Published in 2018
by «Scientific Route» OÜ
Narva mnt 7-634, Tallin, Harju maakond, Estonia, 10117

ISBN 978-9949-7316-2-6 (Hardback)
ISBN 978-9949-7316-3-3 (eBook)

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Assessment in Accounting: Concept and Tools

Monograph

General editorship
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December, 2018

Scientific Route

Tallinn
Estonia

Chapter 4
5D paradigm of actuarial accounting in the system of the cost of business valuation

4.1 Business valuation for the use of actuarial calculation in the management system

Business valuation is an extremely important category in the current market economy. In foreign and domestic practice of valuation of the enterprise, there are many approaches to its implementation. Valuation of particular relevance is acquired in the conditions of selling a business as an integral property complex (IPC). An investor is always inclined to the opinion of an expert valuer when it makes a decision on acquiring a business as a property.

After all, the expert valuer provides a scientifically-based opinion on the value of the property being valued in monetary terms. That is, the cost of a business is a valuation of the amount of money that third-party buyers are willing to pay in order to acquire an enterprise as a CEC. The process of determining the value of an enterprise is itself its valuation [163].

In a modern business management system for a rather long period of time, there are several basic approaches to the valuation of an enterprise. In particular, among them: income, cost (or property) and market (or comparative). Methodical approaches to valuation of a business are widely discussed in the works of leading domestic and foreign scientists, in particular: A. Vorobiova, Y. Derevianko, M. Yefimova, I. Kriukova, A. Lukash, A. Matiushenko, A. Nikolaenko, S. Starchenko, I. Filipova, A. Kharitonov, V. Khaustova, V. Scherbakova, N. Scherbakova and others. Each scientist reveals the content of existing approaches and methods for valuation of a business, provides them with a comparative description and justifies the effectiveness and feasibility of using various methods in practice.

In particular, Yu. Derevianko, A. Lukash and L. Starchenko [164] raise topical issues of improving the existing approach to evaluation by introducing an approach that would take into account a greater number of influence factors and give more adequate information about the value of commercial activities, taking into account possible changes in the future.

In particular, scientists propose the use of an integrated measure of the value of a company, the calculation of which is based on the use of the principles of both income and cost approaches, which helps to account for a larger range of information. In turn, A. Nikolaeva, M. Efimova [165] emphasize the cost (property) approach to valuation of a business and incline priorities to the net assets method. However, a detailed and comprehensive description of existing approaches to valuation of a business based on the actuarial aspect and in the context of the functioning of International Financial Reporting Standards has not yet been considered, which necessitated further research in this direction. After all, none of the existing approaches to the valuation does not take into account the indicators of other time dimensions, that is, it is based on fairly static information, does not take into account the prospects for changes in the property potential of a business in the forecast time dynamics. The latter can be gleaned from the accounting and information content of the innovative 5D paradigm of actuarial accounting and reporting.

The aim of the study is improvement of the approaches to valuation of a company based on the use of actuarial calculation and actuarial financial statements. Such an approach will form the foundation for an objective prospective valuation of a business, taking into account the ever-increasing needs of real and potential investors in terms of selling a business as an IPC. In addition, actuarial financial statements fully take into account the recommendations of the Conceptual Framework for Financial Reporting and not inconsistent with the context of International Financial Reporting Standards (IFRS).

The updated Conceptual Framework for Financial Reporting-2018 contains a new section 6, Measurement. It reveals the essence of the valuation of the initial cost and valuation of the current cost, as well as the essence of the factors that should be considered when choosing datasets for valuation [14].

The main valuation approaches used in domestic and foreign valuation practice include: income; cost (property) and comparative. The income approach is based on such valuation methods as: the method of discounting cash flows; capitalization method. The basis of the cost (property) approach is based on such methods as: replacement method; salvage value calculation method; asset accumulation method; net assets method (adjusted book value of the enterprise). The comparative approach is based on such methods as: method of accumulation of assets; method of liquidation value, and is used in conditions where it is not possible to apply the income or cost approaches.

Each of these approaches contains a number of advantages and disadvantages. But it is quite obvious that the activities of a modern enterprise should be strategically focused on the future prospects of functioning in a dynamic economic and international arena. Quite well, such aspects, in our opinion, take into account the income approach to business valuation.

However, Yu. Derevianko, A. Lukash, L. Starchenko [164] note that one of the main problems that arises when using the income approach is the forecast of future income. To calculate the value of the cost within this

approach, it is important to obtain sufficiently accurate data on the future income of the enterprise, which causes certain difficulties in practical application. According to scientists, the use of the income approach allows to more fully take into account the target values, consistent with the indicators of the economic and social development of the country [164, p. 94].

The income approach is an approach to valuation of a business based on a prospective determination of the value of an enterprise in accordance with the «*future economic benefits*» of owning it [163]. It is based on a probabilistic approach to forecasting the future incomes of an enterprise and complex mathematical tools.

It is worth noting that in the new edition of the Conceptual Framework for Financial Reporting-2018, the approaches to the interpretation of key accounting items: assets, capital, liabilities, expenses and income will be radically changed.

In particular, the main change in the interpretation of the term «asset» refers to the fact that an asset should be regarded as an «economic resource» and not «*income from future economic benefits*» from owning it. Accountant-expert A. Homiuk [168] notes that the exclusion of «expected incomes» means that it is not necessary to be confident in receiving economic benefits; The low probability of obtaining economic benefits in turn may affect the decision to recognize and value the asset.

In our opinion, similarly, if an expert makes a valuation, then the parameters of an enterprise's value within the framework of the income approach concept should be interpreted as «future economic potential» instead of «future benefits from owning the enterprise». To a certain extent, the term «ownership of an enterprise» echoes a new category of the Conceptual framework for financial reporting, such as «*stewardship*». Since we are talking about the conditions for the sale of a business as an integral property complex, the term «responsible management» will play an extremely important role. In addition, for enterprises of the corporate form of organization of business processes, this category is extremely relevant. After all, large corporations quite often encounter a conflict of interests of the direct owners of the business (investors) and managers of the highest levels of business (the so-called top-managers). This situation gives rise to the emergence of an «agency conflict», that is, the prevalence of the interests of managers over the interests of the actual shareholders (owners) of the enterprise.

Because of this, business owners must bear a number of agency costs in order to encourage senior managers to act from the point of view of shareholders' property, and not just their own «selfish» interests in managing business processes at corporate enterprises. The main problem of moral hazard is that shareholders in practice do not have the ability to control all actions of managers. By virtue of such circumstances, in the category «agency expenses» include:

– the cost of monitoring the activities of managers (i. e., the costs of organizing and conducting audits);

— the cost of creating an organizational structure that limits the undesirable behavior of managers (in particular, the introduction of external investors into the Board of Directors of an enterprise);

— alternative agency costs, in circumstances where the conditions are determined by shareholders limit the actions of managers, which contradict the achievement of the main goal of the corporation — an increase of shareholders' wealth [167].

That is, only the «responsible management» of the company can overcome the «agency conflict». As for Ukraine, the term «stewardship» is quite new for domestic accountants, if literally, the online dictionary Merriam Webster interprets this concept as «careful and responsible management of what was entrusted». The expectations of investors and lenders to return investments (for example, dividends, interest payments, etc.) should be based on a valuation of «future cash flows» and a valuation of responsible management. In this case, both types of information are important for decision making. In other words, the decision of users of financial statements [166].

The cost (property) approach is determines the value of the enterprise on the basis of the costs incurred for the formation of the enterprise [163]. In particular, A. Nikolaenko, M. Yefimova [165] emphasize that the cost approach, first of all, considers the enterprise as an integral property complex (IPC), which is used to carry out entrepreneurial activity. The content of this method lies in the fact that at first all the assets of the enterprise are sad. At the next stage, the present value of liabilities is deducted from the amount received. The resulting value reflects the cost of equity of the enterprise. Information base in the valuation implementation of the cost approach is the accounting filling financial statements of the company.

In turn, Yu. Derevianko, A. Lukash, L. Starchenko [164] note that with the cost method the cost is determined by reassessing the resources that were spent on the creation of this business, that is, evaluated from the position of the costs already incurred. To calculate this, they use the data of the Balance Sheet (Financial Status Report) at the valuation date. The most common methods of the cost approach are the method of net assets and the method of the liquidation value of the enterprise [164, p. 95].

Net assets are the value determined by deducting from the amount of the assets of the company, the amount of its liabilities. Calculation by the method of net assets is reduced to determining the difference between assets and liabilities. Net assets should not only be positive, but also exceed the registered share capital of the company. This indicates that in the course of its activities the enterprise not only did not squander the funds contributed by the owners, but also ensures their growth. The valuer is tasked with adjusting the balance of the enterprise. To do this, a preliminary valuation of the reasonable market value of each asset is carried out separately, then the current value of liabilities is determined and, finally, the current value of all its liabilities is deducted from the reasonable market amount of the company's

assets. The result reflects the equity value of the enterprise. The method of net assets allows to evaluate the cost of own capital of an enterprise from the position of the owner, which fully controls the entire business [165, p. 1527].

