Rationality of Expectations of Industrial Enterprises – Analysis Based on Business Tendency Surveys with Item Non-response*

Racjonalność oczekiwań przedsiębiorstw przemysłowych – analiza oparta na teście koniunktury przy występujących brakach odpowiedzi

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Abstract

In this paper, we propose to extend the standard analysis of rationality of expectations expressed in business tendency surveys by taking consequences of item non-response into consideration. We describe direct approach to measurement of expectations, discuss survey non-response problem, provide theoretical framework for the test of rationality of expectations and extended analysis of survey data, and conduct empirical analysis. Our major finding is that expectations of Polish entrepreneurs concerning general economic situation are not formed rationally; and that our results continue to hold independently from the imputation method, and consequently from the real values of the missing item data.

Keywords: tendency surveys, qualitative data, contingency tables, item non-response, rationality of expectations, general economic situation

JEL: C10, C42, D84

Streszczenie

W artykule przedstawiamy propozycję rozszerzenia standardowej analizy racjonalności oczekiwań formułowanych w ankietowych badaniach koniunktury o wnioski wynikające z częściowych braków odpowiedzi w ankietach. Omawiamy bezpośrednie metody pomiaru i badania własności oczekiwań; przedstawiamy problem braków odpowiedzi, teoretyczne podstawy testu hipotezy racjonalności oczekiwań oraz rozszerzonej analizy danych ankietowych cechujących się częściowymi brakami danych, po czym przeprowadzamy analizę empiryczną. Nasz podstawowy wniosek brzmi, że oczekiwania polskich przedsiębiorców na temat ogólnej sytuacji gospodarczej nie są formułowane racjonalnie oraz że wynik ten nie zależy od wybranej metody imputacji danych, a zatem pozostaje w mocy niezależnie od prawdziwych wartości brakujących obserwacji.

Słowa kluczowe: badania koniunktury, dane jakościowe, tablice częstości, częściowe braki danych, racjonalność oczekiwań, koniunktura gospodarcza

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1. Introduction

Expectations of economic agents exert unquestionable influence on their investment, employment, and production decisions. To analyze properties of expectations formation processes, direct data on expectations are needed. However, the main source of direct data on expectations of entrepreneurs – namely, business tendency surveys – is plagued by non-response. Furthermore, observed non-response rates are much higher for questions concerning expectations as compared to questions requiring assessment of current situation; and the missing-data mechanism is suspected of not being random. In light of these difficulties, the problem of drawing conclusions about properties of expectations formation processes becomes particularly challenging.

Our empirical analysis is based on business tendency surveys conducted by the Research Institute for Economic Development (RIED) of the Warsaw School of Economics (RIED 2008). We propose to verify the hypothesis that expectations of Polish industrial enterprises are formed rationally. To this effect, we employ the Gourieroux – Pradel (1986) test of rationality of expectations[1], based on contingency tables summarizing firm-level (individual) data.

The main purpose of this paper is to supplement the conventional analysis of rationality of expectations with examination of item non-response and its influence on results of rationality tests. We propose to consider item non-response as a new perspective from which rationality of expectations can be evaluated on both theoretical and empirical levels. Our effort can be considered a step towards obtaining a more comprehensive set of methods designed to test properties of expectations formation processes, as well as leading to more reliable conclusions concerning rationality of expectations expressed by Polish industrial enterprises. As far as we are aware, joint analysis of rationality of expectations and survey non-response has not been attempted so far.

In section 2 we briefly describe direct approach to measurement of expectations; in section 3 we discuss survey non-response problem including mechanisms that lead to missing data and its consequences. Section 4 describes data that are employed in section 7 for the purpose of empirical analysis of expectations expressed in the RIED business tendency survey in the manufacturing industry. Sections 5 and 6 provide theoretical framework for the test of rationality of expectations and extended analysis of survey data, respectively; section 8 concludes.

[1] Following Gourieroux and Pradel, the term „test" is not used in its classical statistical sense. Detailed description of the Gourieroux-Pradel test is provided in section 5.

