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DETERMINANTS OF LONG-LIVED ASSET IMPAIRMENTS. EVIDENCE FROM POLAND

Introduction*

The objective of the paper is to analyse the determinants of the occurrence and magnitude of long-lived asset impairments for companies listed on the Warsaw Stock Exchange. We hypothesised that both the probability of impairment disclosure and its magnitude depend on four groups of determinants: economic performance of company, other economic factors and the capacity to absorb the consequences of write-offs, managerial and reporting incentives, and the effect of recurrence. The empirical research was based on the sample of 180 firm-year observations of companies which disclosed impairments, and the control group consisted of 390 observations. The sample was drawn from companies listed on the Warsaw Stock Exchange. We provide evidence that the occurrence of impairments is less dependent on financial performance, and it is more influenced by changes in senior management, audit quality and some indicators of the capacity to absorb the write-offs: size of the company, the share of property, plant and equipment in total assets, and cash reserves in preceding periods. There were strong effects of recurrence for write-offs. The magnitude of write--offs is linked negatively with percentage changes in sales and the size of the company. Recurrence is not very significant under the multivariate analysis, but is significant according to the correlation analysis. The multivariate analysis has shown evidence of strong links between the magnitude of write-offs recognised as expenses and large negative and positive changes in earnings, and also with increased discretionary accruals.

1. Asset impairments

The objective of asset impairment is to ensure that long-lived assets are carried at no more than their recoverable amount. According to the IFRS treatment of asset impairments (IAS36), an impairment loss is recognised in profit or loss for assets carried at costs, and treated as revaluation decrease for assets carried at revalued amount. The recoverable amount is the higher of an asset fair value less costs to sell and its value in use. The value in use is computed as present value of future cash flows expected to arise from the use of an asset, and from its disposal at the end of its useful life. At the end of the reporting period, assets are reviewed to look for any indication that assets may

* A shortened version of the research results was also published in Polish in [Piosik, Równińska, 2001, pp. 197-225].

be impaired. If impairment is indicated, the asset's recoverable amount is calculated. Reversal of the prior years' impairment losses is permitted in certain instances but prohibited for goodwill.

Asset impairments require the management to choose methods and make judgements, and that is why the disclosure of impairments and their magnitudes is often linked with managerial and reporting incentives, including earnings management techniques.

2. Determinants of long-lived asset impairments in prior literature

The occurrence of write-offs disclosure and the magnitude of write-offs are usually used by researchers as dependent variables to describe the phenomenon of impairments in contemporary research. Researchers usually consider three groups of write-offs determinants. Economic and performance factors seem to stand for basic rationale for long-lived asset impairments, and they especially relate to weakened financial performance or disadvantageous changes in performance. The reported impairments depend on the choices of accounting methods used and judgements made by the management of the company while preparing financial statements (reporting and managerial incentives). The recurrence of impairments reported in the preceding periods is supposed to be linked with impairments in the following periods. Usually the research is carried out on the basis of large samples of firm-year observations retrieved from various industries.

Particularly noteworthy empirical research on the determinants of impairment was published in the 1980s [Elliott, Shaw, 1988, pp. 117-134]. It was carried out in the USA and based on a sample of 240 observations of companies, operating in various industries, which reported write-offs of long-lived assets during the period 1982-1985. The majority of write-offs were disclosed in the fourth quarter. As a rule, the response of capital markets is usually less restrictive for write-offs reported at the end of the reporting year or for the whole year. The authors used the *Wilcoxon signed-rank test* to compare the financial performance of companies disclosing write-offs with the average performance of the firms' industries. The magnitude of write-offs was greater for: large-sized companies, firms making lower pre-write-off earnings as well as having lower pre-write-off return on equity, and more leveraged ones.

A series of publications comes from the year 1996. The main research objective of J. Francis, J.D. Hanna and L. Vincent [1996, pp. 117-134] was to analyse the determinants of reported write-offs and to answer the question whether impairments stem from economic factors or whether they are derived from reporting and managerial incentives. The two groups of factors were significant in explaining the impairments but the extent of their significance depended on the group of long-lived assets. Economic factors are more significant for tangible asset impairments, however, managerial and reporting incentives proved to be more significant for intangible assets, especially within impairments for goodwill. The group of companies which disclosed write-offs was characterized by: lower return on stock (yield), the increase in relation of BV/P, and negative change in return on assets. The companies with more disadvantageous changes in financial performance reported greater write-offs, and consequently income smoothing was not observed – the opposite of the results of Zucca, Campbell [1992, pp. 30-41]. The results do not relate to the impairment of goodwill.