That is, there appears again such a rather important category for each company as «responsible management», which focuses on the updated version of the Conceptual Framework for Financial Reporting-2018.

In contrast to the considered approaches to valuation, Yu. Derevianko, A. Lukash, L. Starchenko [164] propose to use an integrated measure of value, based on the use of the principles of both income and cost approaches, allows to take into account a larger range of information. To calculate the integrated indicator of business value, the following is taken: the value of the financial result (net profit) in the reporting period; growth rate of the financial result; book value is calculated using the cost approach and the coefficient of expectation. The expectation ratio characterizes the growth of the financial result in dynamics [164].

However, in the epoch of the 21st century there is very little effective approach to evaluation. In our opinion, it should be supplemented with an innovative platform for the 5D paradigm of actuarial accounting. It is from the actuarial accounting system that the actuarial financial statements derive their information. After all, actuarial reporting provides an opportunity to evaluate the growth of the economic potential of an enterprise in value terms through the structure of actuarial reporting forms. Also, actuarial reporting to a greater extent takes into account aspects of the Conceptual Framework for Financial Reporting-2018 that the content of the reporting forms in the context of the functioning of International Financial Reporting Standards. After all, the reporting information should comprehensively take into account the growing needs of investors and other suppliers of capital in its information content as a whole.

Actuarial financial statements correspond to paragraph M4; M7, Section 1 «Purpose of general purpose financial statements» Conceptual basis of financial statements. In particular: the general-purpose actuarial financial statements are not intended to show the value of the enterprise that it reports; but it provides information to help current and potential investors, lenders and other lenders to evaluate the enterprise [14].

The new edition of the Conceptual Framework for Financial Reporting, like its previous version, does not have priority over IFRS. But it is possible to rely on it, if IFRS do not give an answer to accounting questions [166].

Better in our opinion, «*valuation of future cash flows*» can be made on the basis of introducing actuarial accounting into the practice of corporations. Actuarial accounting is based on the innovative 5D accounting paradigm, which makes it possible to see the prospects for changes in the property potential of a business in a 5-dimensional space, that is, through the prism of a 5-dimensional format. According to 5D=4D+actuarial financial statements, where 4D=3D+t (time).

Actuarial accounting is a system based on descriptive, triple and simple entry methods, and provides information on changes in market potential and future cash flows of an enterprise in 5 (5D) dimensional space.

The trajectories of changes in the domestic economic system, more and more direct the development of accounting in the direction of its complete reorientation from stating facts and business operations of past events to the long-term perspective of changes. After all, it is the forward-looking data on the property potential of a business that serves as the foundation for evaluating the growth of economic value and creates the prerequisites for generating future cash flows. Such information content of accounting forms, in the case of positive trends, the investment attractiveness of the enterprise's activities for attracting the necessary capital investments from real and potential investors and other capital providers. Since the investor immediately sees the possibility of obtaining additional benefits from investing in the development of this enterprise that is a priority in increasing wealth. In conditions when the overwhelming majority of sectors of the economy are taking the path of European integration processes, the traditional accounting paradigm needs to be significantly improved. After all, the domestic economic system needs to attract investment to overcome the negative effects of crisis trends.

Therefore, an important task before modern accounting science is a complete theoretical substantiation and real practical implementation of the methodological foundations of actuarial accounting in Ukraine, which should be preceded by a sharp regulation and legislative level of its effective construction, contribute to the development of business structures, even in crisis conditions, by attracting from outside the required amount investment investments.

The disclosure of the theoretical foundations of actuarial accounting and the declaration of its substantive content is found in the works of such domestic scientists as F. Butynets [168], L. Goretska [168], K. Gulpenko [168], M. Kuzhelnyi [170], S. Kuznetsova [171], S. Levytska [170], Ya. Lebedzevich [172], O. Osadcha [172], T. Slozko [173], Z. Tuiakova [57], I. Yaremko [174] and others. According to foreign theoretical and practical experience in the implementation of actuarial accounting, then the work of V. Ivashkevich [74], M. Kuter [175], S. Penman [176], J. Richard [177], A. I. Shyhaev [178], since the authors disclose in detail the semantic content of the modern type of accounting – actuarial – as a new crossbar of accounting development, and also describe in detail the methodology of its construction and the main aspects of practical approbation. According to Russian scientists, in Ukraine, aspects of the theoretical substantiation of this problem are only being initiated in scientific research, deep insights are present in the works of A. Lagovska [179]. However, due to European integration changes, there is a need to continue research in this direction to create high-quality accounting and analytical support for management, to encourage the attraction of the necessary amount of investment resources to stabilize the economy of Ukraine with its characteristic sector structure.

Professor M. Kuter [175] distinguishes three revolutionary transformations in the evolution of accounting theory and its corresponding practice: from 1850 until the beginning of the twentieth century – static accounting; Twentieth century – dynamic accounting; XXI century – actuarial accounting. In addition, the scientist refers to the fundamentals of the theory of balance diversity J. P. Savary (1673), according to which: «...interests define goals, goals determine the composition of property and methods of its valuation...» [175, p. 115].

In turn, Ya.Sokolov, V. Sokolov, when disclosing the distribution of a double accountant in Europe (in the era of the XV century – the first half of the XIX century), noted that it was to this French scientist that the national accounting idea was due to the introduction of the classification of accounts according to the volume of recorded data, which led to their division into synthetic and analytical there is a foreign scientist, so to speak, became the founder of a two-step data recording system, which led to the formation of relevant postulates [5, p. 61].

According to M. Kuter as a consequence of the postulates of E. Pisani is the following statement: «...a positive financial result (profit) is possible only if incomes exceed expenditures, and own capital must not only be saved, but also be multiplied» [175].

Under such circumstances, in our opinion, the real prerogative of the reorientation of modern accounting concepts can be informational content of actuarial accounting, which is aimed at meeting the ever-increasing needs of owners, lenders and other capital providers. So, M. Kuter interprets the accounting policies of the organization as a concentrated expression of the financial policies of its owners.

This approach contributes to further substantiation of the chain of interests:

– the interests of the owners – to make a profit;

– the tasks of the owners – to invest;

– the interests and objectives of the organization – to preserve and increase the capital [175, p. 116].

K. Gulpenko exploring the main aspects of the development of accounting concepts for the purposes of management in modern conditions, draws attention to the fact that the information of static accounting is presented in a summarizing form helps to determine the prospects for the development of the country's economy. According to a foreign researcher, the relationship between types of accounting can be applied in various aspects. Thus, during periods of bankruptcy of an enterprise, when the analytical capabilities of accounting, tax, and management accounting make it possible to correctly make management decisions to get out of the current situation and assess the prospects for the company's work in a prospective period. At the same time, strategic accounting can be applied, built in an organization in accordance with the method developed by him [169, p. 18].

The scientist is of the opinion of S. Krylov that in modern conditions for management purposes information is needed on the strategic, long-term prospects for business development, promotes the use of accounting valuations in forecasting and analytical work [180, p. 8].

In this regard, considerable attention is paid in our time to strategic management accounting, which has arisen relatively recently, but has emerged as a fairly broad area of scientific and practical activity [180, p. 17].

V. Smernytska considering the systematization of types of accounting in a unified accounting system in a new interpretation among its types such as: financial, tax, social, environmentally oriented, forecast, also highlights its kind as actuarial. Which the scientist treats as branches of accounting [181, p. 242].

According to the research approach, which objects, tasks or features would not have one or another kind, they all act not in isolation, but complementing each other, which creates information integrity, which is and remains the core of accounting [181, p. 243].

S. Levytska, Ya. Lebedzevych, O. Osadcha [172], when considering the methodological and organizational basis for the functioning of the enterprise's accounting system as an information source for preparing reports, disclose in detail such types of accounting as: dynamic, actuarial, social, creative, and strategic (forecast).

In turn, M. Kuzhelnyi, S. Levytska during the study of the fundamentals of the organization of accounting, note that currently economic accounting in Ukraine combines: accounting, management (internal), tax, dynamic, actuarial, social, creative, strategic (forecast). In addition, according to scientists, statistical accounting functions in a parallel projection [170].

F. Efimova, L. Goretska [168, p. 30] describing in detail other types of accounting, allocating: actuarial accounting, dynamic accounting, office accounting, creative accounting, macrooblique, micro viewing, human resources accounting, operational accounting, patrimonial accounting, social accounting, statistical accounting, static accounting, strategic accounting. (Among these species, actuarial is also distinguished).

V. Maximova [182, p. 107] among other types of accounting highlights: creative, actuarial, strategic, social, budget, dynamic. Noticeably, according to Table 4.1, that a scientist, when interpreting the content of a key research concept, applies identically meaningful content, like the overwhelming majority of Russian scientists on this subject.

