 80% determine the performance of the enterprise, the change in its value in the form of net assets and net liabilities, and the need to determine these factors, assess the impact, forecasting, control, and analysis.

The method of forming derivative balances in the management accounting system of an agricultural enterprise can be developed only by borrowing the tools of related sciences (using an engineering approach). The most important from the point of view of strategic management are the following derived balances:

- Derivative balance sheet of property management
- Derivative balance of management of agency relations
- Derivative balance of physical capital management
- Derivative balance of intellectual capital management (informal knowledge)
- Derivative balance of knowledge management (formalized) of an economic entity.

The system of derivative balance sheets - strategic, segmental, forecast, situational, hedged, and integrated risk - acts as an accounting and analytical toolkit for strategy development, display, and implementation [18]. The derivative balance system provides:

- Accounting for factors of external influence;
- Display of alternative (multivariate) strategic decisions with appropriate analytics (types of activity, internal segments, external segments, directions of strategic activity, market segments, strategic horizons, etc.);
- Accounting for assets and liabilities that arise as a result of the implementation of the adopted strategy (solvency, procurement, sales, competitive, etc.);
- Recording of assets and liabilities arising as a result of a change (adjustment) of the strategy;
- Recording of assets and liabilities due to the use of a new strategy;
- Display of hypothetical processes of conditional realization of assets and satisfaction of obligations necessary for making price decisions.

Derived balances strengthen the analytical nature of the accounting system, which involves the reflection in the system of sub-accounts and analytical positions of the structured chart of accounts of the used types of activities, internal, external, market segments, directions of strategic activity, and other analytical positions, taking into account the peculiarities of the activity and strategic directions of the agricultural organization development.

The mechanism of strategic accounting in its general form is represented by a system of accounting mechanisms for the implementation of online, reserve, segmental, and predictive strategy - a system of derived balances. Derived balances have the following formation algorithm and structural design:

- 1) Basic balance sheet (sections of the structured chart of accounts);
- 2) Adjusting accounting records based on operational management information;
- 3) Intermediate adjusted derivative balance;

- 4) Specific records of strategic operations taking into account the influence of external institutional factors;
- 5) Intermediate or final strategic derivative balance;
- 6) Hypothetical operations or processes if they exist;
- 7) Final hypothetical derivative balance.

The algorithm for forming derivative balances is presented in Figure 3.

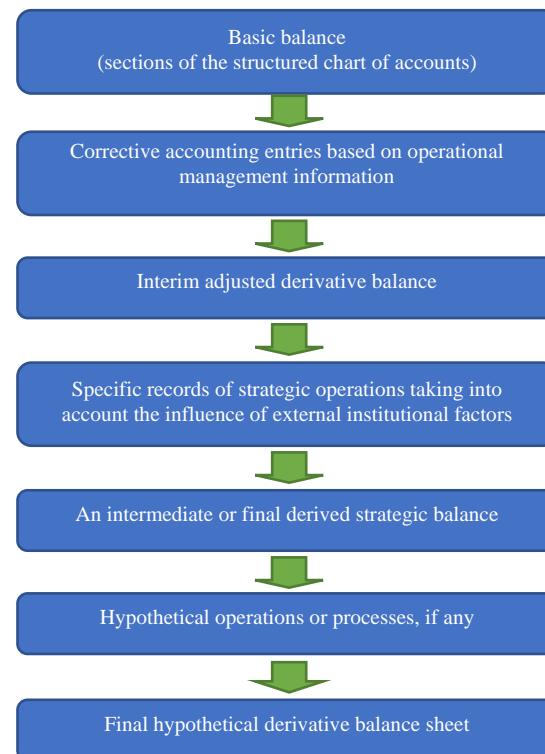


Figure 3. Algorithm for the formation of derivative strategic balances

Source: authors' own generalizations.

In addition to the above-mentioned balances, scientists distinguish a number of others, the simplest of which is considered a zero balance sheet. The founder of zero balances is T. Limperg [17].

The balance is considered zero if there are free cash sources in the asset and the corresponding structure of net liabilities (authorized capital, additional capital, reserve capital, net profit, added value) in the liability. It contains data on the movement of capital and the value of liabilities and assets shown on the balance sheet.

