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BEHAVIOURAL APPROACH AND ECONOMIC EXPERIMENT IN AGRICULTURAL FINANCE*

Abstract

The main aim of the paper is to assess possibilities of implementing behavioural approach and economic experiment in Polish studies in area of agricultural finance. There are two sub-goals: (i) highlighting methodology of economic experiment and indication of technical subtleties concerning agriculture; (ii) identification of potential areas of implementing behavioral approach and experiment in agriculture finance. The article verifies following thesis: economic experiment that was carefully planned and carried out, closely related to the behavioural approach, in addition to traditional research methods, contributes to clarification of more complex financial problems of agriculture. The article also presents the current state of research referring to behavioral approach and economic experiment, as well as indication of potential areas of exploiting them in agricultural finance. Behavioural approach and economic experiment, complementary to traditional research methods, significantly enrich the research workshop of financiers. There are many limitations of using economic experiment. Both processes of integration of Polish financiers dealing with the agricultural sector and also establishment of co-operation beyond the rigid framework of research areas should be reinforced. Taking into account trends in development of modern economic sciences, behavioral finance with economic/financial psychology will play a more significant role in explaining financial processes of the agricultural sector.

Keywords: behavioural approach, economic experiment, agricultural finance, behavioural economics, econometric methods.

* Behavioural approach spans a set of research methods characteristic for behavioural economics. Economic experiment is a specific method facilitating both gathering and processing empirical micro data, remaining under particularly strong influence of achievements of economic psychology.

Introduction

Beyond doubt modern economic sciences are characterised by substantial interdisciplinarity. The example is finances as a scientific discipline, which in the Polish scientific system became an independent domain in April 2010. When carrying out any scientific research in the area of finance, it is difficult to omit phenomena, which are subject of broadly understood social sciences (including sociology, psychology, law and political science). Finance, in a sensu largo perspective, discussing monetary phenomena (i.e. those related to generating, flow and accumulation of money), evolved historically as a branch of service type practice, both towards the state – in the fiscal system, and towards economic operators – in accounting, into an interdisciplinary and internally complex science [20]. It should be pointed out that agriculture – as a section of national economy – participates in monetary phenomena as a collection of economic operators which are heterogeneous in organisational terms and are in varying economic and financial conditions. Although division by economic functions dominates in modern finances, the finances of agriculture, similarly to economics of agriculture, result from the sectoral classification of scientific disciplines¹.

Most of modern economists share the view that homo economicus (“economic man”) is the decision maker. Such entity acts in its own interest, for the sake of which it can make cool-headed calculations, taking decisions on the use of financial (which is the primary topic of interest in the finances discipline), human or social resources. In its calculations it uses criteria such as profit/loss (in case of an entrepreneur) or income (in case of a household) [30]. As R.H. Thaler and S. Mullainathan [48] believe, the model of human behaviour traditionally adopted in studies of economists is based on three unrealistic premises: (1) unlimited rationality, (2) unlimited willpower, and (3) infinite egoism of the agent of economic decisions. The doctrine of neoclassical economics omitted psychological and sociological determinants (e.g. money illusion, unwillingness to bear losses) of economic or financial decisions². As S. Flejterski notes [8], only the concept of selective rationality (X-efficiency paradigm) of H. Leibenstein³ was a breakthrough and contributed to “drainage” of theories and research methods used for a long time in psychology, as well as in sociology for economic

¹ First attempts at classification of economic sciences were made in Poland after the Second World War – at the 1st Congress of Polish Science (in 1959) a division into political economics and economic sciences was adopted, from the point of view of location of the subject of interest in the national economy. Alongside specific economics, a group referred to as “finances, credit, monetary flow” has emerged. As S. Flejterski notes [8], a similar approach to classification of economic science was preferred by O. Lange, who distinguished the so-called specific economics, as well as by H. Chołaj, who also distinguished the so-called special economic sciences, studying the national economy in a more specific subject range.

² In this case, financial decisions should be treated as those referring to financial resources of an economic entity.

³ According to this concept, decision makers may choose the degree of rationality. As a result people may: (1) behave the way they like; (2) act the way, they have to behave; (3) choose an intermediate solution.

sciences. At the end of the 20th century, the behavioural approach⁴ (present in behavioural economics and finances), as well as economic experiment⁵ were admitted as an alternative to traditional research methods. Awarding by the Bank of Sweden the Prize in Economic Sciences in Memory of Alfred Nobel in 2002 to D. Kahneman, the author of the Prospect Theory, was a kind of ennoblement.

The primary objective of the study is to assess the possibilities to use the behavioural approach and economic experiment in Polish scientific research on agricultural finance. Two sub-objectives have also been defined: (1) presentation of the methodology of economic experiment with pointing to technical subtleties related to agriculture; (2) presentation of potential areas of use of behavioural approach and experiment in agricultural finances. The following proposition shall be the axis of the considerations: carefully designed and implemented economic experiment, closely connected with behavioural approach, alongside traditional research methods, contributes to more precise explanation of more and more complex problems of agricultural finance. The article presents a synthesis of literature on behavioural approach and economic experiment from a chronological perspective. The state of play in research shall be presented, taking into account behavioural approach and economic experiment with indication of potential areas of use in agricultural finances. The study ends with conclusions.