2. Direct measures of expectations

Expectations[2] of economic agents constitute a major factor that determines their decisions. Analyses of properties of expectations formation processes, while far from supplying definite answers, provide valuable insights for both explanation and prediction of economic behavior.

Measurement of expectations is plagued by numerous difficulties arising mainly from the fact that expectations, as such, are not directly observable. Before any formal analysis can be initiated, expectations have to be defined and measured. Two methods of observation and measurement have been proposed in literature: indirect and direct.[3] Indirect methods are based on the analysis of influence that expectations exert on the economic environment in which they are formulated; expectations are deduced from the behavior of the economic system. Two major difficulties with this approach have been noted: the lack of a generally accepted pattern of expectations formation process, and inference on the basis of two interlocked models: expectations-related and behavioral (any of which could be the reason why the model does not perform as expected.) These obstacles add to the popularity of direct methods of measurement of expectations, based on declarations of economic agents expressed in experiments and surveys. The latter have traditionally enjoyed much greater popularity in economic literature.

From the point of view of the formal analysis of expectations, the essential classification of surveys follows from the way questions are presented to respondents:

- in quantitative surveys, respondents are asked to provide a number (point assessment and / or forecast),
- in probabilistic surveys, respondents are asked to provide probability with which a variable will fall into one of predetermined intervals (interval forecasts) or to supply a probability distribution, either descriptively or through a histogram (density forecasts),
- in qualitative forecasts, respondents are asked to specify direction of changes recently observed (assessment) and/or expected in the future (forecast).

Considerable portion of expectations surveys discussed in applied literature are of quantitative nature, the main reason for their popularity being the relative ease of formal analysis. Dependability of expectations of survey respondents expressed as point forecasts is, however, often called into question. Qualitative surveys (also known as tendency surveys) are regarded as more reliable, particularly when forecasts, and not only

[2] Terms "expectations", "predictions" and "forecasts" are used interchangeably to denote beliefs of economic agents concerning future value of economic variables.

[3] Various approaches to observation, measurement, and formal analysis of expectations are summarized in Pesaran (1989).

assessments of the current situation, are concerned. Respondents are more likely to correctly identify the direction of changes than to provide a precise point forecast. Therefore in many analyses of properties of processes of expectations formation, researchers purposefully avoid quantitative measurement of expectations; point forecasts are replaced with questions that require respondents to define the predicted direction of change of an economic variable.

Formal analysis of expectations expressed in surveys may commence on either individual or aggregated level. Analysis of individual responses requires access to databases that are often protected by their owners for confidentiality reasons; issues of data availability, coupled with numerical difficulties arising when large sets of data are to be processed, has caused individual-level analysis of expectations to be less popular than the examination of aggregated data. In this paper, we base our empirical analysis on the firm-level data[4] in order to examine item non-response influence on results of rationality tests. Empirical results are presented in section 7.

Regardless of the type of a survey data – quantitative or qualitative, individual or aggregated – several classes of errors in expectations series have to be considered, both of sampling and nonsampling nature. Within nonsampling errors, both coverage and measurement errors are of utmost importance as far as tendency surveys are concerned. For the classification and description of errors in statistical research, see Kordos (1988).

The unavoidable problem of expectation errors in economic data series has been pointed out in the 1960-ties. However, formal analyses of the consequences of measurement and coverage errors in directly observed expectations data series, and of their influence on estimation and testing of models describing expectations formation processes, have been instituted only twenty to thirty years later. So far, they have not resulted in providing satisfactory remedial measures; consequences of measurement and coverage errors in survey data are considered to be the major unsolved problem of direct tests of expectations formation processes.

Even though many questions concerning the reliability of surveys, particularly in view of measurement and coverage errors, remain unanswered, data series obtained on their basis are considered to be an important source of information on – otherwise unobservable – expectations of economic agents. Also, formal analyses based on this data provide valuable insight into expectations formation processes and lead to results of practical significance.