The analysis of the frequency of reporting special items was published by J.A. Elliot and J.D. Hanna [1996, pp. 135-155]. The percentage of companies disclosing special items increased during the period 1956-1994. The authors analysed the special items which were disclosed in financial reports during the period 1970-1994. Earnings proved to be significantly higher in the quarters without disclosed write-offs than in the periods with disclosures of impairment. The information relevance of write-offs was analysed by observing changes in share prices after the disclosure of impairments, in comparison with the rate of return on stock of the preceding 300 quotations; the analysis was based on ranks. The analysis has provided evidence that the changes in share prices were significant after the disclosure of long-lived assets impairments. The changes in return on stock and their links with the magnitude of write-offs were also modelled, by performing regression. The estimate of the parameter for the variable describing the magnitude of write-offs proved to be significant, however this significance was then reduced if the following write-offs were disclosed by the company. While testing the fourth succeeding write-off the estimate is not significant.

The main objective of the research of L. Rees, S. Gill and R. Gore [1996, pp. 157-169] was to check whether companies used the disclosure of long-lived asset impairments as a tool of earnings management. The companies which disclosed write-offs demonstrated a decrease in the return on assets corrected for a median return on assets in the firm's industry, in the period preceding the write-offs. The rates of return on stock (corrected for median rates) also tended

to decrease in the period preceding the disclosure and they were significantly less than 0. The profitability of companies in the periods following the write-off depended on the occurrence of subsequent write-offs. Unless the disclosure occurred, the company's return on assets (corrected for the median return on assets in the firm's industry) was still negative but not statistically different from 0.

The determinants of the disclosed long-lived asset write-offs were analysed for Australian companies by J. Cotter, D. Stokes and A. Watt [1998, pp. 157--179]. According to their findings, the magnitude of write-offs was dependent on managerial and reporting incentives and the capacity of companies to absorb the financial results of write-offs in equity. The correlation analysis proved that the magnitude of write-offs was linked with growth options, changes in earnings, cash reserves and changes in senior management. The regression model was performed to describe links between the magnitude of write-offs and the variables. The statistically significant estimates related to the following variables: growth options, company's size (negatively), changes in earnings (negatively), cash reserves and changes in senior management.

E.J. Riedl [2004] analysed the links between the magnitude of write-offs and the determinants of impairments, taking into account the context of two accounting regulations in the USA. He tested the determinants of impairment before and after SFAS 121 was brought into force. The author introduced variables indicating the smoothing of income, equal to the change of pre-write--off earnings scaled by asset value, when the change is above the median of non--zero positive values, and 0 otherwise, with the expectation of positive correlation. The variable used to analyse big-bath was defined as change in pre-write-off earnings scaled by total assets when the change is below the median of negative values, and 0 otherwise, with the expectation that the link is negative. According to the results, the magnitude of write-offs was linked especially with economic factors before SFAS 121 was brought into force. After the introduction of the regulation, the magnitude of write-offs was linked with few performance factors. It was concluded that the regulation reduced the link between the magnitude of impairment and economic factors.

A. Piosik and M. Rówińska [2010] carried out empirical research into the factors determining fixed asset impairments in Poland for the year 2008. The data sources were collected from consolidated financial statements of companies listed on the Warsaw Stock Exchange in Poland. In 2008, 61 companies revealed information about fixed asset impairments. The authors have found evidence that significant factors determining the probability of assets write-downs are: higher assets, higher audit quality, changes in the management board, higher cash-flow

from operating activities, smaller difference between earnings and cash-flow. The financial performance of companies recording write-offs is generally not significantly different than for the control group. The next step of research was to analyse the factors influencing the magnitude of fixed assets write-downs. With the use of multivariate analysis, three estimates of coefficient were found statistically significant in respect to the magnitude of write-offs: revenue index, current liquidity ratio, and net change in ROI (2006-2008). All three estimates were negatively linked with the magnitude of impairments.