Behavioural approach and economic experiment – historical perspective

Already the father of classical economics, Adam Smith, referred to the issue of the connection between psychological factors and economic decisions in “The Theory of Moral Sentiments” of 1759, drawing attention to the impact of emotions, honesty and loss aversion on decision making [40]. Jeremy Bentham in turn, more broadly known as a philosopher rather than an economist, turned the attention to the fact that human activity was motivated by two extreme desires: pursuit of simple pleasures and avoiding pain. And, the best way to measure pleasure are, according to Bentham, monetary units. Neoclassical economics, following the orthodox classical theory, adopted an assumption as a sort of canon that individuals were rational and that they calculate. In the course of development of neoclassical economics, economic research was cut off from the analysis of psychological factors, though the views of the second generation of the so-called marginalists, Irving Fisher in particular, do include psychological justifications of certain economic concepts [7]. Fisher’s interest rate theory is based on the assumption that there are two types of determinants of interest rate: subjective factors, reflecting preferences of individuals in relation to present assets or incomes in comparison to future ones, as well as objective factors, connected with

⁴ The author understands “behavioural approach” as the entirety of methodological implications resulting from rejection of the assumption on rationality of economic decisions (agent as *homo economicus*).

⁵ Here, the author uses the term “economic experiment” wishing to underline its specificity in reference to other domains of science. The author does not use the term “financial experiment” due to the term “economic experiment” being strongly established in English language literature.

availability of investment opportunities and productivity of outputs used [26,50]. In the theory of John Maynard Keynes in turn, considered to be a breakthrough, particularly in macroeconomics (and presented primarily in “The General Theory of Employment, Interest and Money”), references to the science of human behaviour can be traced in the function of consumption, operating with extreme inclination to consumption. According to J.M. Keynes, forecasts of future interest rates are determined by mass psychology. More such references to psychological issues can be found in Keynes “General Theory”. Furthermore, J.E. King [17] turned attention to the fact that beliefs of the great economist of Cambridge were influenced by the anthropological system of Sigmund Freud.

The breakthrough – comparable to the Copernican revolution – in the way economists treated psychological factors took place only after the publication of American psychologist of Hungarian origin, George Katona, representing the so-called Michigan School. G. Katona pioneered in the so-called economic psychology; he created the commonly known *University of Michigan Consumer Sentiment Index*, which was successfully used to predict the post-war boom in American economy [14].

Though, one cannot equate experimental and behavioural economy, it is worth to devote some attention to the views of the most important representatives of this doctrine of heterodox economics (Table 1).

Table 1

The evolution of behavioural economics

Economist	Contribution to the development of behavioural economics
“Precursors”	
Herbert Simon	Research of decision making processes inside industrial organisations; development of the theory of decision-making; introduction to the work on artificial intelligence in organisations; waiving the paradigm of unbounded rationality of decision makers, who maximise their usefulness: development of the model of the company of “satisfactory minimum”, which contrary to neoclassical theory of enterprise (maximisation of profit as the objective of functioning), assumes existence of the so-called profits satisfying shareholders.
Harvey Liebenstein	The concept of <i>x-inefficiency</i> (or ineffectiveness type X), i.e. existence of a mismatch between theoretical behaviour of a company in line with neoclassical theory, and observed behaviour; possible causes of ineffectiveness type X are related to psychology of organisations (e.g. faulty motivational system for workers). Description of the snob effect and the bandwagon effect known in microeconomics (and more specifically in consumer economics).
“The leaders” of behavioural economics	
Daniel Kahnemann	Application of psychology tools in economic research, in particular in conditions of uncertainty; development of the Prospect Theory together with A. Tversky.
Amos Tversky	Identification of (in cooperation with z D. Kahnemann) the so-called cognitive <i>biases</i> , e.g. conjunction bias, <i>the law of small numbers</i> , development of the <i>Prospect Theory</i> , heuristics of making judgements (availability, representativeness, anchoring and matching).

Source: own elaboration.

As T. Zaleśkiewicz noted [52], the research process carried out by behavioural economists consisted of the following stages:

- in-depth analysis of one of the economic theories⁶;
- identification of anomalies, i.e. deviations from theoretical assumptions;
- proposal of an alternative model, taking into account psychological aspects of economic behaviours;
- subjecting the alternative model to empirical tests;
- development of a new theory or supplementing (at least partially) the classical theory with behavioural components.

A. Solec [41] citing J.F. Tomer states that behavioural economics is not homogeneous, but is a collection of quite different schools (Table 2). On the other hand, it is possible to identify a lead axis: questioning the classic-neoclassic assumption that *homo economicus* is the agent of economic decisions. Moreover, representative of behavioural economics oppose the methodological stance of Milton Friedman, increasing psychological realism of assumptions of economic theories [41].

Table 2

Schools within behavioural economics doctrine

School	Leading representatives
Michigan school	George Katona
Psychological economics	Colin Camerer, Richard Thaler, Ernst Fehr
Behavioural macroeconomics	George Akerlof
Evolutionary economics	Richard Nelson, Sidney Winter
Behavioural finances	Robert Schiller
Experimental economics	Vernon Smith

Source: own elaboration based on [41] (from J.F. Tomer).

