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USE OF STATISTICAL METHODS IN DETECTING ACCOUNTING ENGINEERING ACTIVITIES (AS EXEMPLIFIED BY THE ACCOUNTING SYSTEM IN POLAND) – SECOND PART: EMPIRICAL ASPECTS OF ANALYSIS

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Abstract This article is one in a series of two publications concerning detection of accounting engineering operations in use. Its conclusions and methods may be applied to external auditing procedures.
The aim of the present duo-article is to define a method of statistical analysis that could identify procedures falling within the scope of a framework herein defined as accounting engineering. This model for analysis is meant to be employed in these aspects of initial financial and accounting audit in a business enterprise that have to do with isolating the influence of variant accounting solutions, which are a consequence of the settlement method chosen by the enterprise. Materials for statistical analysis were divided into groups according to the field in which a given company operated. In this article, we accept and elaborate on the premise that significant differences in financial results may be solely a result of either expansive policy on new markets or the acquisition of cheaper sources for operating activities. In the remaining cases, the choice of valuation and settlement methods becomes crucial; the greater the deviations, the more essential this choice becomes. Even though the research materials we analyze are regionally-conditioned, the model may find its application in other accounting systems, provided that it has been appropriately implemented. Furthermore, the article defines an innovative concept of variant accounting.

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Introduction

This article belongs to a series of publications dealing with the author's original concept of accounting engineering as a modern management paradigm. Some other publications by the author considering the same topic are: Michalczyk, 2005a-d; Michalczyk, 2006a-e; Michalczyk, 2007a-c; Michalczyk, 2008; Michalczyk, 2010a-c; Michalczyk, 2011a-f; Michalczyk, 2012, Michalczyk 2013a-b.

Application of variant accounting in Polish business practice

In spite of all the serious objections as to the use of variant accounting, it finds its application in the economic reality of Poland. The mechanisms employed in order to facilitate the achievement of economic goals of business entities are most frequently connected with:

1) different ways the value of fixed assets is calculated,
2) calculation and settlement of tangible circulating assets,
3) valuation of unfinanced circulating assets,
4) calculation of the balance interest receivable and payable,
5) calculation of accrued costs, reserves and deferred income tax.

Table 1 presents methods and the extent of their influence on the temporary financial result (Michalczyk, 2008).

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Table 1: Elements of variant accounting affecting the financial result of a company[2]

Balance sheet item	Influence on temporary financial result	
	in plus	*in minus*
Tangible fixed assets - capital assets	Maximum costs of purchase activated in the value of a capital asset	Minimum cost of purchase, abandonment of the assessment of residual value
	Lack of write-downs due to permanent depreciation	Use of revaluation
	Linear methods, maximal period of use in accounting	Declining balance method, minimal period of use in accounting
Non-material and legal values	Goodwill - maximal period	Goodwill - minimal period
	Development costs - maximal extent of activation of production costs; lack of write-downs after the loss of economic value	Development costs - production costs equal to direct costs, write-downs after the loss of economic value
Tangible circulating assets (reserves)	Cost of purchase, maximal expansion of indirect allocated production costs	Cost of purchase, isolating groups of unjustified production costs
	If prices in this product line increase - FIFO; if they decrease - LIFO; use of fixed prices	Price increase: LIFO; price decrease: FIFO; use of fixed prices
	Limited amount and value	Maximized amount and value
Account receivable	Valuation according to present value (nominal value + interest)	Valuation according to historical value
Accruals and prepayments (in analogy: reserves)	Maximal time of costs settlement	Including maximal costs as costs of the current period (also, resignation from creating prepayments[3])
	In limited use	Maximal use
Agreements and long-term contracts	Percentage method	Completed contract method
	Lack of accreditation	Accreditation
Liabilities	Valuation in nominal value	Calculation of interest
Deferred income tax	Exploitation of all negative temporary differences	Adherence to the principle of prudence - exploitation of negative temporary differences whose probability to make profits borders on certainty
	Considered	Not considered

Source: Own studies based on the accounting act. (Michalczyk, 2005a; Michalczyk, 2005b; Michalczyk, 2005c; Michalczyk, 2005d; Michalczyk, 2006b; Michalczyk, 2007; Michalczyk, 2011; Michalczyk 2013)

2 In table used notions definitions – in: Michalczyk, 2013a.
3 The rationalization of accounting operations points to a need to create prepayments at least in those entries that affect tax settlement. Employing optimization of tax settlement in a business may mean that prepayments are recorded on the last day in the reporting period.