In this paper Authors continue the research started in 2010. The rationale for the research is to:

a) analyse systematic determinants of long-lived assets impairments of companies operating in Poland, covering a period longer than one year (one year period weakens the findings of research of A. Piosik and M. Rówińska [2010] but also research carried in other countries [Cotter, Stokes, Watt, [1998]),
b) take into account four groups of determinants of impairments tested simultaneously: performance factors (enriched with industry-based outcomes), other economic factors and capacity to absorbing the write-offs, managerial and reporting incentives, and recurrence; in our view, testing indicated four groups of determinants of impairments should add value to prior research,
c) deepen what are determinants of occurrence of write-offs; prior research has been more focused on determinants of magnitude of impairments than on occurrence of write-off disclosure; testing how four groups of determinants influence the probability of impairments should explain better whether there is a difference between determinants of occurrence and determinants of magnitude of write-offs.

3. Hypotheses development and research design

In accordance with prior research, we shall test the following research hypotheses on the determinants of the occurrence and magnitude of long-lived asset impairments:

H1: Companies reporting worse pre-write-off financial performance or suffering negative changes in performance disclose long-lived asset impairments more frequently.

H2: Companies characterized by an increased capacity to absorb the consequences of write-offs in preceding periods disclose long-lived asset write-offs more frequently in subsequent periods.

H3: Managerial and reporting incentives influence the frequency of disclosing long-lived asset impairments. These incentives may include especially the following factors: changes in senior management, quality of audit, and earnings management techniques.
H4: The magnitude of reported asset write-offs is negatively linked with pre-write-off financial performance and with the extent of disadvantageous changes in performance.
H5: The greater capacity to absorb the financial consequences of write-downs in preceding periods, the greater the magnitude of write-offs becomes.
H6: Managerial and reporting incentives influence the magnitude of disclosed long-lived asset impairments.
H7: The effect of recurrence influences the frequency of disclosing long-lived asset impairments. Write-offs disclosed in preceding periods recur in the following periods.
H8: The effect of recurrence influences the magnitude of disclosing long-lived asset impairments.

The hypotheses H1-H3 and H7 relate to the determinants of the occurrence (probability) of long-lived asset impairments. The hypotheses H4-H6 and H8 relate to the determinants of the magnitude of write-offs. Hypothesis H7 and H8 tests recurrence and relates to occurrence and magnitude of impairments respectively.

In order to confirm or reject the hypotheses, we have performed a few stages of the research:

a) Defining the variables, including dependent variables and explanatory ones. Dependent variables ought to indicate the occurrence of write-offs and their magnitude.
b) Selection of two samples of firm-year observations: a sample of observations with a disclosure of long-lived asset impairments and another one without such a disclosure, standing for a control group.
c) Univariate analysis, indicating the determinants of the probability of long--lived asset write-offs. The analysis is focused on variables providing different quantitative characteristics for observations with write-offs and the control group (mean, median, distribution), and their consequent statistical significance. We have used four statistics: *t* statistics, the Mann-Whitney *U* test, *chi-square* statistics, and *F* statistics in order to indicate different variances.
d) Multivariate analysis indicating the determinants of the probability of long--lived asset write-offs. We have performed a logit and linear regression.

e) Collection of quantitative characteristics of long-lived asset write-offs for companies listed on the *Warsaw Stock Exchange* in the period 2007-2009. The question needs to be answered whether there have been significant differences in write-offs between individual years in the analysed period.
f) Correlation analysis between the magnitude of write-offs and dependent variables. We have computed *Pearson's* and *Spearman's* correlation coefficients and their significance.
g) Regression analysis describing the links between the magnitude of write-offs and the dependent variables under consideration. We have considered a linear regression model, however, because of the fact that relations between the magnitude of write-offs and many factors are not linear, we have transformed the variables and applied a log-linear regression.

The statistical analysis has been carried out using *STATISTICA$_{PL}$ version 9* package (http://www.statsoft.pl/).

Definition of variables

Dependent variables relate to the occurrence and magnitude of write-offs. Independent (explanatory) variables are supposed to constitute the determinants of long-lived asset write-offs and they consist of four groups: performance factors, other economic factors and capacity to absorbing the write-offs, managerial and reporting incentives, and recurrence. Table 1 presents the list of variables defined in the research.