[4] Authors wish to thank the employees of the Research Institute of Economic Development (RIED) at the Warsaw School of Economics for the pre-processing of data to enable empirical analysis without compromising the confidentiality of survey information.

3. Survey non-response

By non-response we mean that desired data are not obtained for the entire set of elements s selected for observation. The extended definition[5] of non-response includes situations in which missing data arise from any of the following reasons: refusals, inability to respond, unavailability of an appropriate response, illness, imperfect processing of information, etc. Unit non-response refers to an empty record, when the sampled entity has provided no data. Item non-response refers to a missing item – the sampled entity provided data, but only partially, so we have missing values on particular items in the questionnaire.

For a more detailed description of non-response[6], we define the indicator of response, R, as an n x q matrix (n is the planned sample size of a survey, q the number of study variables), in which one symbol is used to indicate that the corresponding value in the dataset is missing, and another one that the value has been recorded. More precisely $R = (r_{ij})$, such that $r_{ij} = 1$ if y_{ij} is present (responded) and $r_{ij} = 0$ if y_{ij} is missing, where y_{ij} is the value of the variable Y_j for the index i; $i = 1, 2, \ldots, n$, $j = 1, 2, \ldots, q$.

Let $Y = (y_{ij})$ be the complete data matrix. The non-response process is formally defined as the conditional distribution of the response indicator R given the complete data Y, say $f(R|Y; \phi)$, where ϕ denotes unknown parameters.

In the simplest possible non-response mechanism, subjects who fail to respond are as if selected by simple random sampling from all the subjects selected by the sampling process. If it is so, if missingness does not depend on the values of data Y, missing or observed, that is, if

$$f(R|Y; \phi) = f(R, \phi) \text{ for all } Y, \phi,$$

the data are called missing completely at random (MCAR). This assumption does not mean that the pattern itself is random, but rather that missingness does not depend on the data values. The conditional distribution of the response indicator R given the complete data coincides with the (unconditional) distribution of R. That is, R and Y are independent. As simple random sampling is a very special sampling process, this distributional identity is not true in general. Often a more reliable assumption is that the mechanism belongs to a more general class.

Let Y_{obs} denote the observed components or entries of Y, and Y_{mis} the missing components. An assumption less restrictive than MCAR is that missingness depends only on the components Y_{obs} of Y that are observed and not on the components that are missing. That is,

$$f(R|Y; \phi) = f(R|Y_{obs}; \phi) \text{ for all } Y_{mis}, \phi.$$

[5] Extended definition is used by many authors, e.g. Little, Rubin (2002).

[6] For a concise description of various types of non-response processes, see Little, Rubin (2002).

This missing-data mechanism is then called missing at random (MAR). A key characterization of MAR is that the response indicator depends on the complete data only through its recorded part. A more figurative interpretation is as follows.[7] First, we define stratified simple random sampling, in which the population is classified into subpopulations, called strata, and simple random sampling is applied within each stratum with responding probabilities of inclusion (usually different in each stratum). Stratified simple random sampling is a generalization of simple random sampling. Further, we can define a sequence of designs with more and more detailed stratification.[8] In the corresponding non-response mechanisms, data are said to be missing at random.

The mechanism is called not missing at random (NMAR) if the distribution of R depends on the missing values in the data matrix Y.

The literature on the analysis of partially missing data is comparatively recent (Little, Rubin 2002; Rubin 2004; Longford 2005). Common techniques for addressing unit nonresponse in a survey are called weighting methods, while item nonresponse is typically handled by imputation methods. But this delimitation is rather coarse. Weighting methods serve mainly for estimating problems, while imputation implies that a missing value of the study variable (variables) for a sample element in the data matrix is substituted by an imputed value.

4. Description of data

Data on expectations of Polish industrial enterprises have been systematically collected through business tendency surveys conducted by the Research Institute of Economic Development (RIED) at the Warsaw School of Economics. The surveys, launched in 1986 within the framework of centrally planned economy, have been redesigned in 1991 to reflect system transformation and to conform to standards set in leading business survey research centers. Since then, continuing efforts to improve data collection procedures and ensure reliability of collected data resulted in establishing a unique database that encompasses data on current situation faced by Polish households and enterprises as well as their expectations for the future.