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Accounting engineering analyses typically assume must have a deterministic form. In the deterministic model, the following need to be defined:

1) controlling variables - the management of a company using accounting engineering solutions controls the choice of settlement methods,
2) exogenous variables - include all the factors conditioning accounting that are not the choice of a company as well as relevant aspects of the tax law, which also do not leave the company any choice regarding the procedures of accounting and taxation,
3) endogenous variables - covering the definition of a financial result in a business.

With the premise that a company's actions are constant, the simulation model has no random variables; hence, it is a deterministic model (Michalczyk, 2005b, p. 110-114; Michalczyk, 2011c, p. 103-111).

As assumed by the idea of managing relations with stakeholders, the matter of the financial result generated by a business enterprise is essential. The financial result constitutes a point of departure for many crucial decisions, ranging from the allocation of financial resources by investors and cooperation with contractors, the evaluation of the general efficiency and quality of management in a company, to the decision on whether collaboration with the company should be continued or canceled.

Whereas in the modern, globalizing economy, "exceptional" financial results of a company may only be a result of:

1) implementation of new technologies,
2) opening new marketing areas or new supplies of production factors, including human labor,
3) taking over other companies, particularly in friendly circumstances, but also former competitors.

The first aspect is connected with investment and implementation activities regarding R+D (research and development), but also covers the most profitable stages of product lifecycle (growth and maturity). The second one refers to logistical operations associated with looking for cheaper sources of delivery, which are, as a rule, foreign in origin. The third aspect refers to "taking over" the margins of previously cooperative companies or, in the case of former competitors, taking over marketing areas and cutting costs, especially the percentage share of fixed costs, which are not allocated in overall volume of costs; the possibility to affect product prices by, in a sense, "removing" the competition and assuming a more dominant position in the market is also important[4].

Having too positive financial results, as compared to the whole line of business in which a company operates, should result in, if the abovementioned actions are not taken, an inspection of settlement methods employed by the company in the last two or three years. Information regarding such actions may be found in the enclosed documentation accompanying financial reports of companies (Additional Information and Management Board's Report).

At the same time, it is prerequisite for the application of accounting engineering that the company actually operate on the market. The company cannot be a, so-called, dead economic agent; it has to have profits, incur costs, posses some assets and be able to point to the sources that finance them.

Empirical research

In our empirical research, purposive sampling of subjects was used. The researched economic agents were chosen according to the following criteria:

1) size - the research population was defined to include companies that the Polish accounting act classifies as large. This criterion is justified by the fact that such companies are obligatorily subject to inspections by skilled controllers and are required to publish their financial reports.
2) geographical – the research population was narrowed down to one of the Polish voivodships, namely the Lesser Poland Voivodship (Małopolska). Simultaneously, the following assumptions were made regarding types of companies:
   a. corporate entrepreneurship - the location of the central office is decisive (or at least that of the administrative office),
   b. companies with interlocking capitals - the necessary condition for a company to be included in the research population is that it makes its financial reports independently.

4 This last aspect is also reflected in the sections of the Protection of Competition and Consumers Act (a Polish legislation act) specifying that a permit from the president of the Office of Competition and Consumer Protection is required to concentrate companies whose turnover is larger than 1 billion euro (internationally) or 50 million euro (nationally). In other countries, anti-monopoly legislations present similar solutions, both in the European model (administrative proceedings) and in the American one (resolved according to penal legislation), and also in Switzerland (civil legislation).

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3) criterion of kind - the following were excluded from research:
   a. listed joint stock companies,
   b. banks, cooperative associations, auxiliary budget households, and "municipal companies",
   c. supported Employment Enterprises,
   d. agents located (or with some organizational element located) in Special Economic Zones (SEZ),
   e. companies for whom the accounting year is different from the calendar year.

The reasons behind their exclusion are the fact that they use different settlement methods (points 1 and 2), our decision to concentrate solely on variant aspects of the balance sheet law (points 3 and 4), and the intent to avoid business cycles specific to particular lines of business (point 5).