1. Dependent variables. Dependent variables shall describe the frequency of occurrence of the write-off disclosure or the magnitude of impairments. The input variable is total reported long-lived asset write-offs for period *t* expressed in thousand PLN, and titled IMP_t. We have marked out impairments recognised as expenses in period *t* by introducing the EXP_IMP_t variable. To perform the analysis of probability of write-off disclosure, we have used the $IMP(Y,N)_t$ binary variable, equal to 1 if the company disclosed a write-off in period *t*, and *0* otherwise. The magnitude of write-offs is gauged through dividing the write-off amount by total assets (IMP_t/A_t, EXP_IMP_t/A_t).
2. Time and recurrence. The write-offs occurrence and magnitude may be described using contemporaneous variables (indexed *t*) and lagged ones (*t-1, t-2, ...*). The lagged variables are used for all groups of explanatory variables. To take into account the recurrence, and to test whether the occurrence and magnitude of write-offs are linked with the write-off disclosure in the preceding periods or with the magnitude of the preceding write-offs, we have introduced the variables: $IMP(Y,N)_{t-1}$ and EXP_IMP_{t-1}/A_{t-1}.
3. Performance factors. In order to take into account performance factors in the search for determinants of write-offs, we have used a number of variables indicated and described in Table 1, part III. These variables are

based on earnings, operating cash-flows and capital market performance. The rationale for these three groups is that the possible links between impairments and accrual performance may be different than relations between impairments and cash flows streams. We ought to answer the question whether capital market performance responds long-lived assets impairments. The variables, defined on the basis of net earnings ($EARN_t$), preceding net earnings ($EARN_{t-1}$), changes in net earnings ($\hat{}EARN_t$), operating income (OP_INC_t), and changes in operating income ($\hat{}OP\_INC_t$), are corrected and calculated as pre-write-offs amounts, *id est* calculated as if no write-offs were disclosed. We have also used variable $\hat{}E\text{-}_t$ to separate only negative changes in earnings. To enhance the explanatory power of the analysis, we have also introduced variables constructed on the basis of cash flows: cash flows from operations (CF_OP_t), changes in cash flows from operations ($\hat{}CF\_OP_t$) and measures of free cash flows (FCF_t, $\hat{}FCF_t$). To carry out a comparative analysis, we have deflated the earnings, operating income and cash flows by total assets. The lagged variables standing for performance factors have also been used. The changes in revenues may also be ranked as a possible determinant of the occurrence and magnitude of write-offs, therefore we have introduced a variable $\hat{}REV_t$, also with a lagged version.
Some performance factors have been described in relation to the performance of other companies in the industry. Variables retrieved from capital market have also been used: the relation of market to book equity (P/BV_t) and the annual rate of return on stock ($Yield_t$). In prior research the links between impairments and capital market performance may be bidirectional: impairments may influence capital market performance and capital market performance may be treated as a gauge of risk options and consequently as a determinant of impairments.

4. Other economic factors and the capacity to absorb write-offs. We have analysed the influence of other economic factors and the capacity to absorb write-offs. Table 1, part IV presents the list of variables. The size of the company was measured as total assets, gauged directly (A_t) or using the logarithm of the amount ($logA_t$). Logarithm of some variables has been used primarily for multiple regression analysis, which is a standard approach in accounting research. The structure of the company's assets may also be of great importance. We use the ratio of tangible long-lived assets to total assets as a proxy of the structure of assets. Companies may be more inclined to disclose impairments if they have the capacity to absorb the write-off. The capacity can be linked with financial gearing. Companies with a lower degree of financial leverage are more inclined to disclose write-offs. This stems from the fact that impairments of long-lived assets always increase financial gearing. We use the ratio of total liabilities divided by total assets (LEV_t) as a proxy of financial gearing.

The capacity to absorb the write-offs may also result from the cash reserves or liquidity. This stem from the fact that companies with higher cash reserves and liquidity usually have lower incentives to reduce write offs because they have lower demand for external financing. The lower *financial slack*, the more indifferent the impairment disclosure becomes. We have used the ratio of liquid assets divided by total assets ($CASH/A_t$) as a measure of cash reserves. To measure liquidity, we have chosen the current liquidity ratio.

5. Reporting and managerial incentives. According to the results of prior research, impairment may also be used as an earnings management technique. Table 1, part V presents the list of variables. Changes in senior management ($MNG\hat{}_t$) may bring about write-off disclosures. The rationale for this is that present senior managers of a company may explain that former management made decisions which induced impairment of assets, and even if it is not necessary the senior management may reverse impairment in the future. We have used a binary variable equal to 1 in case the company experiences changes in senior management, and 0 otherwise. It is rather difficult to measure the quality of audit. The variable AUD_Q_t is equal to *1* if the company's financial statement was audited by one of the auditing companies which gained at least tenth position in the '*Rzeczpospolita*' newspaper ranking in year *t* as well as *t-1*, otherwise the variable equals *0*. The rating of auditing companies is announced each year. The list of top 10 companies was rather stable in the period.