O. Zorina [183] in the course of disclosing organizational aspects of an integrated accounting and reporting system as an information basis for management and evaluation of recent research and publications on existing scientific concepts of accounting systems at the current stage of development of the Ukrainian economy, highlighted the most common of them: strategic (forecast) accounting , integrated accounting, electronic accounting, social (environmental) accounting, creative accounting, actuarial accounting and dynamic accounting. According to the scientist, the purpose

of financial accounting is providing information to external users with direct financial interest, in particular, owners, creditors, potential investors and foreign counterparties, including foreign owners, in order to make strategic financial decisions and plan and forecast future cash flows based on analysis financial condition of the company.

That is, this goal, in our opinion, is fully consistent with the purpose of accounting actuarial accounting, the full focus of which concerns real and potential investors, lenders and other capital providers.

A detailed description of the approaches of domestic and foreign scientists regarding the characteristics of the content of actuarial accounting is given in Table 4.1.

According to Table 4.1, it can be seen that the overwhelming majority of domestic and foreign scientists interpret actuarial accounting as a system that uses the double-entry method and provides information on changes in the market value of an enterprise, that is, the opinion of scientists is identical.

Table 4.1 Interpretation of the term «Actuarial Accounting» and «Actuarial Concept of Accounting» in foreign and domestic literary sources. *Source: compiled by the author*

No.	Author [Source]	Interpretation of the term
1	2	3
1	F. Butynets, L. Goretska [168, p. 30]	Actuarial accounting is a system that uses the double entry method and provides information on changes in the market value of an enterprise. In practice, in most cases, accountants do not keep these records and provide it to «practice» or specialists in the valuation of enterprises. But the study of the principles of such accounting allows a better understanding of the appointment of other types of accounting
2	K. Gulpenko [169, p. 18]	Actuarial accounting — used in valuation of the created economic value and future cash flows
3	V. Ivashkevych [74, p. 25]	Actuarial accounting is accounting, the main purpose of which is considered to be the valuation of the economic value created and future cash flows
4	M. Kuzhelnyi, S. Levytska [170]	Actuarial accounting is a system using the double entry method and provides information on changes in the market value of an enterprise. Included in the economic accounting in Ukraine
5	S. Kuznetsova [171, p. 79]	The actuarial accounting system is a system that uses the double-entry method and provides information on changes in the market value of an enterprise. The specified information of the actuarial accounting is needed for external users who can receive it in the accounting system, provided it is reformed in the aspect of informatization of the economy

Continuation of Table 4.1

1	2	3
6	A. Lagovska [179, p. 57]	Actuarial accounting concept is focused on the formation of information about the dynamics of the internally generated value of the enterprise as an object of investment, while this concept is not modified using a static concept for evaluating individual objects of the account display. That is, this concept is focused on providing the accounting system with information on how the enterprise's market value changes over time, taking into account the interests of both current and potential investors when disclosing information in financial statements
7	S. Levytska, Ya. Lebedzevich, O. Osadcha [172, p. 8]	Actuarial accounting is a system using the double entry method and provides information on changes in the market value of an enterprise
8	V. Maximova [182, p. 107]	Actuarial accounting is a system that uses the double entry method and provides information on changes in the market value of an enterprise
9	J. Richard [177, p. 90]	Actuarial accounting is a system that applies the double-entry method and provides information on changes in the market value of an enterprise. Actuarial accounting is accounting, which is based on future discounted cash flows
10	T. Slozko [173, p. 178]	Actuarial accounting is a system that uses the double entry method and provides information on changes in the market value of an enterprise. Its data is necessary for those external users, it can also be received in accounting, that part of it, which is called financial accounting, where the value of objects is also formed, is owned by the company at the reporting date. For these reasons, this type of accounting is also only declared by theorists
11	Z. Tuiakova [57, p. 316]	Actuarial accounting is a system using the double entry method and provides information on changes in the market value of an enterprise
12	A. Shyhaev [178, p. 30]	Actuarial accounting is accounting that is aimed at generating the information necessary for real and potential investors, lenders and other capital providers to evaluate the economic value generated and future cash flows in the decision-making process about investing, lending and other investments of resources in the enterprise
13	I. Yaremko [174, p. 249]	Actuarial accounting is a system using the double entry method and provides information on changes in the market value of enterprises

However, a more detailed study of the theoretical and methodological basis of actuarial accounting suggests that using this double entry method

is not limited to this type of accounting. Accounting for advanced foreign experience shows that this system is based not only on the double-entry method, but also applies a descriptive record, the content of which is descriptive and predictive in nature, besides the actuarial concept often uses simple and triple-entry at the same time. The penultimate of which requires detailed justification, since it arose at the initial stage of the development of accounting, the triple dimension of accounting records primarily concerns the future development of accounting science in the 21st century and built on the basis of accounting for force accounts, first found theoretical evidence in the works of the American scientist I. Idzhiri [184], and in the era of modernity were developed in detail in the scientific works of the D. Dobii [185].

Returning to the semantic content of the term «actuarial accounting», it is worth noting that K. Gulpenko emphasizes that this type of accounting is primarily used in valuation of the economic value of a business, and in the course of a real manifestation of the ability to generate cash flows in the long term [169, p. 18].

S. Kuznetsova [171] draws attention to such an aspect as the «informatization» of the domestic economy, and prefers external users of actuarial accounting; however, according to the scientist, the modern accounting concept needs to be significantly reformed for further development in line with such trends at the national level of government.

F. Efimova and L. Goretska [168], notes the circumstance under which the maintenance of actuarial accounting is provided not to practitioners of practice, but to corresponding specialists in the valuation of the enterprise. Fully agree with this approach, since in order to maintain this type of accounting it is necessary to have a thorough knowledge of financial mathematics that underlies the actuarial analysis. In addition, in the initial stages of development of actuarial calculations, their direct implementation was accumulated within the framework of the profession of an actuary, from which actuarial accounting derives its etymological origin.

Accordingly, according to T. Slozko [173] actuarial accounting data is needed for users from the external environment of the company. In addition, the researcher draws attention to the fact that this type of accounting at this stage of development of human society as a whole and in Ukraine in particular is still purely theoretical in nature and direction. In our opinion, the existing regulatory space at the legislative level requires substantial improvement. Due to this, the range of draft laws on the prospects for actuarial activities in Ukraine and an objective valuation of business value in the context of dynamic changes should be significantly expanded.

According to the approach of A. Lagovska, the concept of actuarial accounting should be viewed as the basis for maximizing the financial power of domestic enterprises and their importance in the global economic space due to the improved management of key drivers of their value by solving the problems of information management system, focused on attracting

financial resources, ensuring the increase of economic value added to capital providers in the context of building a new economy of Ukraine [179, p. 58].

I. Kyrianov, in detail in his scientific writings, reveals the methodology for the implementation of auxiliary valuation, notes that the basis of actuarial calculations is the principle of equivalence of obligations of the parties that are directly involved in the relationship that has developed, formulated in 1671 by Jan de Vit and «...all parties should have equal financial obligations to each other»[186, p. 133].

According to S. Kuznetsova, in the course of researching the prospects for accounting, in such perspectives as: strategic, electronic commerce and social orientation, information of actuarial accounting is needed for external users who can get it in the accounting system, provided it is reformed in the aspect of informatization of the economy [171, p. 79].

In addition, according to the approach of the scientist, the accounting system in the process of synergistic development should receive such characteristic features as integration, strategicity (predictability), dynamism, electronic form, creativity, actuariness, social (environmental) orientation. According to the scientist, it is the consistency of all the proposed features that makes it possible to form an accounting system, based on the use of modern computer technology, it will be able to meet the information needs of users with the ability to integrate both at the local accounting level and at the level of the overall management system of companies [171, p. 73].

Z. Tuiakova [57] in interpreting the content of actuarial accounting fully supports the opinion of French scientist J. Richard [20], who draws attention to the fact that it should be used to determine the market value of an enterprise as a property complex as a whole, the main purpose of auxiliary accounting is determining the present value of the enterprise at a certain point in time as the amount of capital that the net cash flows generated by the enterprise could recover in the future.

J. Richard suggests using the percentage of normal profitability for a given period and a given type of enterprise as a discount rate [177, p. 91].

However, according to Z Tuiakova [57], with all the theoretical attractiveness of actuarial accounting, the organization of such accounting and practice, especially in conditions, requires substantial costs. One of the factors that hinder the development of such accounting, in the opinion of a foreign scientist, is the lack of a currently scientifically based and proven method for determining normal market profitability for different types of enterprises. In addition, the problem of determining the market value is of particular relevance in the liquidation of an enterprise, and not in the conditions of its continuous activity [57, p. 316–317].