Table 2: Assigning research quanta to particular lines of business in which research subjects operate

Modified line of business	*Number of research quanta*	*Number of subjects*
Construction services	2018	21
Other services	603	10
Production of FSGM products	901	14
Production of B2B products	526	9
Other production	63	1
Wholesale trade in FSGM	2276	5
Other wholesale trade	1004	4
Retail trade in FSGM	411	9
Other retail trade	98	6

Source: based on own research

In the thus defined research population, financial reports of 79 entities were verified.

The subjects under analysis differ according to:

1) size - which, for the present analysis, is defined as a sum of assets and liabilities,
2) line of business - defined according to the detailed nomenclature of the Central Statistical Office (see Table 2 below).

It was assumed in the research that results on a scale of 0,01 (1%) of the general population were significant.

In order to establish the starting criterion for the median, the following actions were taken:

1) in the first stage, the analyzed subjects were "reduced" to their "lowest common denominators" as regards lines of business. With that aim in mind, the value of a single "research quantum" was determined with the following formula:

$$BKB = (\Sigma SBB \times 100) / \Sigma SBC$$

Where:
A = the number of research quanta assigned to a particular line of business,
B = the sum of balance sheet values and recorded profits and losses for all entities in the line of business;
C = the sum of balance sheet values and recorded profits and losses of all research subjects.

The obtained values were rounded off to "1". Thus, the weighted value of each subject (its financial report) in the overall volume of research subjects was established.

2) in the next stage, an analysis of the distribution of standardized differences was conducted. At the same time, the following research question was asked:

If deviations caused by operations exceeding the materiality threshold in a given line of business are discovered, will this mean that the research subject "adjusts the financial report to fit its own needs"?

Positive falsification of the above question (the fact that it remained unchallenged) shall mean that discrepancies observable in particular lines of business depend on the chosen settlement methods.

3) the factual basis was established subsequently. For that purpose, we compared the values obtained from the distribution of the index in the formula presented below:

$$V = W / [(A+B) / 2]$$

Where:
V = index: the financial result against the average value of assets in the reporting period (financial year);
W = the value of the financial result;

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A = the value of working assets on the first day of the reporting period (identical to that from the last day of the previous period);
B = the value of working assets on the last day of the reporting period.

It was assumed that the extent to which "accounting maneuvers" are used will be proportional to the discrepancy between the expected and the actual distribution.

4) the value of deviant operations was established with the following formulas (3 and 4):

$$S = Pt + Rt$$

and:

$$Rt = (Pt\text{-}1 + Pt+1) / 2$$

Where:
S = the volume of observable observations;
P = the actual number of observations in a given period of time (respectively: in the previous and in the following period);
R = the assumed number of observations in a period of time (t).

5) having established the standard deviation and accepted the principle of Gaussian distribution (the majority of analyzed cases are within the limits of the standard deviation), the distribution of standardized differences was obtained:

$$K = S / Z \text{ Where:}$$

K = the distribution of standardized differences;
Z = the standard deviation

In the case of the standard deviation, the response variable is the financial result of a company, while the explanatory variables are particular methods of settling assets and liabilities, calculating costs and classifying book incomes.

6) the range was defined as arising from moderate asymmetry. The asymmetry coefficient was calculated each time with the formula defined by A. Luszniewicz and T. Słaby (2003, p. 42) – formulas 6-7:

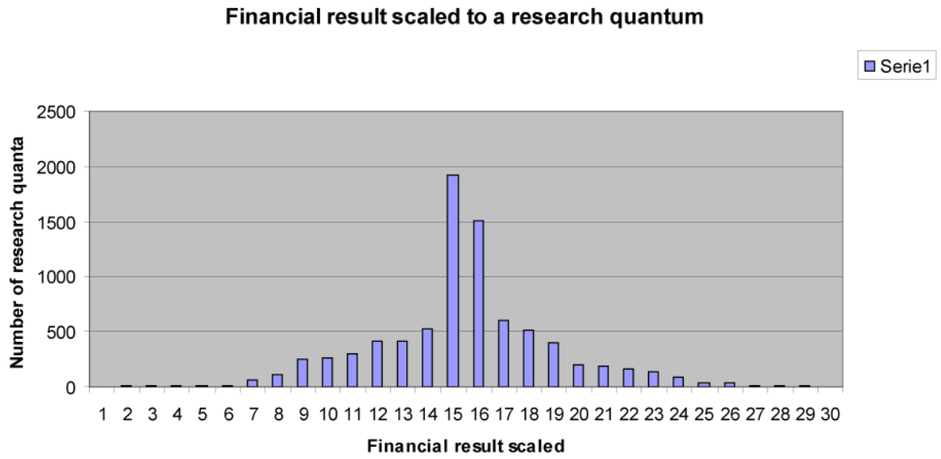
$$A = n \times M / [(n - 1) \times (n - 2) \times s\text{^}3$$