To get a zero balance, one needs to carry out a conditional sale of all assets of the enterprise, repayment of receivables, and obligations to creditors. Based on it, the main control mechanism was created in the form of a zero balance, which is used during any inspection [4].

The method of using accounting engineering tools by agricultural enterprises is based on the following basic positions:

- Focus on the use of a strategic structured plan of accounts;
- Use of computer programs for derivative balance sheets;
- Use of aggregated accounting records;
- Compilation of accounting records by consolidated aggregates.

Table 1 presents the format and structure of the derived strategic balance sheet.

Table 1: The form and structure of the derived strategic balance sheet

Basic balance	Adjustment for operative information	Derivative adjusted balance	Adjustment for external institutional influences	Derivative strategic balance	Adjustment for hypothetical changes	Derivative hypothetical balance
Assets <i>aggregate accounts</i> ...		Assets <i>aggregate accounts</i> ...		Assets <i>aggregate accounts</i> ...		Assets <i>aggregate accounts</i> ...
Passives <i>aggregate accounts</i> ...		Passives <i>aggregate accounts</i> ...		Passives <i>aggregate accounts</i> ...		Passives <i>aggregate accounts</i> ...
Balance	Turn-overs	Balance	Turn-overs	Balance	Turn-overs	Balance

Source: authors' own generalizations.

Sections and groups of accounts of the structured chart of accounts have the following presentation:

Chapter I "Non-current assets"  
 Section II "Production stocks"  
 Chapter III "Cash"  
 Chapter IV "Calculations"  
 Chapter V "Loans and targeted financing"  
 Chapter VI "Equity"  
 Chapter VII "Reserves"  
 Chapter VIII "Revenues"  
 Chapter IX "Expenses"  
 Chapter X "Results of activity".

The sections of the strategic derivative balance sheet are also a simplified representation of its aggregated elements, namely:

Chapter I "Non-current assets"  
 Section II "Current assets"  
 Chapter III "Equity"  
 Chapter IV "Commitments".

As a result, the number of accounting transactions is reduced from 12,000 to 10-20, which allows:

- Creating automated versions of derivative balance sheets in the form of computer engineering programs;
- Using the price system (balance, market, collateral, fair, liquidation, etc.);
- Obtaining basic indicators of ownership - aggregated indicator of net assets and disaggregated indicator of net liabilities;
- Solving the problems of development of strategic management accounting at agricultural enterprises;
- Introduction of practical development and approval of the methodology of using accounting engineering tools.

The methodology of using accounting engineering tools in the formation of derivative strategic balances in agricultural enterprises includes six blocks:

- Objects of strategic accounting;
- Assessment of activity results;
- Strategic accounting analytics;
- Process of strategic accounting;
- General economic mechanism of using accounting engineering tools;
- Decision-making.

The first block of the methodology for using accounting engineering tools in agricultural enterprises is represented by objects of strategic accounting:

- a) Objects of the resource potential of the agricultural organization;
- b) Objects of external management.

The second block of the methodology provides an assessment of the results of strategic accounting on the basis of a consolidated derivative balance sheet of strategic accounting, the structure and composition of which will depend on the selected accounting areas and objects.

The third block of the methodology, in accordance with the positions of the structured chart of accounts, provides appropriate analytical strategic accounting with a reflection in the system of derived balances:

- Types of activities: specialized derivative balances;
- Internal segments: segmental derived balance sheet;
- External segments: segmental, fractal derivative balances;
- Directions of strategic activity: strategic, fractal derivative balances;
- Main directions of development: forecast derivative balances;
- Market segments: segmental, venture derivative balance sheets;
- Links and segments of the value creation chain: sectional derived balance sheet;
- External economic situations: situational derivative balance;
- Main strategic measures: strategic derivative balance.

The fourth block of the methodology for forming derivative strategic balances structurally includes three stages, which allow for a better understanding of the relationship between strategic management and its information support system:

- Strategic planning, forecasting;
- Strategic control;
- Strategic analysis.

The Swiss researcher Johann Friedrich Scher (cited in Boiar et al.) wrote that accounting is an impeccable judge of the past, a necessary companion of the present, and a guide to the future of every economic enterprise [5]. The above can be fully attributed to the engineering theory of management accounting, which allows planning and forecasting the development of economic processes with the help of appropriate tools, methods, and techniques.