But the studies of Z. Tuiakova [57] in this direction related to the era of the twentieth century, however, in the XXI century, deep insights on this issue appeared in the works of A. Shyhaev and V. Ivashkevich [168], who theoretically proved and practically substantiated the methodological

aspects of determining the increase in the value added of an enterprise in market conditions and investment activity.

M. Kuzhelny and S. Levytska [170] note that it is this type of accounting that becomes an important component of business accounting in Ukraine. At the same time, scientists adhere to a common opinion when interpreting its essence and meaningful content as a whole.

According to the research results of the theoretical foundations of the content of actuarial accounting, it can be concluded that this is a complex dynamic system based on the methods of descriptive, simple, double and triple entries and provides detailed information about the market value of an enterprise in three-dimensional space based on the use of triple accounting system. The need for its use is due to the euro integration processes in the domestic economy, the need to attract investment in the development of its sectors, which requires its effective theoretical and methodological substantiation both at the general scientific and national levels in order to practical implementation of the practice of economic entities in Ukraine.

Also, actuarial accounting allows to resolve the agency conflict between the actual business owners and senior management managers through the content of the actuarial financial statements. In addition, the structure of the actuarial statement of financial position clearly reflects the potential change in the economic value of the business. After all, the Actuarial Report on the financial condition is built on the dichotomy of the operating and financial activities of the enterprise. In the asset are accumulated operating assets and liabilities, and in liabilities are financial assets, liabilities and capital. That is, such actuarial reporting form fully combines all the necessary components for valuation of a business using the net asset method. As a supplement to valuation of a business using an integrated indicator, the second form of actuarial reporting is the actuarial profit and loss statement. The last reporting form allows to take into account the conceptual framework of the income approach in valuation of the enterprise.

An important place in the system of actuarial accounting belongs to the «actuarial calculation». It is thanks to it that conditions are created for analyzing and disclosing the reasons for economic, financial and organizational success or deficiencies in the activity of an enterprise. Also, «actuarial calculation» is often interpreted, as a total calculation, the result of an actuary's work, which is generally summarized in a tabular format, characterizing the likelihood of trends in the economic potential of a business [187]. It is based on a rather complex mathematical apparatus of probability theory and financial statistics.

Actuarial calculation is carried out with close consideration of the characteristics of actuarial accounting, namely: the economic potential of the evaluated enterprise, or, its growth or reduction, are probabilistic in nature, highlighting the risk group of the occurrence of negative trends in the change of the economic potential. The latter is carried out on the basis

of calculating the mathematical probability of the occurrence of the corresponding changes in the prospective time lase [188].

Other sources state that «actuarial calculation» should be understood as the cumulative amount of the costs of conducting an actuarial evaluation of the enterprise. The main tasks of actuarial calculations include a particular: a detailed and comprehensive study of risks within the framework of an actuarial valuation of an enterprise (this concerns compliance with the requirement of a scientifically based classification characteristic of the level of risks for the formation of a «homogeneous population»).

The term «homogeneous system» (from the Greek. «Ὁμός» – equal, identical, «γένω» – to give birth) is commonly understood as a homogeneous system, the properties of which is the same in all parts or change continuously [189].

In addition, the range of tasks in the implementation of actuarial calculations also includes:

– calculation of the mathematical probability of growth/reduction of the economic value of a business, determining the frequency and severity of the consequences of damage, both in individual risk groups and in the insurance population as a whole;

– mathematical substantiation of the necessary expenses for conducting an actuarial valuation of a business and forecasting trends for its change over the future [190].

In the implementation of actuarial calculation and with its direct preparation, certain features should be taken into account, among which the most important are:

– events are subject to valuation, have a probabilistic nature. This is reflected in the size of the prospective valuation of the business;

– in some years, the general pattern of the phenomenon is manifested through the mass of isolated random events, the presence of which implies significant fluctuations in the total amount of changes in the value of the net assets of an enterprise [191].

According to the research results of existing approaches to the valuation of the company, taking into account the actuarial aspect through the prism of actuarial calculation, it should be concluded that the existing system of business valuation should be built on the information foundation of actuarial financial reporting, which derives its content from the actuarial accounting system based on actuarial calculation. In addition, the actuarial financial statements are fully consistent with the basic criteria of the updated Conceptual Framework for the Financial Statements – 2018. In particular, the general-purpose actuarial financial statements are not intended to show the value of the enterprise that it reports; and it provides information to help current and potential investors, lenders, and other lenders valuate the enterprise in a prospective temporary business. This contributes to the simplification of the valuation algorithm, since the structure of

actuarial reporting forms, in particular, the actuarial statement of financial position, contains indicators that are the information basis for valuation of a business using the net assets method. Such aspects facilitate the further valuation and determination of the growth of the economic potential of the enterprise. In addition, the entire totality of actuarial reporting forms serves as a favorable information tool for valuation of a business based on the use of an integrated value indicator, taking into account the principles of both income and cost approaches, and serves as a prospect for further research in this direction of research to improve management efficiency now.

4.2 Argument of the development of NP(S)A «Actuarial financial reporting» in the context of property potential valuation

Complex and comprehensive support of entrepreneurship from the state and improving the management of the activities of business entities of any legal form of ownership and the economic sector are among the most important and complex tasks in the context of deepening globalization transformations.

To ensure the necessary level of development of the economy of Ukraine, it is necessary to actively and effectively apply innovative approaches to the management of enterprises in all types of economic activity — from the agricultural sector to the aviation industry. However, any innovative implementations require an adequate level of funding, in conditions of the manifestation of crisis trends in the domestic economy becomes an extremely difficult dilemma. Due to such circumstances, attracting direct investments in the development of the national economy, both external and internal, is a strategic exclusive right of domestic business entities.

Favorable ground for improving the investment attractiveness of domestic enterprises can be achieved by improving the accounting and information content of reporting from the actuarial accounting system. It is actuarial financial statements that are able to provide information to real and potential investors about the additional economic benefits of attracting investment in business development and the prospect of changes in future cash flows. Therefore, there is an urgent need for regulation at the legislative level and the active implementation in Ukraine of a foreign actuarial 3D model of accounting and financial reporting.

In modern economic conditions, the main tasks of enterprises that are in an unstable or crisis financial situation, and seek to attract investment in their development from external or internal investors, there is the formation of such accounting support, which would reflect the relevant information about the prospects for changes in future cash flows of the object investment, changes in its net operating assets and net financial liabilities that

can't provide general purpose reports. Traditional public financial statements are not able by their nature to create such an information foundation for investors, lenders and other capital providers, as it is oriented to state the facts of past events and a reflection of the actual financial position of the enterprise. Due to such circumstances, the financial statements (including those prepared under IFRS) require transformation into actuarial financial statements that can reflect the prospect of changes in the economic potential of a business. Therefore, the accounting of foreign experience and the development in Ukraine at the legislative level of a new National regulation (standard) of accounting 3 «Actuarial financial reporting» is one of the priorities at the national level of government that requires urgent solutions.

On the issues of building an effective enterprise management system based on the actuarial concept of accounting and reporting, they are described in detail and comprehensively in the works of such foreign and domestic scientists as V. Ivashkevych, V. Kogdenko, M. Kuter, A. Lagovska, J. Martin, S. G. Penman, J. Pettia, J. Richard, Ya. Sokolov, B. Stewart, A. Shyhaev and others. In particular, V. Ivashkevych, A. Shyhaev [178] refer to the methodology of maintaining actuarial accounting and the use of its data in the management system. Disclose the concept of actuarial accounting and the formation of actuarial financial statements based on the transformation of financial accounting and IFRS statements. In numerous works by J. Richard [177], special attention is also paid to actuarial accounting (or accounting for valuation of property that is sold as an integral property complex (IPC). According to the scientist's approach, a new type of accounting is intended not only to create a favorable information ground for attracting investments, but also acts as an effective lever of influence in terms of the sale of a business as an integral property complex. However, the question of the need to introduce a foreign actuarial 3D concept of accounting and its corresponding regulation at the legislative level, require further research in order to create a favorable investment climate and attract the necessary investment in the economy.

At the same time, there are no scientific works in which the argumentation of the development and implementation of the national provision (standard) of accounting 3 «Actuarial financial reporting» by domestic enterprises would be covered. The study requires a foreign approach to the composition and forms of actuarial reporting, as well as its differences from the financial statements.

The main objective of the study is argumentation for the development of a new National Accounting Standard 3 «Actuarial financial reporting», comparing it with NP(S)A 1 «General requirements for financial reporting» and highlighting key differences.

The level of direct foreign investment from the countries of the world in Ukraine plays an important role in maintaining and ensuring the necessary level of development of the domestic economy.