The beginning of experimental economics date back to the 1930s. It was pioneered by L.L. Thurstone, who introduced the survey method⁷. First, prototype economic experiments had the nature of recurrent series of observations of exposition (typically of students) to economic incentives in laboratory conditions. Participants of experiments would get small, but real payments, proportional to results. One should agree with A.E. Roth, who pointed out that the theory

⁶ T. Zaleśkiewicz [52] exemplifies his considerations with the theory of life cycle, the “behavioural version” of which, i.e. the so-called behavioural theory of life cycle had been proposed by H. Shefrin and R. Thaler. In brief, according to the theory in question, self-control mechanisms prevent impulsive consumptions, while increasing readiness to delay gratification. Moreover, people use the rules of the so-called mental accounting, including virtual (existing only in the mind) accounts. Behavioural theory of life cycle was discussed in detail in article [38], while the essence of the so-called mental accounting was presented in the study [49].

⁷ Thurstone used the survey methodology to draw individual indifference curves, including to shoes and hats [36].

of games approach, including the work of Neumann and Morgenstern “Theory of Games and Economic Behaviour”, had an impact on the interest of economists in the theory of individual choices, as well as interactions of behaviours of economic agents [37]. As a consequence, the theory of games contributed to targeting researches towards evaluation of behaviours of economic decision makers in controlled conditions. Significant economic experiments were presented in global literature beginning from 1940s. (E.H. Chamberlin⁸ or M. Allais⁹ for example). Flourishing development of the methodology of economic experiment, as well as a significant intensification of empirical work using it, only took place beginning from the 1960s [36]. Because they used laboratory animals (presently rarely), experimental economists were even called “economist-rats” by “methodological purists”¹⁰. A specific ennoblement of the methodology of economic experiment was granting of the 2002 Swedish Bank Award in Memory of Alfred Nobel to Vernon Smith¹¹, whose contribution to explanation of numerous microeconomic problems was very significant:

- development of a centralised market mechanism and definition of rules for conclusion of buy and sell transactions, facilitating achievement of an efficient market price;
- research of auction mechanism and market organisation;
- research of the mechanism for provision of public goods.

From the perspective of the new doctrine of economics, the spreading of computer technologies as a specific platform facilitating efficient organisation of economic experiment turned out very advantageous. V. Smith was keen to use IT novelties of the day, including real time communication of participants or touch screens [40].

In summary – the dynamic development of social sciences, primarily of psychology, persuaded economists to reject or at least partially waive assumptions of classical/neoclassical economics, including perception of the *homo economicus* as the agent of economic decisions. The theory of games, analysing mutual interactions of participants (e.g. in the framework of market mechanisms)

⁸ M. Krawczyk [21] recognises Chamberlin as a pioneer of new doctrine of heterodox economics, who carried out experiments on students, suggesting inadequacy of market balance.

⁹ M. Allais, the laureate of the Swedish Bank Prize in Memory of Alfred Nobel in economics in 1988 is known in global economics, because he proposed an experiment, presently referred to as the so-called Allais paradox, in which he called into question the theory of expected utility [10]

¹⁰ M. Friedman in particular, the chief monetarist, almost denied scientific value to economic research (e.g. carried out with the use of the survey method or economic experiment), claiming that the results were worthless, as the subject would not know exactly, how he would behave in a real economic situation [37].

¹¹ H. Landreth and D.C. Colander [26] claim that an experiment including the so-called “double oral auction market” became a model solution, used by many subsequent experimental economists. The essence of this experiment lies in verification, whether in a double oral auction market (where buyers and sellers publicly submit their offers and proposed prices) it is possible to achieve balance (it turned out to be possible, in just quarter of an hour in a market with around 14 participants).

prompted in-depth research, which as a result led to identification of deviation from established theoretical models, explaining behaviour of subjects in the framework of market structures.

The methodology of economic experiment

It should be noted that economic experiment¹² in itself is not a simulation or role playing exercise, it has a sound methodological foundations, developed from half of the 20th century¹³. M. Krawczyk [22] states that two categories of economic experiment can be identified:

- in basic research (e.g. experiments on risk perception or those on strategic interactions);
- in applied research (e.g. experiments for examination of effectiveness of individual market institutions).

The above distinction indicates that potential scope of application of economic experiment could be encouraging for a researcher. However, it is worth to turn attention to the classification drafted by the Nobel Prize winner, recognised for his achievements in development of experimental economics. V. Smith [40] meticulously discusses as many as seven premises convincing a researcher-economist to carry out experiment(s):

- testing prediction capacities of theoretical models, as well as identifying differences between them;
- finding out why there was a failure of a prediction using a theoretical model;
- identification of empirical regularities, which could provide foundations for new economic theories;
- comparison of conditions of environment, in which a given economic theory is applicable;
- benchmarking of institutions (including the issue of auction mechanisms);
- evaluation of different scenarios of economic policy¹⁴;

¹² The intention of the author was only to familiarise readers with methodological foundations of economic experiment, with a focus on potential technical subtleties connected with researching the agricultural sector. More detailed information, particularly on planning of economic experiments, may be found in work of foreign authors [1]. M. Krawczyk's study in Polish is a very interesting publication [21].