and:

$$M3 = \Sigma (x, -x)\text{^}3$$

7) the value of deviant operations was defined in keeping with the principle of equality in determining the scale: Such an approach also allows us to:

Graph 1: Financial result scaled to a research quantum



Run description: each within a range with the scope of 0,02 units, following in sequence from run 1 to run 30

Source: based on own research

a. define the vector of expectations for an analyzed company regarding the type of accounting methods, thus realizing the goal - creating a loss or creating a profit (?),

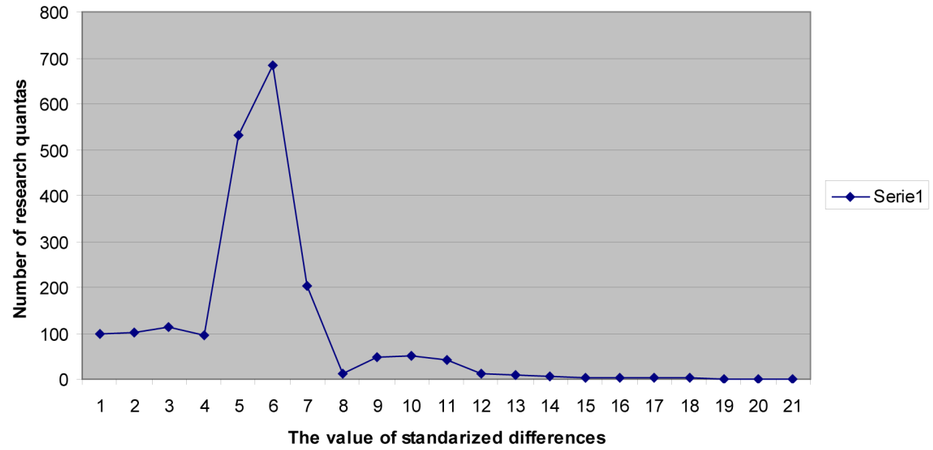
b. determine the level of current operations which will bring changes in the financial result in the following period, which is a result of the going concern principle and the fact that a profit/loss may be "created" in accounting only by transferring costs or incomes to subsequent reporting periods.

8) in the last stage, the scaling of the financial result took place. Its outcome for particular groups of research subjects is shown below:

It follows from the above that:
There exist companies using mechanisms of "accounting adjustment" affecting "negatively" or "positively" the financial result (this is one of the reasons why there are single digits and decimals describing the number of research quanta in each range). This means that, in the next stage, we will separate items which unambiguously represent accounting engineering characteristics from those that do not.

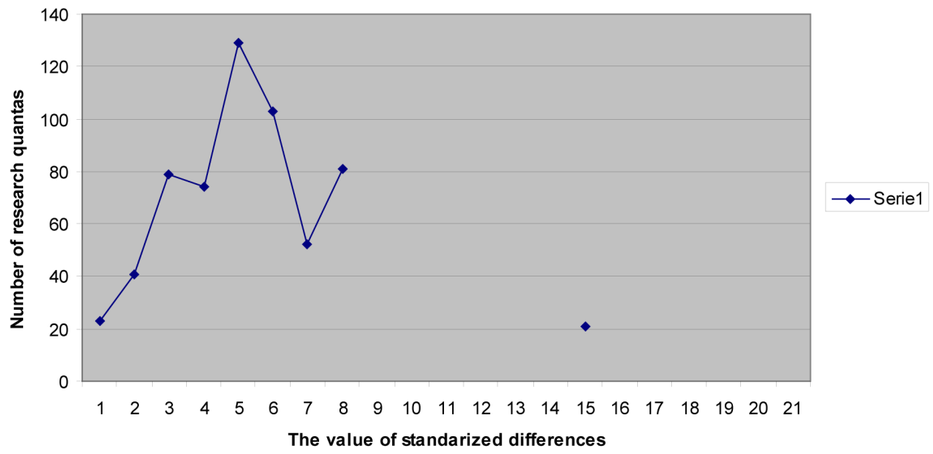
9) a distinct discontinuity at "0" is "flattened in the following sections". This also points to the fact that