The latter requires an adequate level of financing, which is extremely difficult to ensure in the conditions of crisis tendencies in the domestic economy. Therefore, an increase in the level of foreign direct investment in the agricultural sector is becoming a strategic prerogative of the state as a whole. A kind of panacea, under such circumstances, may be the transition to a new actuarial stage of development of accounting and reporting. That is, in the conditions of a new economy, the priority of business owners should be to form such an accounting basis that, through the prism of financial statements, could provide real and potential investors with necessary information about the potential change in the economic value of an enterprise and the prospect of a change in cash flows. It is this content that can be obtained in the actuarial accounting system, as a new crossbar of the development of modern accounting teaching in the 21st century, which provides the necessary level of activity management.

The present epoch is extremely dynamic, constant innovations at the legislative level, and numerous innovations in various spheres of public life require active movement in rhythm with time. Keeping your hand on the pulse of change contributes to the effective adoption of rational management decisions and the basis of objective, timely, accurate and relevant information about the economic activities of the market entity. That is why, the expression of the founder of the banking dynasty Nathan Rothschild remains relevant for years: «Who owns the information — owns the world». To make effective decisions in the course of business management and its effective content, to ensure such a rational process, detailed information comes out of the management and actuarial accounting system, quite often acquires the forms of management and actuarial reporting of an economic entity that are not regulated at the legislative level.

However, due to the trends of the 21st century, an innovative actuarial concept of accounting appears in the enterprise management system to help the management accounting system, in contrast, the management concept has a specific subject and objects, and also operates with innovative methodological tools. Due to such changes and transformations in the modern accounting system, there is an urgent need to explore the characteristics and specific features of actuarial accounting, in a parallel projection with a comparison of the content with the rather traditional and customary accounting practice — management accounting, which determines the relevance of the study.

«Management Accounting» and «Actuarial Accounting» are fundamentally different from each other, among the common features it is necessary to single out: the lack of clear regulation at the legislative level regarding the main aspects of their practical use by domestic business entities; and the level of accuracy of accounting information, because, in both management and actuarial accounting, there are a number of forward-looking and prospective valuations. Identified number of criteria for comparing the

studied types of accounting testifies to the characteristic features of each, including among them: the obligation to maintain; main users of account information; purpose of accounting; the fundamental basis of the accounting concept; the basic rules of an organization in an enterprise; informational time lag of submission of generalized accounting information; level of accuracy of accounting information; content type; frequency of preparation and the main types of forms of management and actuarial financial statements; ways of grouping information; level of openness of information. However, despite the fundamental difference between «managerial» and «actuarial» accounting, each of these types of accounting is designed to provide the necessary information for a long-term business management system, including strategic planning, valuation of economic value growth, because a modern accounting model must be based on a holistic and an integrated system of traditional and innovative accounting concepts. This will fully contribute to the effective construction of a business management system and its accounting interpretation in the 5D space, even in conditions of financial instability. The latter determines the prospects for further within the framework of selected issues, namely, the disclosure of the main aspects of the accounting procedures, taking into account the features of the innovative 5D-model of actuarial accounting and the use of its data to manage the activities of a corporate type entity.

However, in our opinion, actuarial accounting, in today's conditions, must acquire 5D format, that is, provide accounting information in three-dimensional space that would fully satisfy the growing needs of investors and other capital providers. After all, actuarial accounting, in addition to traditional accounting methodological tools, operates with specific methodological techniques of descriptive, triple recording and actuarial calculations. Therefore, we propose to actively implement the 5D model of actuarial accounting in domestic enterprises, the meaning of which is that both in the accounting system and in the light of the information displayed in the actuarial financial statements, special accounting information is generated about the level of economic potential of the business that is being created and also about the prospect of changing it.

In Ukraine, the general principles for the preparation and presentation of financial statements are defined by NP(S)A 1 «General requirements for financial reporting» [58]. On the order of preparation of the consolidated financial statements, it is governed by the NP(S)A 2 «Consolidated financial statements» [192].

However, in accordance with M.2, Section I, Conceptual Basis of Financial Reporting [14], the purpose of financial reporting is providing useful, relevant financial information about the company for current and potential investors, borrowers and lenders in their investment decisions in the development of this business entity. M.3 of the same section of the Conceptual Framework [14] determines that the hopes of investors and

borrowers on the aggregate amount of return on invested capital are determined by evaluating the amount, time and prospects for the inflows of net future cash flows.

Such content can be obtained in the actuarial financial statements, but in foreign accounting practice there is no standard, or at least a regulatory document, which would regulate the methodology for the preparation and presentation of actuarial financial statements. It should be noted that a significant increase in the usefulness of reporting information was achieved in 2011 within the framework of adoption by the IASB and the Accounting Standards Board of IFRS (Presentation of Financial Statements) [56, IFRS 1], because the standard defined the conceptual structure of financial statements for business entities . However, according to the foreign scientist A. I. Shyhaev [178] reporting prepared under the requirements of IFRS requires a transformation in actuarial financial statements based on the dichotomy of operational and financial activities.

Following the structure of the NP(S)A 1 «General requirements for financial reporting» [55], and based on the application of the approach to the composition and structure of the actuarial forms of financial reporting of foreign scientist A. Shyhaev [178], we have developed a draft NP(S)A 3 «Actuarial financial reporting», the contents of the proposed standard are given in Appendix D.

The proposed project of NP(S)A 3 «Actuarial financial reporting» has the same structure as NP(S)A 1 «General requirements for financial reporting» [58], but the main differences between these standards are the basic terms and definitions, the composition and structure of the elements of reporting and disclosure of information in the reporting. In the system of actuarial accounting appear such specific objects as: operating assets and liabilities; financial assets and liabilities; net operating assets and net financial assets (liabilities).

According to NP(S)A 1 [58], the financial statements include the following reporting forms as: Balance sheet (Report on financial position), Report on financial results (Report on comprehensive income), Report on equity, Report on cash flow and notes to financial statements. In accordance with the proposed NP(S)A 3 «Actuarial financial statements», it includes reporting forms such as: Actuarial balance, Actuarial statement of comprehensive income, Actuarial report on cash flow (Actuarial balance of cash flow), Actuarial report about changes in equity. The principles of preparing financial and actuarial statements differ among themselves.

In particular, the principles of preparation of financial statements, according to NP(S)A 1 [58], belong to the following principles: enterprise autonomy, business continuity, periodicity, historical (actual) cost, accrual and matching income and expenses, full coverage, consistency, diligence, prevalence essence over the form and a single monetary measure. The basic principles of the requirements for the preparation of actuarial financial

statements, as can be seen from the Table 5.5, are: fundamental (relevance, truthful lighting) and amplifying (comparison, timeliness and clarity) [178].

In the conditions of an active capital market, an actuarial report on changes in equity is extremely important in the system of actuarial reporting, therefore, we will build this form on the example of the agricultural enterprise InterAgrocom (Chernivtsi region), which main activity is the cultivation of grain and pome fruits. It should be noted that foreign direct investment from Germany («Redcast Holding Limited») has been attracted to the activities of this agricultural enterprise. The structure of the actuarial report on changes in equity for the agro-enterprise «InterAgrocom» is presented in Table 4.2.

Table 4.2 Actuarial statement of changes in equity of PJSC «InterAgrokom» on 01.01.2017, thousand UAH. ***Source:*** *compiled by the author according to the financial statements of the studied agricultural subject and on the basis of [178]*

Item	Line code	Reporting period	Previous period
Equity at the beginning of the year	**7010**	**20000**	**18786**
Operations with shareholders – holders of ordinary shares			
Issuing own shares			
Sale of repurchased own shares	7020	9	347
Dividends	7030	(741)	(458)
Net result for shareholder transactions	**7040**	**(732)**	**(111)**
Cumulative financial result			
Net income (loss)	7050	(897)	679
Disposals of subsidiaries	7060	–	–
Dividends on preferred shares	7070	10	10
Total cumulative financial result	7080	(907)	(887)
Equity at the end of the year	7090	18361	19562

As noted in Table 5.6, in clause 4.1, section IV, of the project of NP(S)A 3 «Actuarial financial reporting», in the actuarial statement of comprehensive income, information on the calculation of equity at the beginning and end of the reporting period is given separately. We proposed to implement coding of lines in the forms of actuarial financial statements within the continuation of the coding system in public financial statements, regulated by NP(S)A 1 «General requirements for financial reporting» [58].

The introduction of actuarial accounting and financial reporting in Ukraine will contribute to the formation of a new basis for accounting and analytical support for managing the activities of domestic enterprises. The development and implementation at the legislative level of a new NP(S)A 3 «Actuarial financial reporting» will help create a favorable

information ground for attracting foreign direct investment in the development of the national economy, since a potential investor will immediately see prospects for changes in future cash flows and additional economic benefits from invested capital. In this way, there will be a revival of potential opportunities for all types of economic activity, in particular for the agricultural sector of Ukraine as one of the backbone in the domestic economy.