In strategic planning and forecasting, not only internal but also external factors of the macro environment of the agricultural enterprise are taken into account.

Strategic forecasting is able to determine the scenarios of the future state of the agricultural organization with the determination of alternative options and potential development opportunities, forms the basis for the development of economically justified decision options based on forecast and specialized derivative balance sheets.

The process of strategic accounting will be effective only if there are appropriate control procedures with subsequent adjustments of decisions, strategies, and plans.

The organization of control over the results of implemented strategies is based on the application of the system of zero balances. The zero balance is built on the basis of the hypothetical realization of assets and the hypothetical satisfaction of obligations on the relevant dates of control with the acquisition of free cash resources in the asset, and the corresponding sources in the liability, and the determination of the main factors for determining ownership.

The strategic analysis allows evaluating the results of the implementation of the strategy, and its effectiveness in relation to the value of the agricultural enterprise, with the generalization of information in the form of strategic information and reports, which are directly used in decision-making.

The fifth block of the methodology “The general economic mechanism of using accounting engineering tools” is represented by the algorithm for integrating the display of strategic processes, factors, and operations: the initial operator is the sections of the structured chart of accounts or sections of the balance sheet.

A key feature of accounting engineering tools is the compilation of postings by aggregates, which can act as sections of a structured chart of accounts, balance sheet, etc., to focus attention on aggregated indicators of the value of equity capital: net assets at book value and market value, net liabilities at fair value, etc. This will make it possible to reduce the number of accounts and develop automated versions of derivative balances in selected directions.

Actual, forecast, expert, and other data in the section of the structured chart of accounts can be taken from the data of the financial accounting information base, the general ledger, the balance sheet, and the budget, balance sheet, etc.

Based on the fact that the main evaluated indicator of the implementation of the strategy is the growth of the market value of the capital, all aggregated accounting records are considered in relation to their impact on the value of the agricultural enterprise.

The sixth block of the “Decision-Making” methodology focuses on making operational, tactical, and strategic decisions on the management of objects of strategic accounting in the conditions of the existing macro-environment (Figure 4).

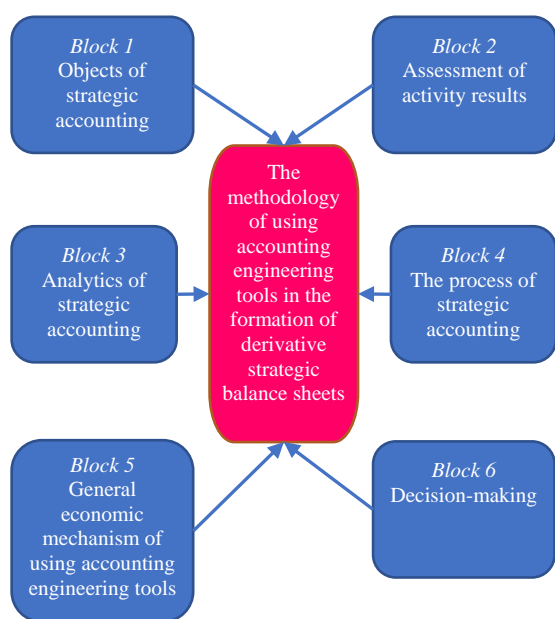


Figure 4. The methodology of using accounting engineering tools in the formation of derivative strategic balance sheets\*  
Source: developed by the authors

## 5 Conclusion

The developed and recommended method of using accounting engineering tools in agricultural enterprises includes six blocks (objects of strategic accounting, evaluation of activity results, strategic accounting analytics, strategic accounting process, general economic mechanism of using accounting engineering tools, and decision-making) and provides comprehensive

strategic management accounting and the efficiency of management of objects of resource potential and the external environment of the agricultural enterprise based on the application of the system of derivative balances.

Derived balances strengthen the analytical nature of the accounting system, which involves the reflection in the system of sub-accounts and analytical positions of the structured chart of accounts of the used types of activities, internal, external, market segments, directions of strategic activity, and other analytical positions, taking into account the peculiarities of the activity and strategic directions of the development of the agricultural organization. The system of derivative engineering balances provides accounting for factors of external influence; display of alternative (multivariate) strategic decisions with appropriate analytics (types of activity, internal segments, external segments, directions of strategic activity, market segments, strategic horizons).

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**Secondary Paper Section: AH, GA**