The empirical part of this paper is based on monthly surveys of industrial enterprises in which respondents evaluate changes in eight selected areas of economic activity (see Appendix 1). We focus on question number 8 ("general situation of the economy") for two reasons: first, expectations concerning general business conditions are believed to influence numerous decisions of enterprises (among them, production, investment, and employment levels); and second, non-response problem is the most evident in this category (see Appendix 2), making conclusions drawn on the basis of the original survey data particularly doubtful.

Each survey question asks respondents to evaluate both current situation and expectations for the next 3 – 4 months by assigning them to one of three categories: increase/improvement (henceforth coded with "1"), no change (coded with "2"), or decrease/deterioration (coded with "3"). Raw data are therefore qualitative in nature. Aggregated survey results are regularly published and commented on in RIED bulletins: each month, a number of respondents is announced, along with a percentage of respondents who observed increase no change/decline and who expect increase/no change decline in a given area of economic activity.

Imprecise formulation of the forecast horizon (3 – 4 months) requires taking both possibilities into account; 3-month forecasts ($h = 3$) will be therefore analyzed independently from 4-month forecasts ($h = 4$). Vague wording of the questionnaire constitutes a major drawback from the point of view of empirical analysis; however, previous research based on RIED data suggests that respondents tend to interpret the forecast horizon to extend to three months rather than four (Tomczyk 2004).

After aggregation of answers of all respondents who expressed their expectations in period $t-h$ and then reported observed change in general business conditions in period t, joint probability distribution may be expressed through contingency table (p_{ij}), where p_{ij} denotes fraction of respondents whose expectations in period $t-h$ belonged to category i, and whose assessment of actual change observed in period t belonged to category j ($i, j = 1, 2, \ldots, K$), where $K = 3$ for RIED survey data. The element p_{ij} – taking p_{13} and question number 8 as an example – is therefore interpreted as follows: it denotes fraction of survey respondents who, in period $t-h$, had expected general business conditions to improve within the next h months, but when they found themselves in period t, they actually observed that business conditions have deteriorated.

Comparison of expectations formed in period $t-h$ with changes observed h months afterwards requires identifying respondents and fitting their expectations to changes reported 3 to 4 months later. Expectations expressed in January 2008 are therefore evaluated against April 2008 ($h = 3$) and May 2008 ($h = 4$) realizations, which is the latest data point currently available. This approach unfortunately limits the number of individual observations available. For example, in January 2008, 358 respondents expressed expectations about general economic situation for the next 3 – 4 months, and in April 2008, 496 respondents commented on general economic

[7] This interpretation follows Longford (2005).

[8] Stratification given by a categorical variable B is said to be more detailed than stratification based on A, if A can be formed by aggregating (collapsing) some of the categories of B.

conditions as compared to January 2008. However, after comparing expectations and observed changes in business conditions, number of individual responses that could be included in contingency table analysis was reduced to 239, as this number of respondents supplied answers to question number 8 in both January and April.

5. Gourieroux – Pradel test of rationality of expectations

In neoclassical economics, Rational Expectations Hypothesis (REH) has been traditionally used as a tool of empirical analysis of rationality of expectations. J.F. Muth (1961, s. 316) expressed it in the following way: *(...) expectations, since they are informed predictions of future events, are essentially the same as the predictions of the relevant economic theory. At the risk of confusing this purely descriptive hypothesis with a pronouncement as to what firms ought to do, we call such expectations 'rational.'*

Since the 1970-ties, considerable growth of interest in Muth's hypothesis has been documented in thousands of publications. Results of tests performed so far proved to be inconclusive and highly dependent on time period considered, variables selected, methods of aggregation, forecast horizon, and other factors. Such sensitivity of results does not allow to safely extrapolate findings from U. S. and Western European studies to expectations formation processes of Polish entrepreneurs. Independent analysis seems therefore justified. Attempts to analyze rationality of expectations of Polish economic agents made to date (Osińska 2000; Łyziak 2003; Tomczyk 2004) did not lead to unequivocal results either.