4.3 5D paradigm of actuarial accounting and preparation of new generation accountants to evaluate changes in the economic potential of a business entity

In the conditions of innovative transformations in the world and domestic capital markets, the traditional accounting system requires rethinking. Since accounting is the language of business, the latter, due to dynamic tendencies in the global and national economy, also requires fundamental changes in the direction of development. It is not known exactly how and in what way it is better to direct the management system of a domestic enterprise to the necessary direction, but one thing is for sure, significant changes hidden only behind innovations in the context of all spheres of public life. In order to facilitate the exit of the economy and business from the crisis and negative economic results, in our opinion, the approach to training employees of the enterprise's accounting office should be improved. It is about providing the labor market with accountants of the «new generation» (from the English «New generation»), who in addition to owning the foundation of the «language of business» were able to assess the prospect of changes in its economic potential (from the English «Key Performance Indicator»), cash flows, to determine the forecast level of the main «drivers» of improving the financial position of the enterprise on the market in the future period and would have mastered the methodology of actuarial calculations. That is, experts can overcome the problem of inefficient management of domestic enterprises in crisis conditions, and complete financial uncertainty, except for knowledge of accounting, have the skills of actuarial calculations and thoroughly know the methods of actuarial accounting. That is, the «accountant of the future» is not only an accounting specialist at an enterprise who works in accordance with the requirements of current legislation, it is also to a certain extent an «actuary», that is, an expert in actuarial mathematics who possesses not only the methodology of actuarial calculations but also actuarial accounting.

The studies of theoretical and methodological aspects of actuarial accounting are devoted to the works of such scientists as V. Ivashkevych, V. Kogdenko, M. Kuter, A. Lagovska, J. Martin, S. G. Penman, J. Petty, J. Richard, Ja. Sokolov, B. Stewart, A. Shyhaev. However, none of the scientists focused on the multidimensionality of both actuarial and traditional accounting space, as well as the potential and urgent need to develop a priority

of the 5D paradigm of actuarial accounting. The most groundwork for the 3D-format of financial statements are presented in the works of foreign science by L. Golden (2016) [68], which discloses a non-trivial approach to the study of accounting science, by its semantic content allows to establish the cause-effect relationships of the impact of business operations on the financial statements, and also provides for the construction of thinking at the level of the postings and the financial result of the company. This approach is based on the preparation of 3D-reporting bypassing the writing of accounting entries. However, it is worth noting that we began to explore the 3D dimension of the actuarial system much earlier, but in something completely different format. Indeed, in society it has already become a fairly common phenomenon to apply the approach of n-dimensional space (3D, 4D, 5D...7D, etc.) to various objects and systems, including us, you will not be surprised by 3D (4D, 5D...8D) – cinemas, 3D printers, 3D glasses, 3D, ..., 5D modeling, etc., however, the approach to presenting an innovative actuarial accounting system in 5-dimensional space (5D) is generally still not considered, which caused the need for research in this particular direction.

The study of the need to develop a new 5D paradigm of actuarial accounting, training of employees of the accounting apparatus of the new generation (accountant + actuary) and making appropriate changes in educational programs and curricula in institutions of higher education, which prepare specialists in the specialty 071 «Accounting and taxation».

In the Top 7 most popular economic professions in 2017, according to the official PRO-prof web site [193], the accountant profession is in 2nd place, after the auditor, and the following professions are also at the next steps after the accountant: financier, economist, merchandiser and sales manager. In turn, much earlier in 2010, the American financial and economic magazine Forbes [194], which is one of the most authoritative global economic publications, published the Top 10 most prestigious professions, in which the first place was headed by the profession – the actuary.

In world practice, the actuary (from the Latin. Actuaries) is primarily an expert in insurance mathematics, who is fluent in the theory of actuarial calculations. As noted by prof. G. Falin [195] an actuary is a professional with special mathematical training, thorough knowledge of statistics, finance, economics, who carries out modeling of various situations that are directly related to the uncertainty in the volume and time of future cash flows and the like.

On the official website of the Community of Actuaries of Kazakhstan, the following definition of an actuary is presented – it is a person who has the appropriate qualifications for assessing risks and probabilities of occurrence of events. The actuary applies its knowledge to the problems of business and finance. Actuaries are multilateral analysts with theoretical background and applied skills from such sciences as mathematics, statistics, economics, demography, probability theory and finance. On the basis of the accumulated statistical information and with the help of special

software, actuaries make financial forecasts and short-term and long-term perspectives, and also use risk management methods quite widely. Actuaries provide managers with the highest levels of management with analytical rationales for the prospects for the adequacy of making certain management decisions. In the case of project failures, it is the actuaries who provide the practical solution to the difficult situation with the least losses [196].

However, if to plunge into a historical excursion and more deeply refer to the etymological origin of the term «actuaries», it is possible to find that another interpretation is the «counter,» that is, the accountant. In addition, during the times of the Roman Empire, actuaries were called officers, directly keeping records of material values in the army [197].

Accounting functions were accumulated in actuaries of the Fair Life Insurance and Survival Community (which was founded in London in 1762), and determined a more different perception of the actuary's profession in the world, because such specialists also had to operate with complex mathematical tools and analytical models in insurance companies. A certain period of time (from 1819 to 1825), the professions of «actuary» and «accountant» in the insurance business were generally identified. However, in 1827, at the parliamentary hearings in England, differences in the specifics of the work of the actuary and the accountant were substantiated [198]. Despite this, many Western researchers still emphasize that the functions of these two professions are comparable with each other.

In 1895, the International Actuarial Association (IAA) was founded with its headquarters in Brussels. The main objectives of which are coordination activities and cooperation with national associations of actuaries of several countries [197]. The founders of the IAA are such countries as the United Kingdom, the United States of America, France, Germany and Belgium.

In the United States of America and the United Kingdom, only members of certain professional associations have the right to call themselves «actuaries»: the Society of Actuaries (USA), the Institute and the Faculty of Actuaries (Great Britain). The general structure of the program for the training and certification of actuaries includes 4 groups of courses (stages): Core technical (CT), Core applications (CA), Specialist Technical (ST), Specialist Applications (SA) [195; 199].

Fig. 4.1 presents a list of disciplines for the development of which provides for obtaining a core technical level (CT).

According to the decision of the International Actuarial Association (IAA) [71], the qualification programs of national actuarial organizations should cover the «silibus» (from the Latin. Syllabus – list) of the IAA, which includes the following disciplines: financial mathematics, probability theory and mathematical statistics, economics (macro- and micro-), *accounting* (ability to interpret accounts and financial statements), modeling, statistical methods, actuarial mathematics, investment and asset management, fundamentals of actuarial management, professionalism [195]. As for

Ukraine, as a sovereign state, the Society of Actuaries of Ukraine (SAU) [200] also functions effectively here, which is one of the non-profitable organizations and comprehensively ensures the development of actuarial business in the country. To qualify as an actuary, it is necessary to go through a series of professional exams. The center for passing the qualification examinations of the British Institute of Actuaries was established in Ukraine on the basis of SAU and the T. Shevchenko National University. There is also an opportunity for exams in the actuarial-information center, which is open at the Lviv Polytechnic National University [200].

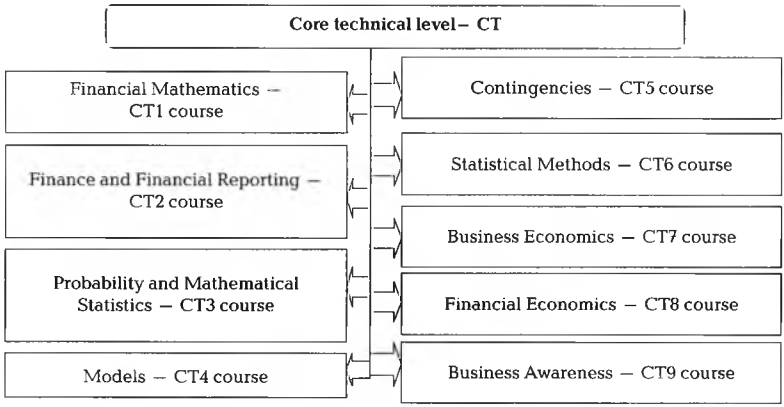


Fig. 4.1 List of disciplines for mastering core technical level.
Source: *compiled by the author*

In accordance with the current legislation, the activities of actuaries are subject to licensing by the National Commission, which exercises state regulation in the sphere of financial services markets (National Financial Services).

To obtain a Diploma in Actuarial Techniques, it is necessary to pass 9 qualification examinations of the key technical stage (CT1 – CT9). To obtain the Certificate in Finance and Investment, it is necessary to pass 6 exams at the key technical level (ST1, ST2, ST 4, ST 7, ST8, ST9) and the exam on the discipline Actuarial Risk Management – Course CAI) of Key application phase. To obtain a Certificate in Financial Mathematics: the exam «Financial Mathematics» (course CT1) [201].