¹³ S. Flejterski [8], although he believes that taking financial decisions *in vivo* (in the reality of an economic operator) is experimenting in itself, is quite sceptical about application of an experiment as laboratory exercise. The author mentioned above considers a method of calibration of models, elaborated by F.E. Kydland and E.C. Prescott, and inspired by methodological approach of R. Lucas. Thought experiment, as a sequence of conclusions derived from assumptions through logical reasoning is in principle – in S. Flejterski's view – an alternative to the experiment known to empirical sciences. However, supporters of experimental economics/experimental finances could argue with such a statement. Economic experiment strongly inspired by achievement of economic psychology, and also indirectly of behavioural economics, is based on methodological assumptions which are completely different to those of experiments used in, for example, life sciences.

¹⁴ The above shows that economic experiment could be used in, for example, assessment of sensitivity of farmers to changes in agricultural policy.

- research of changes in institutions (e.g. effectiveness of new institutional forms). Motivations encouraging a researcher to use economic experiment are very diverse. It could be used, for example, to explain multi-faceted economic problems (often strongly connected with other social sciences, psychology and sociology in particular), where research methods used so far are not very effective¹⁵.

It should be noted that similarly to any research process¹⁶, economic experiment includes sub-processes of planning (design), implementation and analysis of results. Table 3 characterises the planning process in economic experiment. While the initial operation, which consists in formulation of research questions (problem) does not raise any doubt, the choice between using an existing experiment plan and designing a new experiment plan could be cumbersome to a researcher. The second solution is used in a situation, where a researcher is unable to relate to earlier experimental research and the subject of experimental analysis turns out to be extremely complex. A researcher should carefully consider the decision of the subject and take into account their determinants and whom they could affect. The issue of controlling the number of repetitions of a decision¹⁷ is crucial from the point of view of planning of an experiment. Typically the analysis of one-shot decisions is used, if not for any other reason than because of limited pay outs to experiment participants as the opportunity to reduce the length of a session¹⁸. Another important issue is manipulation of

¹⁵ The issue of effectiveness in case of econometric models remains extremely complex. One of the fundamental measure of fitting a model is the coefficient of determination R² (or its adjusted form), providing information about the proportion of the dependent variable predicted by the model. As J. Kulawik rightly notes [25] in Polish research in the area of economics and finance of agriculture one could notice excessive focus on the degree of model's fit (e.g. in case of multiple regression), without a closer look at materiality of variables. As T. Kufel states [24] in case of zero-one models, McFadden pseudo-R-squared coefficient could be used as a measure of fit. J. Kisielińska [18] enumerates the so-called coefficients of empirical accuracy of classification used to assess effectiveness of classification (assuming absence of asymmetry), e.g. (1) counting R², (2) individual coefficients of accurate classifications, (3) total percentage or erroneous classifications, (4) individual coefficients of erroneous classifications. Low effectiveness of econometric models (illustrated by coefficients mentioned above) encourages a researcher to use "alternative", non-classic research methods.

¹⁶ Also in organisation of scientific activities it is useful to employ categories of a process approach, which is rooted in business process re-engineering used in economic activity [42].

¹⁷ As M. Krawczyk [21] notes, application of repetitions makes sense, if the decisions taken differ at least slightly and participants of the experiment get relevant additional information.

¹⁸ In case of using repetitions, the algorithm of division into groups is important: whether in subsequent rounds participants remain in the same groups. The work of F. Mengel and R. Peeters [29] contains quite a good review of the methodology of repetition in case of an experiment with interactions in groups. In general, the most frequently used option of division into groups is: (1) partner and (2) stranger. In the former experiment participants do not change their group, in the latter participants do not know if the play with the same person. J. Brands and G. Charness [4] also discuss the so-called strategy method, introduced to experimental economics by R. Selten. The essence of this method consist in the fact that a participant of experiment takes into account only one option from many decision options and it determines the results.

a variable, which the researcher may freely control (the so-called experimental variable), as well as setting the levels of the variable (control level, as well as experimental level)¹⁹.

In case of experiments related to impact of several variables, it is necessary to use achievement of design of experiments (DOE), in order to draft the so-called factorial plan and to define the sequence of experimental conditions. The easiest methodological approach would be to assume beforehand that participants of a session take decisions in constant conditions; in certain case the assumption mentioned before is waived²⁰.

Table 4 presents advantages and disadvantages of different ways of implementation of economic experiments. Taking into account the considered possibility to use economic experiment in research of the agricultural sector, it is difficult to state conclusively that a field experiment could be an optimum solution. Many empirical studies using PL-FADN system are based on the survey method. The method of economic experiment by definition assumes gathering of a certain group of participants, and to research interactive behaviour it is necessary to expose subjects to experimental procedures at the same time. Some hope may be placed in computerised experiment using the Internet, nevertheless ensuring representativeness of the sample remains a significant problem. Using the environment of a computer laboratory may be limited only to a small number of experiments.