Diverse approaches have been attempted in the economic and econometric literature to describe the general definition proposed by J.F. Muth in more formal terms necessary for its empirical verification. The neoclassical approach to testing rationality of expectations is burdened with numerous difficulties, many of them following from assumptions of econometric techniques employed for the purpose of hypothesis testing. In their 1986 paper, C. Gourieroux and J. Pradel proposed an alternative and much simpler test based on contingency tables. Following the definition proposed by R.J. Shiller (1978), authors define optimal forecast as forecast with the smallest mean square error, and show that in the case of qualitative variables, such forecast belongs to the wide class of forecasts for which results of rational expectations tests are comparable. The crucial assumption states that optimality of forecasts describes the necessary condition for the expectations of respondents of a business tendency survey to be considered rational. Finally, Gourieroux and Pradel propose a definition of rational expectations that facilitates testing of the REH on the basis of contingency tables.

In order to verify the hypothesis that expectations of Polish manufacturing industry enterprises (to be precise, their sample questioned through business tendency surveys) are formed in a rational manner, the following theorem will be employed.

Theorem 1 (Gourieroux, Pradel 1986)
Rational expectations hypothesis is true if and only if

$$p_{kk} \geq \max_{j \neq k} p_{kj} \qquad \text{for all } k = 1, ..., K. \qquad (1)$$

The proof consists of two parts. First, authors show that the optimal forecast corresponds to selection of the category characterized by the highest conditional probability on a given information set. Then they prove the identity of three notations of REH defined as the optimal choice from the point of view of minimizing the mean root square error of prediction. They point to one of these notations as particularly useful in the case of qualitative data. It allows to replace REH, in which the information set is not clearly defined, by a condition based on the smallest element of an information set that includes forecast of the variable under consideration.

An attempt to assess the rationality of expectations undertaken in this paper, based on contingency tables obtained in business tendency surveys, offers the advantage of relative simplicity in comparison to classical direct tests of REH, allowing to draw tentative conclusions before embarking on a more time- and effort-consuming rationality analysis program.

6. Theoretical basis for extended analysis of survey data

Conventional tests of rationality of expectations are applied to a sample provided by an institution that conducts the given survey (henceforth referred to as „original sample"). The original sample covers only the joint set of respondents who reported both their expectations in period $t - h$ and assessments of actual changes in period t. In this paper we also consider a supplemented sample, created on the basis of the original sample following the concept of statistical data imputation. Our purpose is to verify if supplementing the original sample with imputed data influences results of rationality tests. If the answer proves to be "yes", conclusions drawn on the basis of the original sample can be considered to be biased because of item non-response. While statistical aspects of item non-response and its influence on results of rationality tests have been separately addressed in literature[9], no effort has been made to link these two branches of analysis.

[9] Description of missing data problems in tendency surveys is given in Marsh (2000), Donzé (2000), Utsunomiya, Sonoda (2002), and Wang (2004). The discussion of the influence of measurement errors on econometric analyses of rationality of expectations is summarized in Pesaran (1989) and Bound et al. (2001).

Let us define the specific imputation method, which will be called **imputation assuming accurate expectations**. By imputation assuming accurate expectations we mean such imputation method in which for respondents who in period t - h expected for the period t the state i, i = 1, 2, …, K and did not state their assessment when they found themselves at period t, we impute the value i, and for respondents who state their assessment at the period t as j, j = 1, 2, …, K and did not give their forecast at the period t - h for the period t, we impute the value j.