According to the Qualification Requirements for persons who should be engaged in actuarial calculations in Ukraine, which is approved by Regulation (National Financial Services) No. 3519 dated February 08, 2005 (with changes from September 19, 2017 No. 3782) [201], and in order to directly receive the Certificate in accordance with clause 2.1 of the specified

qualification requirements, the following should have: a university degree; experience in performing actuarial calculations (at least 3 years); Qualification certificate; Master's degree in specialty and/or specialization in actuarial and financial mathematics or documents on the successful passing of professional exams envisaged by the American (in codes of SOA Course 1/P – SOA Course 6, or SOA Exam P – SOA Exam C, or CAS Course 1 – CAS Course 6, or CAS Exam 1 – CAS Exam 6) and/or British (codes 101 – 109 or CT1 – CT8) examination systems.

The main qualification requirements for persons who can engage in actuarial calculations in Ukraine are summarized in Table 4.3.

Table 4.3 Basic Qualification Requirements for persons who may engage in actuarial calculations in Ukraine. ***Source:*** *compiled by the author on the basis of [201]*

No.	System	Brief description	(1) In parentheses are the specified authentic exam numbers.
1	British Examination System	The system of actuarial examinations (exams) established by the professional actuarial organization of the United Kingdom (Faculty and Institute of Actuaries) and complies with the requirements of the International Actuarial Association (IAA)	(101) (1) Statistical Modeling. (102) Financial Mathematics. (103) Stochastic Modeling. (104) Survival Models. (105) Actuarial Mathematics 1. (106) Actuarial Mathematics 2. (107) Economics. (108) Finance and Financial Reporting. (109) Financial Economics
2	US Examination Systems (Society of Actuaries, Casualty Actuarial Society) and meets the requirements of the International Actuarial Association (IAA)		The system of actuarial exams (examinations), which is established by professional actuarial organizations of the USA (Actuarial Society, Property Insurance Actuaries) (SOA Course 3/M) Actuarial Models. (SOA Course 4/C) Actuarial Modeling. (SOA Course 5)
2.1	Examination System 1 of Society of Actuaries		Application of Basic Actuarial Principles. (SOA Course 6) Finance and Investments
2.2	Examination System 2 of Society of Actuaries		(SOA Exam P) Probability. (SOA Exam FM) Financial Mathematics. (SOA Exam M/MLC) Life Contingencies. (SOA Exam M/MFE) Financial Economics. (SOA Exam C) Construction and Evaluation of Actuarial Models

In world practice, there are actuarial titles of the following statuses: Corresponding Member (a person who has passed all 9 core technical subjects (ST1 – ST9), all three core applications (CA1 – CA3), have practical

actuarial skills (at least 1 year of practical experience in this area); Full member (face is a corresponding member who additionally passed another 2 exams for technical courses for specialists (CT) and an examination for specialists (CA), and also has actuarial skills (3 years of practical work in this field)). Diplomats this is a Chartered Enterprise Risk Actuary (CERA), Corresponding Member or Full Member, who has also passed the ST9 exam [196].

To obtain a certificate of compliance with the qualification requirements of persons who may be entitled to engage in actuarial calculations, in addition to having practical work experience, you must have a diploma in the Master's degree in the field of knowledge 11 «Mathematics and Statistics» in the specialty 111 «Mathematics».

Returning to the profession of «accountant» (*Buchhalter, Buch*, Halter – holder), it should be noted that this is primarily an accounting specialist who works in the accounting system in accordance with the requirements of the current legislative space. In our opinion, in the 21st century, the «inverted approach» should be applied to the profession of the modern accountant (eng. «*flipped approach*»). The point is that, among the main accounting functions, a modern accountant should be able to perform certain duties of an actuary, who also relate to the accounting process, but in one of the accounting subsystems – actuarial accounting.

In order for such professional accountancy training to become a reality, first of all, changes should be made to educational programs and current curricula in higher education institutions that are trained by specialists in the field of knowledge 07 Management and Administration and specialty 071 Accounting and Taxation. In particular, the first year of training specialists in educational degrees «bachelor» in the specialty 071 «Accounting and Taxation» should include such disciplines as: «Actuarial Mathematics 1» and «Actuarial Mathematics 2» (in the I and II semesters, respectively), on the second «Actuarial calculations»; on the third «Actuarial accounting», and on the fourth «Actuarial financial reporting». Upon receipt of the educational degree «master» should include the discipline «Actuarial analysis», «Construction and evaluation of actuarial models».

Such professional training will provide the domestic labor market by accountants of the future generation. Indeed, to a certain extent, a «modern accountant» must possess mathematical tools and have an analytical mind. The accountant must see in advance, that is, to provide for the consequences of a particular event. It must make rational and effective management decisions on the distribution and use of financial resources of the enterprise. By virtue of such circumstances, to some extent, an accountant must have the knowledge and abilities of an actuary, but in such an important accounting subsystem as actuarial accounting.

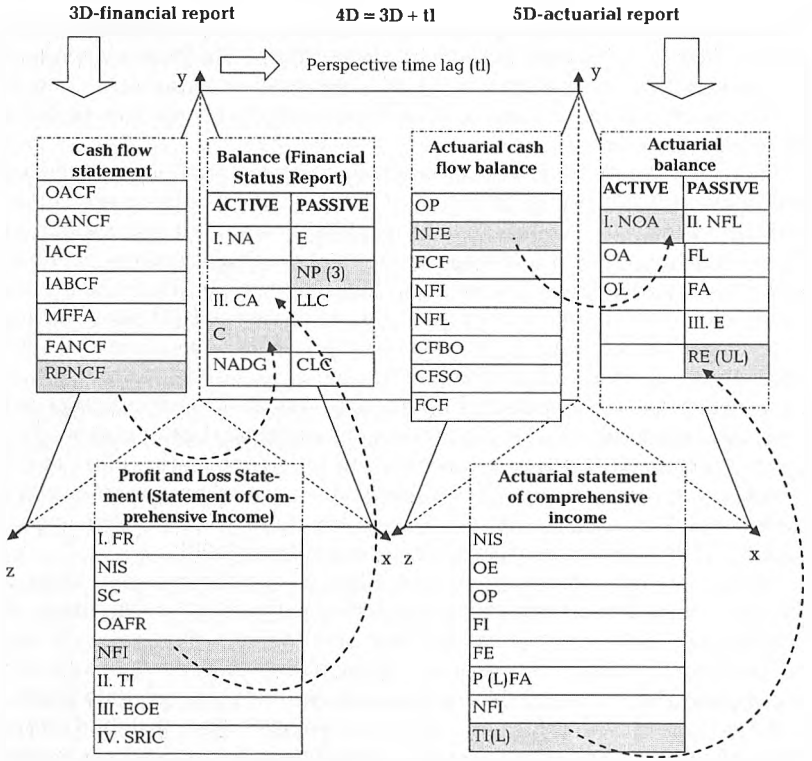
In our previous studies, we have already paid attention to the disclosure of the essence of actuarial accounting, in particular, determined that this is a system that uses the 3D recording method and displays information

about the prospects for changing the economic value of an enterprise and its cash flows in 4D space (3D+time) on the use of 3D force accounts in 5D actuarial financial statements. That is, actuarial accounting, as one of the important subsystems of traditional accounting, allows you to build a 5D accounting model.

For the first time, it was possible to interpret traditional financial statements in 3D format in 2016 by L. Golden [198]. A foreign researcher generalized the Western methods of teaching accounting and suggested a non-trivial approach to studying accounting teaching as soon as possible, calling it «Financial Reporting in 3D». This approach contributes to a comprehensive and comprehensive establishment of cause-effect relationships of the impact of business operations on the financial statements. It also allows you to think at the level of accounting entries and financial results of the enterprise in the market. In particular, the science officer proposed a non-traditional methodology for drawing up financial statements based on the most popular business transactions, while bypassing (at the initial stage) the writing of accounting entries. Subsequently, the technique reveals the secrets of making entries, thereby contributing to a comprehensive understanding of the fundamental principles of accounting [198].

In our opinion, 4D measurement in the accounting system is formed when the economic activity of the enterprise, summarized in the financial statements in 3D format is considered not only in space, but also in «time», that is, 4D = 3D + «time» in this case, it is not about the two actual adjacent periods, or the actual report date, but the prospective (forecast) time lag (tl). In order for accounting information to acquire 5D format, it should be interpreted through the prism of actuarial accounting (in particular, actuarial 3D force accounts (F)) and summarized in actuarial financial statements in 5D, starting from a foreign non-trivial approach to financial statements in 3D. Let's try to illustrate such an approach by constructing two regular tetrahedra (that is, triangular pyramids in which all faces are an equilateral triangle), with the corresponding reporting forms on each face (Fig. 4.2).