In order to analyse reporting incentives, the researchers have focused on total accruals and discretionary accruals. Accruals occur when there is a discrepancy between the timing of cash flows and timing of accounting recognition of the transaction [Ronen, Yaari, 2010, p. 371]. In earlier research [Jones, 1991], total accruals were calculated on the basis of changes in working capital and depreciation. Total accruals (*TA*) were then estimated by performing regression [Jones, 1991], and consequently the discretionary accruals (*DA*) are equal to residuals form the regression. We have introduced a modification of the Jones approach. Total accruals (TA_t) have been defined as the difference between company's pre-write-off earnings and cash flows from operations, scaled by total assets. Total accruals (TA_t) have been calculated from the regression cross-sectionally and controlled for the following variables: the reversal of assets ($1/A_t$), change in revenues ($\hat{}REV_t$), plant, property and equipment scaled by total assets (PPE_t/A_t), change in PPE_t/A_t ($\hat{}PPE/A_t$), change in free cash-flow ($\hat{}FCF_t$) and change in shareholder equity ($\hat{}C\_ST_t$). We have applied the following model:

$$TA_t = \alpha\,[1/A_t] + \beta_1[\hat{}REV_t] + \beta_2[PPE_t / A_t] + \beta_3[\hat{}PPE_t / A_{it}] + \\ + \beta_4[\hat{}FCF_t] + \beta_5[\hat{}C\_ST_t] + \zeta_{it}$$

The estimates we received were statistically significant for all parameters, except for $\hat{}C\_ST_t$. The determination coefficient equals 0.10, which is significant. We have also tested Jones's model (cross-sectionally) but the significance of the parameters and determination received have been much worse (we have performed the regression analysis on the basis of annual financial statements). Discretionary accruals (DA_t) are equal to residuals between TA_t and estimated TA_t on the basis of the above regression. Our intention was to find out if the occurrence of write-offs and the magnitude is linked with discretionary accruals.

Income smoothing is one of the most frequent earnings management technique. The objective of income smoothing is to mitigate the changes of earnings. The variance of changes of earnings is therefore one of the most popular proxies to measure income smoothing. We have calculated changes in earnings deflated by total assets ($\hat{}RE_t$). According to M.E. Barth, W.R. Landsman, M.H. Lang [2008], changes of earnings ought to be controlled for economic factors, and consequently the comparison of two variances of changes in earnings is based on the residuals of the econometric model, controlled for economic factors. We have used a similar approach and performed the regression:

$$\hat{}RE_t = \alpha + \beta_1[logA_t] + \beta_2[LEV_t] + \beta_3[\hat{}LEV_t] + \beta_4[\hat{}REV_t] + \beta_5[\hat{}C\_ST_t] + \\ + \beta_6[\hat{}IND\_E_t] + \beta_7[\hat{}L_t] + \beta_8[\hat{}PPE_t] + \zeta_{it}$$

Using the residuals, we have obtained unexpected changes of net reported earnings ($U\hat{}RE_t$) in order to compare variances of residuals in the companies with write-offs and in the control group.

Then, to analyse the direction of changes, we have decomposed the variable $U\hat{}RE_t$ into two variables: $U\hat{}RE+_t$ = total unexpected $\hat{}RE_t$, equal to $U\hat{}RE_t$ if $U\hat{}RE_t > 0$, 0 otherwise; $U\hat{}RE-_t$ = total unexpected $\hat{}RE_t$, equal to $U\hat{}RE_t(-1)$, if $U\hat{}RE_t < 0$, 0 otherwise.

We would like to find out if companies with unexpected reduction of earnings tend to disclose write-offs more frequently. A similar variable was computed for unexpected negative changes in pre-write-off earnings ($U\hat{}E-_t$) to mitigate the influence of impairments on net profits.

We have also applied E.J. Riedl's [2004] approach and computed variables referring to the smoothing of income, equal to the change of pre-write-off earnings divided by assets, when the change is above the median of non-zero positive values, and 0 otherwise ($\hat{}E+Me_t$). The variable used to analyse big bath was defined as change in pre-write-off earnings scaled by total assets when the change is below the median of negative values (computed as positive amounts), and 0 otherwise ($\hat{}E\text{-}Me_t$). We would like to find out if the magnitude of impairments is linked with large negative/positive changes in pre-write-off earnings.