The following notation will be used:

s – the original sample, i.e. the joint set of respondents who both formed their expectations in the period $t-h$ for the period t and evaluated current situation at the period t,

s' – the supplemented sample, i.e. the set of respondents who formed their expectations in the period $t-h$ for the period t or evaluated current situation at the period t,

n – the original sample size, i.e. the number of respondents who both formed their expectations at the period $t-h$ for the period t and evaluated current situation at the period t,

n' – the supplemented sample size, i.e. the number of respondents who formed their expectations at the period $t-h$ for the period t or evaluated current situation at the period t,

n_{ij} – the number of respondents from the sample s who at the period $t-h$ expected state i for the period t, and then observed j at the period t, I = 1, 2, .., K; j = 1, 2, …, K,

n'_{ij} – the number of respondents from the sample s' who are treated (after data imputation assuming accurate expectations) as expecting state i for the period t at the period $t-h$ and then observing j at the period t, i = 1, 2, .., K; j = 1, 2, …, K,

$\tilde{n}'_{ij}$ – the number of respondents from the sample s' who are treated (after any data imputation) as expecting state i for the period t at the period $t-h$ and then observing j at the period t, i = 1, 2, .., K; j = 1, 2, …, K; for different imputation methods numbers $\tilde{n}'_{ij}$ will usually be different.

Theorem 2

If condition (1) is not satisfied for the set s and if it is not satisfied for the set s', in which all missing values are imputed by assuming accurate expectations, then it is not satisfied for any possible imputation.

Proof:

If condition (1) is not satisfied, then there exists j = 1, 2, … , K and k = 1, 2, … , K; $j \neq k$ such that $n'_{kk} < n'_{kj}$. For any imputation method we have $\tilde{n}'_{kk} \leq n'_{kk}$ and for $j \neq k$ we also have $n_{kj} = n'_{kj}$. Then $\tilde{n}'_{kj} \geq n'_{kj}$. Thus there exists j = 1, 2, … , K and k = 1, 2, … , K; $j \neq k$ such that $\tilde{n}'_{kk} \leq n'_{kk} < n'_{kj} \leq \tilde{n}'_{kj}$.

7. Empirical analysis

Empirical analysis presented below is designed to illustrate theoretical considerations introduced in section 6, namely, to evaluate rationality of expectations of Polish industrial enterprises both on the basis of original and supplemented samples.[10] We will show that Theorem 2 proves that expectations of Polish entrepreneurs are not rational for either the original or supplemented sample constructed by the means of data imputation algorithm described in section 3.

Theorems 1 and 2 will be now used to draw inferences about rationality of Polish entrepreneurs. Appropriate contingency tables have been created on the basis of answers supplied by the respondents of the RIED business tendency survey in the manufacturing industry to question number 8 ("general situation of the economy regardless of situation in your sector and enterprise"). Tables 1 and 2 present results obtained for the original sample, for forecasts horizons h = 3 (January

[10] Our results refer to the original and supplemented samples and cannot be interpreted as concerning the entire population of the manufacturing industry enterprises due to the structure of the Gourieroux – Pradel test (see section 5).

Table 1. *Forecast horizon h = 3; original sample*

		Realizations		
		1	2	3
Expectations	1	0,0753	0,1213	0,0167
	2	0,0544	0,5188	0,0586
	3	0,0042	0,0962	0,0544

Source: Authors' calculations based on the RIED database.

Table 2. *Forecast horizon h = 4; original sample*

		Realizations		
		1	2	3
Expectations	1	0,0439	0,1360	0,0351
	2	0,0526	0,4868	0,0702
	3	0,0088	0,0965	0,0702

Source: Authors' calculations based on the RIED database.

Table 3. *Forecast horizon h = 3; supplemented sample (assuming accurate expectations)*

		Realizations		
		1	2	3
Expectations	1	0,0856	0,1128	0,0156
	2	0,0506	0,5292	0,0545
	3	0,0039	0,0895	0,0584

Source: Authors' calculations based on the RIED database.

Table 4. *Forecast horizon h = 4; supplemented sample (assuming accurate expectations)*

		Realizations		
		1	2	3
Expectations	1	0,0435	0,1348	0,0348
	2	0,0522	0,4913	0,0696
	3	0,0087	0,0957	0,0696

Source: Authors' calculations based on the RIED database.