Table 3

Planning of economic experiment

Operations	Description
Formulation of research questions	Definition of scientific problems motivated by (1) analysis of source literature, (2) shortcomings or ambiguity of research results (3) as an attempt to explain field observations, which are difficult to interpret (stylised facts)
Application of an existing experiment plan	Using a known research plan
or: drafting of a new experiment plan	<ul style="list-style-type: none"> • Identification of a single decision of a participant • Setting the number of repetitions and choice of repetition strategy (matching, strategy method) • Definition of technical issues of an experiment: definition of sample size, identification of impact of independent variables, selection of the level of experimental variable, definition of a sequence of experimental conditions

Source: own elaboration based on [21].

¹⁹ According to M. Krawczyk [21] one should refer to theory when setting the level of experimental variable. It is also advised to set the levels of the controlled variable far enough to allow appearance of a difference.

²⁰ The work of F.J. Gravetter and L.B. Forzano [12] contains a very good discussion of the issue of randomisation, facilitating testing of research hypotheses with a small number of participants (and therefore with relatively low costs), including the so-called within-subject design. It is also worth to turn attention to the problem of the so-called time lapse effect, including effects of boredom and learning of participants, as well as monetary effects.

The selection of a sample is a very important issue²¹. It is methodological issue very well known to economists of agriculture familiar with the specificity of field research and experiments in agriculture. It should be noted that the way of carrying out of an experiment (e.g. in a laboratory) very often prevents the use of a representative sample. Definition of sample size is a separate statistical issue, although a good practice here is to use the so-called Stein's two-stage sampling scheme, i.e. estimation of experimental effect and variance of a random component and then matching the entire size sample to it [21].

According to R. Borowski [3] the general scheme of an experiment may be presented as a sequence of the following components:

- presenting instructions to participants,
- presenting control questions to participants of the experiment,
- launching the experiment,
- recurring decision making process (decision making stage, calculations, presentation of results),
- presenting the final calculations,
- participants completing post-experiment questionnaire.

The scheme above shows that carrying out of an experiment may be difficult for a beginning experimenter. Normally, a good solution is to carry out an economic experiment for a small group of participants in pilot conditions. Ready-made software packages available free of charge in the Internet make it easier to a certain extent, as they facilitate holding a session in laboratory conditions or in the Internet (particularly z-Tree and Polish LabSEE²²).

In case of analysis of empirical data, attention should be paid to the issue of comparing more than two groups through analysis of variances²³ (ANOVA) and co-variances²⁴ (ANCOVA), remembering that empirical data from experiments do not meet very restrictive requirements characteristic for parametric tests. Therefore, typically there is a necessity to use non-parametric tests (primarily Kruskala-Wallis and Friedman test). From the point of view of model considerations it is necessary to use methods alternative to commonly used least square method: instrumental variables method, binomial models (logit or probit) or model of ordered variables (e.g. ordered logit or probit models) [13, 32].

In conclusion, the key role in carrying out of an economic experiment is played by deliberate drafting of a plan of an experiment, with particular focus on the issue of sample selection and the level of experimental variables. It is important that a researcher gets to know “technicalities” of an economic experiment

²¹ The work of J. Ledolter [27] contains an interesting discussion of statistical issues related to a sample in a field experiment.

²² LabSEE XP 1.4 software (as of 28.08.2013) is available for a free download at labsee.pl.

²³ Exhaustive discussion of this method, including experimental applications is presented in the handbook of R.N. Cardinal and M.R.F. Aitken [5].

²⁴ In-depth discussion of statistical planning of experiments (Design of Experiments, DOE) is included in [43].

and, first of all, carefully selects a location of economic experiment. For beginning researchers-experimenters it is recommended to carry out an experiment for a pilot group (e.g. in a computer laboratory), and then for the selected group.

Behavioural approach and economic experiment in agricultural finance – the state of research so far

Table 4

Methods of implementation of an economic experiment – advantages and disadvantages.

Method	Advantages	Disadvantages
Computerised experiment in a laboratory	<ul style="list-style-type: none"> • Interactivity (with the right software interfacing computers and participants) • Multimedia communication • Significant control over behaviour of participants • Opportunity for in-depth analysis of the decision making process • Automated data processing process 	<ul style="list-style-type: none"> • Potential costs related to renting a laboratory • The risk of IT system failure • Exclusion of certain groups from research (discrimination)
Computerised experiment over the Internet	<p>As above, plus:</p> <ul style="list-style-type: none"> - no cost related to renting a laboratory - opportunity to reach many participants scattered geographically, including special groups - greater feeling of anonymity among participants - freedom of organisation of an experiment (participants may log in at any time) 	<ul style="list-style-type: none"> • No direct control over behaviour of participants (including multiple participation) • Difficulties related to payment of rewards to participants • Time consuming preparation of a website
Field experiment	<ul style="list-style-type: none"> • Opportunity to observe behaviour of participants in very realistic conditions • Opportunity to use a diversified sample of participants • Better clarity of instructions for participants of the experiment 	<ul style="list-style-type: none"> • Substantial cost of preparation of the experiment (including print outs of forms, per diems for experimenters) • Limitations to design of an experiment (typically only one experimental variable at two levels) • Very time consuming (primarily due to carrying out of the experiment, but also due to analysis of results)

Source: own elaboration based on [1, 21].