Graph 2: The value of standardized differences for research quanta (construction services)



Source: based on own research

Graph 3: The value of standardized differences for research quanta (other services)



Source: based on own research

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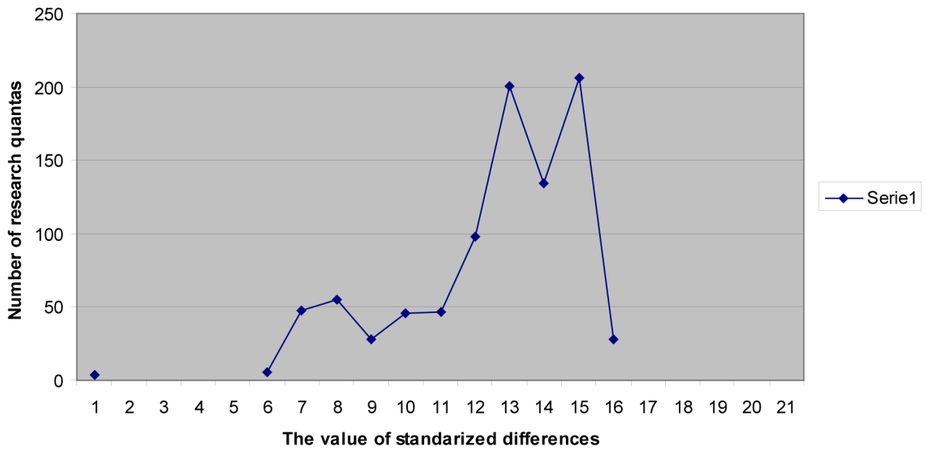
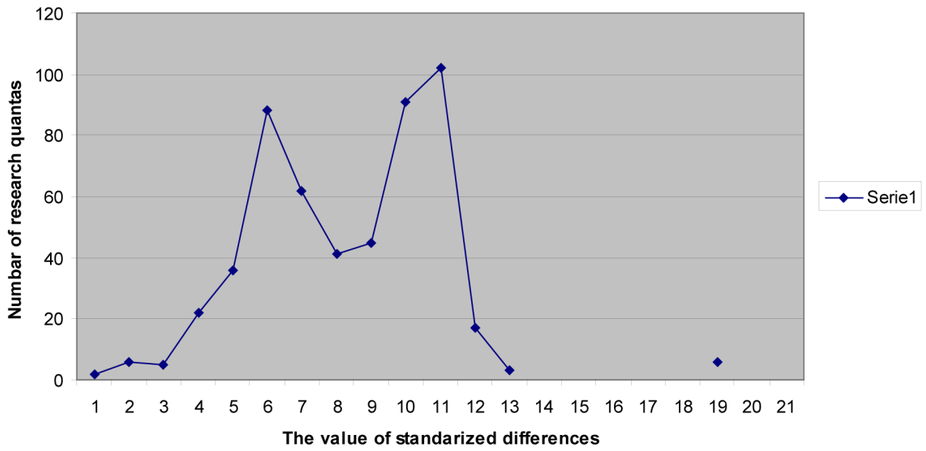
Graph 4: The value of standardized differences for research quanta (production of FSGM products)



Source: based on own research

Graph 5: The value of standardized differences for research quanta (production of B2B products)