2008 expectations, April 2008 realizations) and $h = 4$ (January 2008 expectations, May 2008 realizations), respectively; Tables 3 and 4 describe results obtained for the supplemented sample (constructed by the means of imputation assuming accurate expectations) for forecasts horizons $h = 3$ and $h = 4$, respectively.

It is clear that condition (1) for the expectations to be rational, expressed in the Gourieroux–Pradel Theorem, is not fulfilled in any of the analyzed cases. Conclusions drawn on the basis of empirical results obtained for the original sample may be summarized as follows:

1. Polish industrial enterprises – or, more precisely, their management – do not form their expectations about the future economic situation. This result holds regardless of whether the forecast horizon is interpreted to extend to three or four months.

2. The reason why the rationality condition is not met is that the "no change" category always constitutes the largest fraction of every contingency table across rows; i.e. respondents who expected either improvement or deterioration of the general business conditions state their actual assessment h months later as "no change" more often that the rationality condition allows.

The results continue to hold for the supplemented sample with the missing data imputed by assuming accurate expectations, as seen in Tables 3 and 4. On the basis of Theorem 2, we conclude that condition (1) is not satisfied irrespectively of the real values of missing data. The fact that observed non response rates are much higher for questions concerning expectations as compared to questions requiring an assessment of the current situation usually leads to many doubts about the reliability of results of classical analysis (i.e. analysis not taking the item non-response problem into consideration). On the other hand, the possibility that the results are biased because of a specific pattern of item non response has been proved not to hold for Polish industrial enterprises.

8. Concluding comments

An analysis of contingency tables obtained through business tendency surveys in industry suggests that expectations of Polish entrepreneurs concerning the general economic situation are not formed rationally. A heavy share of the "no change" category is typical for the analysis of expectations contingency tables. One of the reasons for the concentration of responses in this category may be that entrepreneurs select it because the "I don't know" option is not available.

What is perhaps more interesting, for the results of the rationality test (precisely speaking, rationality of expectations concerning general economic conditions in the next 3 – 4 months) it does not matter what the assessments and expectations are of respondents who did not supply answers to this question; the result of the test will be negative in any case. This conclusion follows from Theorem 2: independently from the imputation method, and consequently from the real values of the missing item data, our results continue to hold.

On the basis of results obtained in this paper, the following directions of further research could be suggested:

1. Disaggregation of analysis across factors other than forecast horizon (for example, ownership structure, industrial sector or enterprise size). At present, empirical applications are limited because of problems of data availability.

2. Extending the analysis to other properties of expectations (for example, their unbiasedness and orthogonality to available information) to evaluate their sensitivity to item non-response.

3. Designing methods of comprehensive (both unit and item) non response analysis of the rationality of expectations of Polish industrial enterprises.

4. Generalizing the results for the population of Polish industrial enterprises.

5. Applying an analogous testing procedure for other variables included in the RIED survey, such as production, employment and inflation expectations.

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Appendix 1. *Monthly RIED questionnaire in industry*

		Observed within last month	Expected for next 3 – 4 months
1	Level of production (value or physical units)	up unchanged down	will increase will remain unchanged will decrease
2	Level of orders	up normal down	will increase will remain normal will decrease
3	Level of export orders	up normal down not applicable	will increase will remain normal will decrease not applicable
4	Stocks of finished goods	up unchanged down	will increase will remain unchanged will decrease
5	Prices of goods produced	up unchanged down	will increase will remain unchanged will decrease
6	Level of employment	up unchanged down	will increase will remain unchanged will decrease
7	Financial standing	improved unchanged deteriorated	will improve will remain unchanged will deteriorate
8	General situation of the economy regardless of situation in your sector and enterprise	improved unchanged deteriorated	will improve will remain unchanged will deteriorate

Source: the RIED database.

Appendix 2. *Item non-response rates in April 2008 (in %)*

Question	Item non-response: realizations	Item non-response: expectations
1	0.95	2.32
2	0.19	1.34
3	5.16	6.43
4	2.91	4.33
5	1.53	2.51
6	0.38	1.34
7	0.19	1.15
8	6.85	8.38

Source: Authors' calculations based on the RIED database.