In the first tetrahedron let's place the financial statements in 3D, and reflect the connection between the three reporting forms. Fig. 4.2 shows a close relationship between the balance sheet (Statement of financial position), statement of cash flows and statement of financial performance (statement of comprehensive income), as well as between the relevant forms of actuarial financial statements: actuarial balance, actuarial statement of cash flows and actuarial statement of comprehensive income. We propose to transform financial statements in 3D, according to L. Golden's approach [198] to actuarial financial statements; A.Shyhaev [178] to the 5D format (5D paradigm) proposed by us for the actuarial accounting system (based on taking into account the peculiarities of the formation of the spatial interpretation of socio-economic phenomena and processes in 4D space (3D + perspective time lag (tl)) forecast periods).



OACF — cash flow from operating activities; OANCF — net cash flow from operating activities; IACF — cash flow from investment activities; IABCF — net cash flow from investment activities; MFFA — the movement of funds from financial activities; FANCF — net cash flow from financial activities; RPNCF — net cash flow for the reporting period; FR — financial results; NIS — net income from sales; SC — cost of sales; OAFR — financial result from operating activities; NFR — net financial result; TI — total income; EOE — elements of operating expenses; SRIC — calculation of indicators of stock returns; OP — operating profit; NOA — net operating assets; NFE — net financial expense; NFL — net financial liabilities; CFBO — cash flow for operations with borrowers; CFSO — cash flow for operations with shareholders; FCF — free cash flow; OE — operating expenses; FI — financial income; FE — financial expenses; P(L)FA — profit (loss) from financial activities; NFI — net financial income; TI(L) — total income (loss); NA — non-current assets; CA — current assets; OA — operating assets; C — cash; NADG — non-current assets and disposal groups; OL — operational liabilities; NFL— net financial liabilities; FL — financial liabilities; FA — financial assets; LLC — long-term liabilities and collateral; CLC — current liabilities and collateral; E — equity; RE(UL) — retained earnings (uncovered loss)

Fig. 4.2 5D format of actuarial financial statements.
Source: *compiled by the author on the basis of [178; 198]*

5D is the paradigm of actuarial accounting, in our opinion, can be created by opening a separate 10th class «Actuarial 3D accounts» in the current Chart of Accounts for assets, capital, liabilities and business operations of enterprises

and organizations, approved by Order of the Ministry of Finance of Ukraine No. 291 of November 30, 1999 (with changes of February 8, 2014. No. 48) [202].

The specifics of the structure of T-accounts of force (F) were discussed in our previous studies, in particular on the use of 3D-recording and complex methodological tools of actuarial calculations, which will contribute to the formation of their predictive accounting information for prospective time periods (tl). In particular, we noted that the actuarial 3D account is two T-accounts in a 3D projection, the answer, besides its traditional two sides: the left, which is called debit and the right, which carries the name of the credit, a third dimension of the account appears — Expectation, that is, a promising 4D format is formed (3D + forecast time lag).

Directly fragmentary proposals for detailing on the basis of taking into account foreign experience [198] and the specifics of the domestic legislative space are summarized in Table 4.4.

Table 4.4 Fragment of the proposed class 10 «Actuarial 3D accounts» for the current Chart of Accounts [202] based on the accounting of foreign experience.
Source: *compiled by the author on the basis of [178; 198]*

Synthetic accounts		Sub-accounts	Scope of use
Code	Name		
Class 10. Actuarial 3D accounts			
Section 101. Operating Activities			
Group 1010. Net operating assets (liabilities)			
10101	Operating assets	101011 Transaction cash. 101012 Calculations for different debtors. 101013 Inventories. 101014 Fixed assets. 101015 Intangible assets	Operating activities
10102	Operating liabilities	101021 Payments to suppliers and contractors. 101022 Calculations for taxes and payments. 101023 Calculations for employee benefits. 101024 Calculations for participants. 101025 Calculations for other operations	Operating activities
Section 102. Financial Activities			
Group 1020. Net financial liabilities (assets)			
10201	Financial assets	102011 Financial investments in cash. 102012 Short-term financial investments. 102013 Long-term financial investments.	Financial activities
10202	Financial liabilities	102021 Short-term loans. 102022 Current debt on long-term liabilities. 102023 Liabilities on lease agreements	
Group 1021. Equity			
10211	Equity	102111 Registered Capital. 102112 Capital in revaluation surplus. 102113 Additional capital. 102114 Retained profit (uncovered losses)	Financial activities

Proposal, which is presented in Table 4.4 to improve the current chart of accounts [202] when introducing 5D paradigm of actuarial accounting into the domestic accounting practice, is reflected only fragmentary. In addition to actuarial 3D accounts summarized by us in a tabular format, it is worthwhile to open the corresponding actuarial accounts for accumulating accounting information from the invoice accounting system about the cumulative financial result, free cash flow and economic value of the business.

Based on the generalization of the results obtained in the course of the study conducted in this article, the 5D paradigm of actuarial accounting that we proposed schematically is presented in Fig. 4.3.

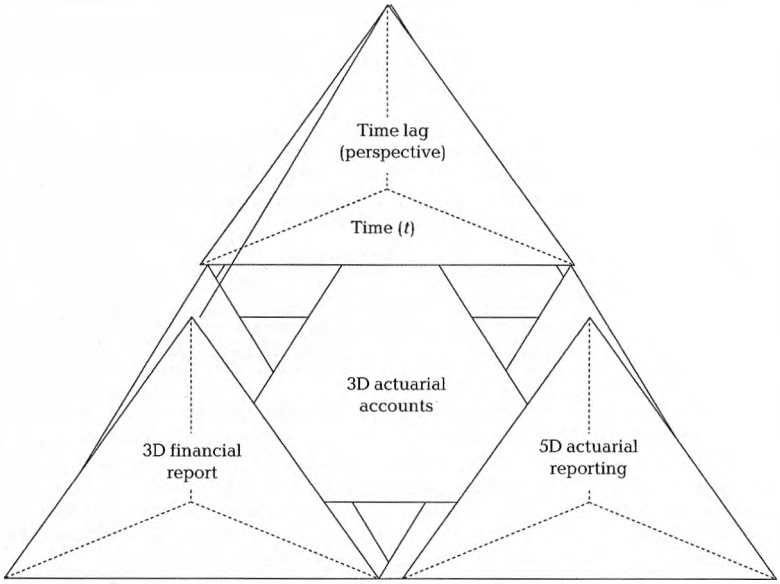


Fig. 4.3 Spatial interpretation of 5D actuarial paradigm.
***Source:** compiled by the author*

In the course of generalization of accounting information from the actuarial accounting system in 5D-format of the actuarial reporting, it is necessary to take into account the specifics of filling out the reporting forms that are characteristic of traditional financial statements, namely: the actuarial balance is drawn up at a certain point in time (forecast date), and the actuarial statement of movement cash and actuarial statement of comprehensive income — for the corresponding forecast period.

In general, according to the results of the study of the 5D paradigm of actuarial accounting and training of new generation accountants, it should be noted that the modern actuarial development of accounting doctrine

requires new innovative approaches to its 5-dimensional spatial interpretation in domestic enterprises. Because of this, there is an urgent need for the preparation of national accountants of such accountants who, in addition to deep knowledge of accounting, would have a toolkit of actuarial calculations and methods of actuarial accounting. Therefore, we proposed to make changes in educational programs and existing curricula for training specialists in the field of knowledge 07 Management and Administration, specialty 071 Accounting and Taxation by introducing a number of actuarial disciplines: Actuarial Mathematics 1 and 2, Actuarial Calculations; Actuarial accounting, Actuarial financial reporting, Actuarial analysis, Construction and evaluation of actuarial models. The practical implementation of such proposals will help the modern accountant in the 21st century to be not only the accountant, but also to some extent an actuary who is able not only to operate with information in the accounting system, but to see prospects for changes in the economic value of a business, its future financial flows in the 5-dimensional space (5D) of the innovation system of the actuarial accounting paradigm. That in complex terms contributes to the growth of prestige of the accountant profession in the labor market and increase the investment attractiveness of domestic enterprises.

The proposed 5D paradigm of actuarial accounting takes into account foreign non-trivial approaches to the formation of financial statements in 3D, and provides for its transformation taking into account the time factor (3D + time = 4D) in the actuarial financial statements in 5D, which is achieved through the use of accounting information that is accumulated on actuarial 3D accounts. The latter are proposed to be reflected in a separate 10th class of accounts with the same name, which it is advisable to open in the current chart of accounts [202]. Such innovations in the domestic accounting field contribute to shaping the image of the investment attractiveness of domestic business entities, even when selling a business as an integral property complex (IPC) and will ensure that the national economy is out of crisis conditions by attracting the necessary investment in the development of its relevant sector. The latter determines the prospects for further within the framework of selected issues, namely, the disclosure of the main aspects of the practical implementation of the 5D paradigm of actuarial accounting in domestic enterprises and the use of its data to improve management efficiency as a whole.