Source: based on own research

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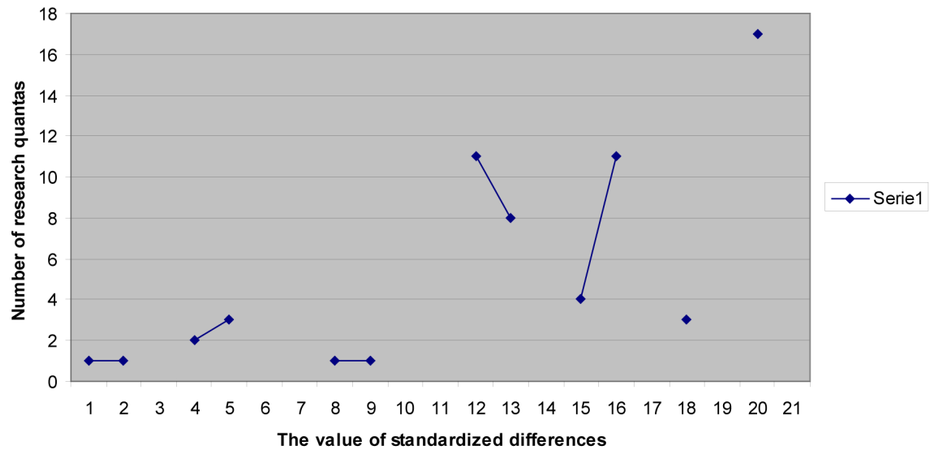
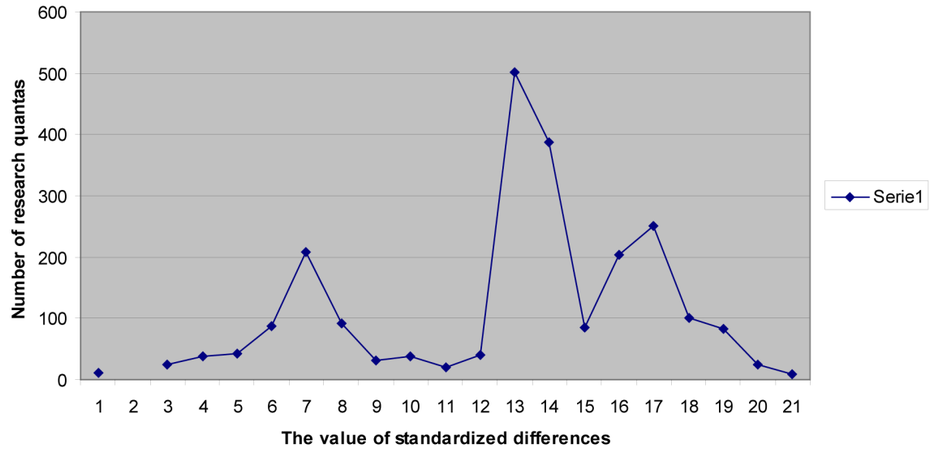
Graph 6: The value of standardized differences for research quanta (other products)



Source: based on own research

Graph 7: The value of standardized differences for research quanta (wholesale trade in FSGM)



Source: based on own research

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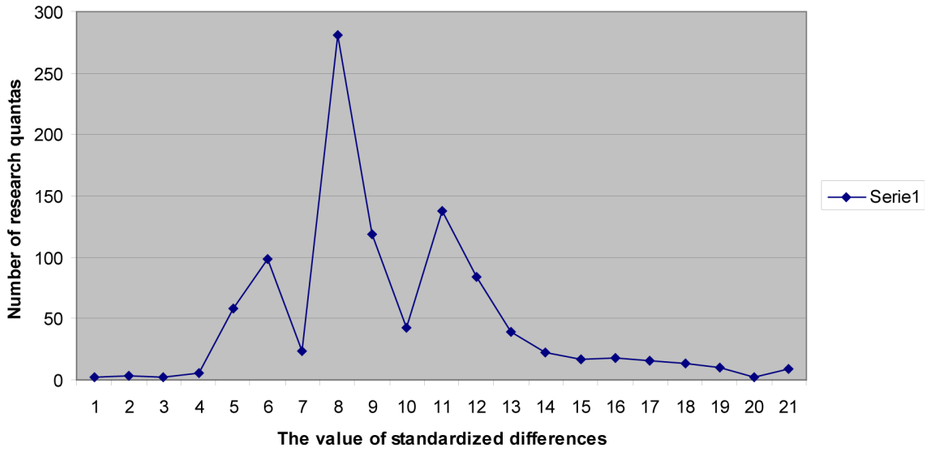
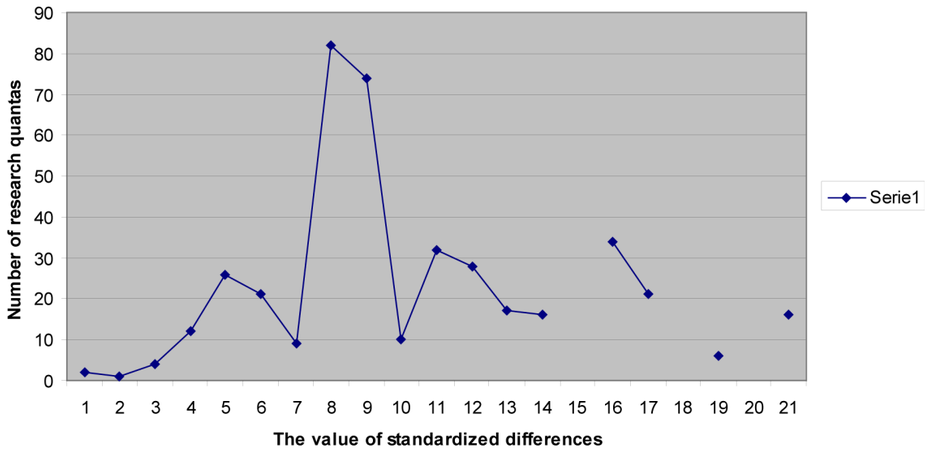
Graph 8: The value of standardized differences for research quanta (other wholesale trade)