When reviewing scientific papers by foreign economists one should note that behavioural approach, as well as economic experiment, are characterised by a specific methodological autonomy. As a consequence, results of research under this doctrine are typically published in international magazine of a specialised nature, e.g. “Journal of Behavioural Finance”, “Journal of Behavioural and Experimental Finance” (both on the so-called Philadelphia list) or “Review of Behavioural Finance”. Interesting papers by financiers can be found in magazines of a more general nature, presenting works in diverse doctrines of the discipline (e.g. “Review of Finance”). The review of foreign research taking into account behavioural approach and/or economic experiment has been presented in Table 5. As authors themselves emphasise, results of certain studies often are of a contributing nature,

on the other hand, they cannot be generalised into the population of agricultural holdings, as actors taking economic decisions are typically students²⁵ (e.g. [23]²⁶).

When analysing achievement of Polish financiers related to behavioural approach²⁷, one needs to note that it primarily focuses on analysis of behaviour of participants of financial markets (e.g. works of A. Szyszka [45, 46, 47]), as well as functioning of the banking sector. It is also possible to find few studies (M. Bąk [2]) related to the use of behavioural approach in the area of accounting and financial reporting, e.g. identifying behavioural problems related to selection of accounting policy or usefulness of information in financial accounting. Researchers tend to be less interested in taking up issues related to the area of personal finance. Works based on literature studies dominate (e.g. [45, 46, 47, 53]), though it is also possible to see articles containing empirical attempts to explain phenomena present in financial markets (primarily with the use of econometric methods, as in the article of the team of M. Osińska [34]).

So far, economic experiment has not been fully used in Poland for empirical verification in research of finances of agricultural sector. On the other hand, Polish financiers of agriculture (and its environment) did use “methodological heterodoxy” in their theoretical or empirical work, meaning that they used components of behavioural approach. Some Polish studies focus on the issue of farm behaviour, that is on identification and exploration (or at least an attempt at that) of impact of psychological factors (in the context of organisational determinant) on economic and financial results of operators. It is a methodological approach very often encountered in Polish doctoral dissertations and habilitation monographs, connected albeit indirectly with finances of the agricultural sector (or in a broader perspective also agribusiness). There could be doubts if the authors in question deliberately used the research approach characteristic for representatives of behavioural economics or finance.

²⁵ It is quite a common approach in articles of American economists.

²⁶ The methodological approach employed by J.D. Kropp et al. [23] deserves attention: in the first option (A) borrowers and lenders only had one opportunity to conclude a transaction, in the next option (B) there was a possibility of the providing entity to secure the loan and in the last option (C) both parties could conclude transactions twice. Only in the last option there was as many as 3 repetitions, in the remaining ones there were 2.

²⁷ After entering keywords “behavioural finance” in BazEkon search engine, 29 scientific articles can be found [as of 29.08.2013].

Table 5

Behavioural approach and economic experiment in foreign research

Researchers	Key research results
J.D. Kropp et al. [23]	The authors used economic experiments (participants were students from three universities from the US and China) in order to establish dependence between wealth (affluence) and creditworthiness . The researchers wanted to explain why micro-lending institutions granted loans to poor person, which is against the model of loan markets and lending limitations proposed by Stiglitz and Weiss. They concluded that creditworthiness was a function of relatively perceived assets (wealth) and social status rather than of absolute level of wealth and income.
D. Tubetov et al. [51]	The team of researchers (including from Germany – O. Musshoff) employed the experimental approach in order to compare investment behaviours of farmers in Kazakhstan and Germany and to determine, whether behaviours of farmers-investors are convergent with benchmarks of NPV and real options . “The results of research indicate that neither of the benchmarks facilitates prediction of farmers’ behaviours. German farmers to a greater extent took into account the flexibility factor, which brings their behaviour closer to “mental” use of real options.
O. Musshoff and N. Hirschauer [31]	The objective of the research was an attempt to determine the mechanism of taking financial decisions by farmers-borrowers with the assistance of analysis of partial information and limited cognitive abilities. Diagnostic survey method was used with the use of a questionnaire. Participants had to make a choice between the offer of the so-called <i>Hausbank</i> and a competing bank. Adoption of contingent valuation facilitated determination of farmer’s willingness to pay for continuation of cooperation with a bank. On average 90% of farmers incorrectly estimated losses (in absolute terms) caused by high interest rates. In case of accepted fee tied to interest rate, losses in absolute terms were on average 10 times higher than in case of accepted fee expressed in EUR. Wrong assessment differed depending on the level of education and the length of cooperation with the bank. The results show that bounded rationality is a significant determinant of the “reluctant to switch” approach.
E. Phimister [35]	The author investigated the impact of borrowing constraints on agricultural farms . Application of a modified life cycle model facilitated identification of two types of constraints. The first type pertained to the ratio of total debt to added value of the farm and reflected the possibility to limit external financing (e.g. by a bank) on the basis of analysis of current profitability. The second type of constraint was related to the ratio assets/liabilities. Using the experiment (on a sample of Danish dairy farms) the author concluded that while the impact of borrowing constraints was not determined by the size of the farm, the share of agriculture land which was owned in the total acreage of the farm was decisive in behaviours expressing borrowing constraints.
H.J. Hila et al. [15]	A team of researchers (including O. Musshoff) analysed behaviours of farmers related to investment/disinvestment through a within-subject experiment. The economists considered if and to what extent the real option approach and the classic investment theory could be used to predict behaviour of farmers related to investment/disinvestment in agriculture. Furthermore, the three researchers focused on the problem of optimal stopping resembling the real option. The real option approach explained behaviour of farmers in a more precise manner. The farmers also benefited from the learning effect and waiting for investment (the value of waiting over time). Social and demographic factors, as well as variables characterising economic situation of a farm had a substantial impact on behaviour related to investment/disinvestment.