Sample selection and sources of data

We have analysed fixed asset impairments for the following groups of long-lived assets: tangible fixed assets, intangible fixed assets, long-term receivables, and long-term cost accruals. Long-term financial investments have been excluded. The sample of firm-year observations relates to companies listed on the *Warsaw Stock Exchange* (*WSE*) in Poland during the period 2007-2009. We have used four main sources of data:

a) Observations retrieved from the basic elements of financial statements of companies (balance sheet, income statement, cash flows) have been obtained form *NOTORIA* data base (http://ir.notoria.pl/). Consolidated financial statements have been used, except when the company does not produce a consolidated financial statement.
b) Observations relating to long-lived asset write-offs and other detailed financial, reporting and managerial data have been retrieved from notes and explanatory information to financial statements, included in the official financial statements published on the companies' websites. We have used the link to investor relations in the companies' websites (using link: http://www.gpw.pl/lista_spolek_en). Consolidated financial statements have been used, except when the company does not produce a consolidated financial statement.
c) Observations relating to industry performance have been retrieved from the website of *Polish Central Statistical Office* (http://www.stat.gov.pl/gus/6799_ENG_HTML.htm).
d) Data relating to the performance of companies in the capital market were retrieved from the website of the *Warsaw Stock Exchange* (http://www.gpw.pl/analizy_i_statystyki_en).

The disclosures of long-lived asset impairments have been investigated for all companies listed on the Warsaw Stock Exchange in period 2007-2009, with the exception of financial institutions. During the period 2007-2009 we have observed an increase in the total number of companies which disclosed fixed asset impairments: 44 companies disclosed write-offs in 2007, then the number of companies increased to 67 and 78 in the years 2008 and 2009 respectively. The total amounts of fixed asset write-offs were as follows: PLN 2,024 millions in 2007; PLN 3,837 millions in 2008 and PLN 1,338 millions in 2009. However, after deducting maximum write-offs each year, the total amounts are PLN 968 millions; PLN 1,338 millions and PLN 1,086 millions.

For the purposes of the research we have excluded write-offs that do not exceed PLN100,000 as not material. Finally, we have obtained the total number of companies which disclosed write-offs: 42, 67 and 71 in the years 2007, 2008 and 2009 respectively. Consequently, the total sample of firm-year observations with write-offs equals to 180 during the period. For the purposes of the analysis of the disclosure of fixed asset write-offs, we have also introduced a control group of 390 firm-year observations without write-offs, randomly selected. The control group relates to the financial statements of companies listed on the WSE in the years 2007-2009 and the data have been retrieved from *NOTORIA* data basis.

All explanatory variables consist of contemporaneous observations (years 2007-2009) or some lagged observations, if necessary (2005-2006). The necessity of using observations from the period of 2005-2006 stems from the use of some lagged variables.

4. Research results

4.1. Univariate analysis of the occurrence of long-lived assets impairments; hypotheses: H1, H2, H3, and H7 analysed separately

In order to find out the quantitative features of companies disclosing long--lived asset impairments, and to confirm hypotheses H1, H2, H3, and H7 and consequently to indicate the determinants of the occurrence of write-offs, we have summarised the descriptive statistics of explanatory variables (hypothesised determinants) for firm-year observations with long-lived asset write-offs and for the control group of observations without such disclosures. We have tested the null hypotheses whether the means for the considered variables of firm-year observations with long-lived asset impairments are equal to those of the control group, and we have used *t* test. Similarly, we have checked if the distributions of dependent variables are equal for the two groups of firm-year observations and we have applied the Mann-Whitney *U* test. Table 2 indicates the complete list of variables for which it has been necessary to reject the null hypotheses that the arithmetic means are equal in the two groups of firm-years observations. Table 3 presents a similar list of variables for which we have rejected the hypotheses that the distributions of observations are equal for the two groups of firm-year observations. In Table 2 and Table 3 we have displayed

only the results of the rejected null hypotheses, statistically significant at $p < 0.1$, and we have indicated p value for each item $p < 0.1$. Consequently, we ought to conclude that the arithmetic means or, respectively, distributions of the remaining variables are not different from the statistical point of view in the two groups of firm-year observations. Taking into account univariate analysis, these variables are not treated as the verified determinants of long-lived asset impairments.