Source: based on own research

Graph 9: The value of standardized differences for research quanta (retail trade in FSGM)



Source: based on own research

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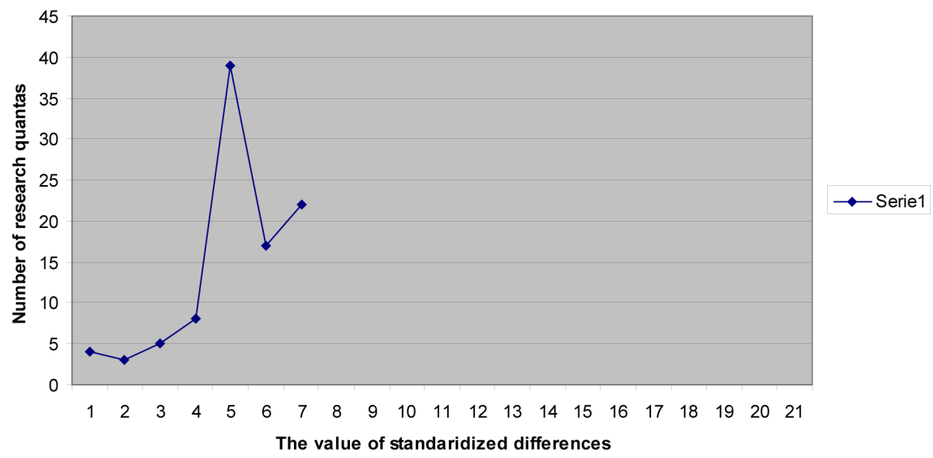
Graph 10: The value of standardized differences for research quanta (other retail trade)



Source: based on own research

some of the studied subjects represent the behavioral finance framework, in which the negative character of a loss receives greater emphasis than the positive character of a comparable (but with an opposite sign, of course) profit.

10) dominant observations "to the right" of point zero show that the accountant is disposed to "create a profit" rather than to "create a loss". Number of observations:

- to the left: (-) 2307
- to the right: (+) 5593

The value of standardized differences for particular lines of business is represented in the following graphs 2-10.

The analysis conducted above allows as to posit the thesis that companies tend to adjust the rules of accounting settlements in order to achieve their own economic goals. If it were not the case, there would be no anomaly value in the distribution of the index around the median. If the financial result were only a consequence of the efficiency of actions, the distribution of standardized differences around the median would be, within a given line of business, more or less conical in shape. The greater the anomalies, the greater the probability that various accounting "maneuvers" appear. Of particular interest is the situation observed among the elements of the population defined in subgroups:

1) other production (Graph 6),
2) retail trade in FSGM (Graph 9),
3) isolated cases occurring in other groups were deemed irrelevant due to the assumption that only results on a scale of 0,01 (1%) of the general population were significant. Moreover, we assumed that the specificity of research subjects, which is neutral with respect to accounting methods, may associate with the occurrence of detached research quanta of as many as several percent.