Source: own elaboration based on [1, 21].

Table 6

Behavioural approach in Polish research on finances – examples of application

Researchers	Key research results
Finance (with the exclusion of research on agricultural sector/agribusiness)	
A. Szyszka [45]	The author, referring to psychological factors, pointing to handicaps of the human mind, states that in the course of the 2008 Global Prime Financial Crisis practically the entire financial system succumbed to behavioural inclinations (not only investors, but also rating agencies, central banks and financial supervision authorities). These views correspond to the conclusion of A. Szyszka from the study [47] that in certain conditions both rational and irrational investors may show inclinations to mimetism (herd behaviour), which as a consequence leads to destabilisation of prices of assets in capital market.
P. Zielonka [54]	The author, instead of classical approach to the disposition effect (i.e. inclination of investors to hastily sell stocks showing upward trend, or in other case to hold on for too long to stocks which are falling) in the function of time, carries out an in-depth analysis of likelihoods ascribed by investors to expected profits/losses. He also sets border values of likelihoods in question, above which it is no longer possible to identify the disposition effect.
M. Swacha-Lech [44]	The author, on the basis of theoretical considerations supported by literature studies, attempted to demonstrate the impact of application of behavioural approach to the analysis of the phenomenon of saving. She also presented the areas of inconsistency of the assumption of full rationality of individuals with real behaviours, which had been the foundation for creation of the Behavioural Life Cycle Hypothesis by H. Scheffrin and R. Thaler in 1988.
M. Masztalerz [28]	The author considered the role played by accounting as an information system in the context of classical theory of capital market and behavioural finance. The author deemed it necessary to continue the research, particularly in the area of application of the theory of behavioural finance in science and practice of accounting.
Finance of agriculture and its environment	
R. Kata [16]	On the basis of statistical analysis of results of questionnaire survey carried out in 2008-2009 on a random sample of users of farmland from south-eastern Poland, the author concluded that behavioural factors (including attitude to risk, satisfaction with status in life, openness to cooperation), have – alongside demographic characteristics – substantial impact on farmers' decisions on the lending market.
J. Franc-Dąbrowska [9]	The author presents theoretical consideration on the role of profit in the light of various economic doctrines, including the behavioural theory of enterprise (placing this economic operator in conditions of uncertainty). J. Franc-Dąbrowska also considers Cyert and March model, where the level of profit, which is of resultant nature, is also a consequence of pursuing other objectives. The researcher concludes that the category of profit is the final verifier of results of carrying out economic activity.
S. Gomezy Paloma et al. ^a [11]	For a sample of 63 farms, the authors prepared model solutions using multi-criteria dynamic programming. The researchers pointed to diverse investment plans, explained by individual characteristics of a farmer and farm resources rather than the farming system and the production area.
T. Siudek ^b [39]	The author, noticing the deficiency of theoretical models explaining the behaviour of cooperative banks, puts forward a theoretical behavioural model of a cooperating bank, taking into account the requirement to maximise the benefits of members from transactions with cooperative banks.

^a One of the co-authors is E. Majewski, thus the article is classified into the group of Polish studies.

^b The work of T. Siudek [39] on financial environment of food economy is directly linked to behavioural approach.

Source: own elaboration.

Prospects for using the behavioural approach and economic experiment in agricultural finance

The prospects for using economic experiments are very promising. First, as noted by A.E. Roth [37], the method, based on using controlled environment, provides support for the theories that cannot be clearly tested using data that can be grasped. On the other hand, in the case of discrepancies between the results from experiments and the economic reality (e.g. in financial reporting), experiments (as well as a diagnostic survey) constitute the basis for distinguishing stylized data which may provide the foundations for creating a new theory.