1. Performance factors – hypothesis H1.

We have found evidence that the occurrence of long-lived asset disclosure is linked negatively with the average return on assets in the industry the company operates in. The average of IND_E_t ratios (net earnings divided by assets, calculated for the firm's industry) is significantly less for firm-year observations with a disclosure of write-offs in the year of disclosure and in the preceding year as compared with the control group (an arithmetic mean equals to 0.062, respectively median is 0.060 in a year t of disclosure as compared with a control group – mean equals to 0.067, respectively median is 0.068 in period t). The difference between the company's pre-write-off earnings and industry earnings, scaled by assets in the period t of disclosure and the preceding period ($E\text{-}IND_t$ and $E\text{-}IND_{t-1}$) is negative for both groups but it is more disadvantageous for observations with long-lived asset impairments than for the control group of firm-year observations (the mean equals –0.057 for observations with a disclosure vs. –0.043 for the control group in year t of disclosure, and respectively –0.024 vs. –0.013 in year *t-1*), but the differences between means and the distributions of variables are not statistically different at $p < 0.1$.

We have carried out comparative analysis of net earnings in the preceding periods for a sample of firm-year observations with long-lived asset impairments and for the control group of observations. The earnings $EARN_{t-1}$, $EARN_{t-2}$ (pre--write-off earnings scaled by total assets in two preceding periods) are less for observations with a disclosure of long-lived asset write-offs than for the control group of observations (mean $EARN_{t-1}$ equals 0.04 vs. 0.055; median $EARN_{t-1}$ equals 0.048 vs. 0.060). We have confirmed the null hypothesis about equal means ($p = 0.16$) but we have rejected the null hypothesis that distributions are equal in a preceding period *(t-1)*. Thus, we have moderate rationale to conclude that the occurrence of a long-lived asset write-offs disclosure in year t is significantly and negatively linked with the profitability of companies in the preceding period. We find evidence that the distribution of returns on equity in preceding periods (ROE_{t-1} and ROE_{t-2}) is different for observations with long-lived asset impairments than for observations without disclosures (median ROE_{t-1} is 0.089 vs. 0.126). The difference is statistically significant at $p < 0.1$. The statistical

difference between distributions of lagged variables is important because it indicates that there are some variables that may support in predicting the forthcoming disclosure of impairments.

We have analysed *CF_OP* (cash flows from operations divided by total assets) and *FCF* (free cash flows divided by assets). Firm-year observations with disclosures of long-lived asset write-offs have significantly greater operating cash flows than observations of the control group. The distributions of CF_OP_{t-1} and CF_OP_t of firm-years observations with disclosures are significantly different in comparison with respective distributions in the control group if we use the Mann-Whitney *U* test (median CF_OP_{t-1} is equal to 0.059 for observation with a disclosure vs. 0.033 for the control group). Cash flows are however positively correlated with the size of companies (Spearman's correlation coefficient between $logA_{t-1}$ and CF_OP_{t-1} is equal to 0.1 and is statistically significant) and simultaneously the occurrence of disclosure is linked with a size of a company. Free cash flows (FCF_t and FCF_{t-1}) also tend to be larger for firm-year observations with disclosures of long-lived asset write-offs than for the control group of observations.

The distribution of the changes in reported earnings deflated by total assets ($\hat{}RE_t$) is statistically different for both groups of firm-year observations. The median value for observations with disclosures is equal to –0.007 vs. median for the control group, which is equal to 0.0015). The arithmetic means are not statistically different, but the variances are not the same. It is worth indicating that changes in pre-write-off net earnings are not statistically different between both groups of observations in terms of the arithmetic means and distributions. We conclude that significant differences between changes in reported earnings between both groups of observations stem also from the financial consequences of impairments. The two analysed groups of observations have not been different with respect to P/BV or yield.

2. Other economic factors and capacity to absorb the write-offs – hypothesis H2.

Firm-year observations with disclosures of long-lived asset write-offs differ significantly from the control group of observations with respect to total assets in the year of disclosure and the preceding periods (year *t, t-1*, and *t-2*). In the preceding period (*t-1*) the arithmetic mean of total assets equals PLN 2,663 millions for observations with disclosures, and PLN 386 millions for the control group. The medians of total assets in both considered groups of observations are also different in the analysed periods. The size of the company is positively related to the occurrence of long-lived asset write-offs disclosures, in spite of the fact that larger companies are supposed to be exposed to a lower risk. However,

this phenomenon has also been proved in other research, and it provides evidence that larger companies disclose long-lived asset write-offs more frequently.