Point allocation of the scaled financial results that are detached to the right of the median points to an aggressive use of accounting engineering, definitely exceeding the average accounting activity in these sections of the economy. Such a situation takes place when a financial result is created positively. While looking for significant differences in financial reports of entities in the analyzed groups, we noticed:

1) significant differences regarding the value of amortization with a relatively similar gross value of fixed assets in the subgroups of capital assets, nonmaterial and legal values. It may be a consequence of the presence (or co-occurrence) of two factors:

a. irregularities regarding the management of capital assets and non-material and legal values, which are demonstrated by the fact that there exists no policy of their "recovery". This leads directly to the technical (capital assets) and technological (capital assets, non-

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material and legal values) decapitalization of the company. This is typically observed in the attitudes of owners of companies geared towards exploitation. Since all of the analyzed subjects belong to the same group (line of business), the fact that some of them experience financial difficulties while others do not may be solely due to improper management in these companies, including the ability to acquire financial resources,

b. use of different accounting solutions in the valuation of particular balance items, and the use of different types of settlement in the statement of profits and losses.

2) higher level of credit debt (in banks) than in the remaining subjects belonging to the same research groups.

Furthermore, the "out of range" anomaly shows that the comparison of financial reports is not possible when variant accounting solutions are employed.

Among all research subjects, service-driven companies exhibit the smallest anomalies. The largest anomalies are exhibited by production-driven companies.

Some characteristic features of the balance sheets of the subjects classified, by the Polish accounting act, as large are:

1) in the case of service-driven companies (chiefly construction companies) - a significant number of long-term contracts,
2) production-driven and commercial companies - a significant value of their material reserves (resources, intermediate goods, products, goods, materials),
3) production- and service-driven companies - a significant value of fixed assets.

Taking this into account, we may draw a conclusion that the transfer of costs plays a considerably more important role in the valuation of financial results with the use of accounting engineering mechanism than the transfer of incomes.

Yet another conclusion is that the tax law has a significant influence on accounting solutions. As a consequence of this influence, the rules of settlement in particular companies are made more specific.

Conclusion

The matters brought up in the present paper concern activities which are part of accounting engineering. Within its framework, the possibilities resulting from variant accounting solutions are exploited. Thank to these solutions, identical economic operations may yield different result. The scope of their use is a function of the goals realized by a company and of the volitional attitudes of employees working in accounting departments. Regarding the achievement of company goals, the way they are described is of paramount importance; what is meant is the use of such accounting solutions that deal with the description of economic operations.

Since different methods may yield different financial results, the influence of the methodological diversity of accounting should also be incorporated in the balance statement of a company. It is not possible to compare the activity of various companies without it. Such a comparison is, in turn, prerequisite to analyses of the rationality of behavior of, in particular, credit grantors, loan creditors or speculators, etc. Thus, the issue should play a crucial role in future accounting research as well as in studies concerning financial and accounting audit.

What also needs to be considered is the problem of accounting methodology and the ethics of the advocates of variant accounting. Can a system in which the description of economic activities depends not on the entity described, but on the method of description be called reliable? Is this system, implemented in the Polish economic reality (meaning its balance sheet law) by accounting theorists (advocates of variant accounting), scientifically valuable? What does it tell us about the motives (and ethics) of Polish theorists of accounting if we realize that cooking up new ideas in variant accounting is the shortest way to advance in the academic ranks? Are lawyers who implement (into the current law) the concepts for which theorists do not feel responsible at all reasonable?

In the coming years, the practice of accounting and financial/accounting auditing should strive to create mechanisms that would either entirely prevent the use of accounting engineering by companies or at least reduce its effects. Accounting is a noble domain of knowledge with an immense influence on the economy, it plays a crucial role in verifying all types of economic activity and reviewing the efficiency of company management, and if the above goals are not met, it will not continue to lose credibility. Achieving this goal, and not creating increasingly absurd variant accounting ideas, should become the focus of accounting. It is for the research in this field that academic degrees and titles should be given. And it will only be then that universities will turn back to the original function of accounting - the protection of economic circulation. And then the ideas of accounting theorists will no longer bring pitiful smiles on the faces of the pragmatic practicing accountants.

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