Table 7

Potential application areas of the behavioural approach and economic experiment in research on agricultural finance

Research area	Possible applications
Agricultural taxation [52]	<ul style="list-style-type: none"> • Determination of the impact of taxes (including agricultural tax, income tax on special sections) on farmers' motivation to work, also outside the agricultural holding • Identification of the perception of fairness of the entire taxation system in agriculture, as well as individual tax rates • Determination of the attitude of agricultural holdings' managers towards taxes (also in its behavioural aspect) • Determination of the farmers' inclination to tax evasion (including experimental determination of the Laffer curve), to tax fraud (the problem of farmers' trust in the tax system)
Investments in agricultural holdings	<ul style="list-style-type: none"> • Identification of emotional factors related to the decision on investment • Determination of the "mental" discount rate taken into account by the farmers who do not keep financial reporting • Identification of psychological factors inclining farmers to use real options • Determination of the mechanism of creating the so-called behavioural investment portfolios • Identification of decision-makers' preferences for risk in investment processes
Financial planning	<ul style="list-style-type: none"> • Identification of the acceptable financial risk level • Determining the financial risk profile of the farmer • Identification of the mechanism of the so-called mental balancing
Agricultural economic insurance	<ul style="list-style-type: none"> • Determination of the farmers' inclination to buy insurance against selected risks • Determination of the role of negative emotions (e.g. grief after material loss) in insurance decisions
Assessment of the efficiency of financial interventionism (financial implications of agricultural policy, including CAP)	<ul style="list-style-type: none"> • Agri-environmental programmes: creation of the auction system under agri-environmental programmes, assessment of farmers' inclination to collective actions, appraisal of public goods under agri-environmental programmes • Determination of willingness-to-pay, willingness-to-accept
Capital structure of an agricultural holding	<ul style="list-style-type: none"> • Specification of the hierarchy of the sources of financing, the most preferred sources of financing • Verification of models on selection of the sources of financing according to the preferences of the manager • Identification of determinants of the debt in agricultural holdings

Source: own elaboration.

Table 7 shows that a wide range of applications of economic experiment in research on agriculture taxation is very promising. Taking into account the planned introduction of the so-called income tax on agricultural activity (hereinafter PITagr) for farms with the highest economic power, it is difficult to predict how farms will behave in the maze of initially unclear tax law regulations. An attempt can be made, based on in-depth interviews or questionnaires, to determine the preferred tax rate and the inclination of farmers to resign from agricultural tax in favour of PITagr. As noted by T. Zaleśkiewicz [52], the “slippery slope” model developed by a German team headed by Erich Kirchler may be helpful in determining the inclination to tax avoidance. It may also be applied to the problem of farmers’ failure to meet their obligations in the case of agricultural subsidies, taking into account the strength of administration (paying agency in this case) and farmers’ trust in administration. Possible applications of economic experiment in agri-environmental programmes seem very interesting, with respect to the aim to modernise the solutions functioning within the current CAP. Nevertheless, the information presented in Table 7 does not exhaust all possible applications of innovative research methods, strongly influenced by economic psychology.

Conclusions

1. Referring to the evaluation criteria for economic theories provided by George Stiegler, behavioural economics improves consistency with reality at the expense of usefulness for analysis. On the other hand, departure from traditional research approaches undoubtedly entail misunderstanding of research methodology and purpose by the research community. This may be minimized by popularisation of new methods that do not belong to traditional research methodology. It should also be remembered that despite the identification of numerous potential areas for use in agricultural finance, experiment (or its element) must be very carefully used as supplementation of traditional methods.
2. Behavioural approach and economic experiment, complementary to traditional research methods, significantly expand research instruments, although they are not a threat to “classic” research approaches. The discussed restrictions on application of economic experiment must also be borne in mind. Economic experiment should not be treated as a remedy or a panacea for all research questions in finance (not only agriculture) which remain unanswered. A particular attention should be paid to sampling and determination of the number of repetitions.
3. It seems necessary to advance the integration of the community of Polish finance professionals dealing with the agricultural sector and to start cooperation going beyond the narrow boundaries of individual fields. In line with

global trends²⁸, publications at the interface are highly valued as they demonstrated the ability of researchers to conduct interdisciplinary studies. The application of innovative research methods, reinforced by an in-depth statistical and econometric analysis, may contribute to dissemination of the Polish research accomplishments abroad (e.g. in prestigious scientific journals). The establishment of a body similar to a project consortium should be considered, as it could efficiently compete for grants, also in international competitions. Alternatively, a strategic alliance of research units dealing with agricultural finance could be created. The sine qua non condition for the functioning of such a body would be the presence of an entity with adequate IT infrastructure, as well as less or more formalised cooperation with leading centres from other fields of social sciences (primarily psychology and sociology).

4. Economic experiment, as a sequence of strongly interlinked research processes, is the method of both collection and processing of empirical data. A researcher-experimenter should have some knowledge of social interactions (sociology, psychology) and be able to perform the analysis of results, using quantitative (statistical, econometric, cybernetic) methods.
5. When economic experiment is initiated, its cost-effectiveness must be taken into account. On the basis of a reliable cost and benefit analysis, the researcher may opt for in-depth direct interview or for questionnaire surveys.
6. Taking into account the development trends in contemporary economic sciences, it may be expected that behavioural finance, combined with economic or financial psychology, will play an increasingly important role in explaining financial processes. Due to the limited application of “classic” econometric methods (e.g. due to measures of fitness), it seems justified to conduct economic experiment even on a purposive sample of respondents.

²⁸ Based on the review of articles in prestigious scientific journals, such as “Agricultural Finance Review”, “Journal of Agricultural Economics”, “Agricultural Economics” or “Canadian Journal of Agricultural Economics”.

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