Financial gearing in the period preceding write-offs is not significantly lower for observations with disclosures of write-offs than in the control group of observations. We have not rejected the null hypothesis about equal means and equal distributions of LEV_{t-1} for both groups of observations. LEV_t is significantly larger for observations with write-off than for the control group of observations. That can be also considered to be a consequence of impairment, besides other possible factors.

The possibilities of absorbing write-offs have also been analysed using cash reserves controlled by companies in the periods preceding the write-offs. We have provided evidence that $CASH/A_{t-2}$ is significantly larger for firm-year observations with disclosures of write-offs than for the control group of observations (Mann-Whitney *U* test has been used). The relationship is however not observed in the year preceding the write-off.

We have also checked whether higher liquidity has led companies to mitigate the consequences of write-offs, but current liquidity ratios are significantly less for observations with disclosures of write-offs than for the control group of observations with respect to the preceding periods. We have also observed a significant difference in the decrease of current ratios for observations with write-off from period *t-2* to *t* in relation to the control group of observations.

The occurrence of long-lived asset write-offs is also linked with the structure of the company's assets. We expect that companies with larger share of property, plant, and equipment in total assets shall tend to disclose write-offs more frequently. We have observed that the average *PPE/A* is significantly larger for observations with disclosures of write-offs than for the control group of observations (the mean equals 0.47 vs. 0.39, significant at $p = 0.0000$).

3. Reporting and managerial incentives – hypothesis H3.

The disclosure of fixed asset write-offs may also be considered as a result of qualitative factors, including changes in senior management and quality of audit. We have built *chi-square* tables with respect to variables: $MNG\hat{}_t$ and AUD_Q_t. Table 4 presents the results of *chi^square* test. Taking into account all firm-years observations, the change in senior management relates to 42% of total sample (see Table 4; 4.1). The percentage for all firm-year observations with a disclosure of long-lived asset write-offs is equal to 54 vs. 36 for the control group. *Chi^square* statistics (after *Yate's* correction) equals 15.2 and we have

concluded that the frequency of impairment increases when senior management has been changed.

In the whole sample we have observed the frequency of higher audit quality equal to 60% of firm-years observations (see Table 4; 4.2). The percentage calculated for all firm-year observations with a disclosure of long-lived asset write--offs equals 76% vs. 53% for the control group. *Chi^square* statistics (after *Yate's* correction) is equal to 25, and we concluded that the frequency of impairment increases when the audit quality is higher.

Assets impairment might also be a result of the techniques known as earnings management, especially *big bath*. We have tested whether the companies disclosing long-lived asset write-offs tended to shape accruals in a different way in comparison with the companies that do not disclose write-offs. Total accruals (TA_t) are equal to the difference between the companies' pre-write-off earnings and cash flows from operations, and have been scaled by total assets. We have provided the evidence that both TA_t and TA_{t-1} are significantly less for firm-years observations with a disclosure of long-lived asset write-offs than for the control group of observations. We ought to reject the idea that observations with a disclosure have larger accruals and use them to manage earnings. The magnitude of discretionary accruals for firm-year observations with a disclosure is also significantly less than for the control group of observations. We should reject the supposition that companies disclosing long-lived asset write-offs have had larger abnormal accruals in order to manage earnings.

The scope for income smoothing has also been compared between the two groups of observations. The variance of changes in reported earnings ($\hat{}RE_t$) is less for observations with a disclosure of long-lived asset write-offs than for the control group of observations (F statistics equals to 2.44; $p = 0.0000$). Furthermore, the differences in variances of changes in earnings have remained significant even if the changes in reported earnings have been controlled (variable $U\hat{}RE_t$) for the following group of variables: $logA_t$, LEV_t, $\hat{}LEV_t$, $\hat{}REV_t$, $\hat{}C\_ST_t$, $\hat{}IND\text{-}E_t$, $\hat{}PPE_t$ and $\hat{}L_t$, (F statistics equals 1.87). This provides evidence that earnings have been more stable for observations with write-offs. We have also analysed the statistical significance between the variances of changes in pre-write-off earnings (of variable $\hat{}EARN_t$). The variances are significant as well (F statistics is equal to 3.39; p = 0.000). Thus, the lower variance of changes in earnings does not stem primarily from disclosing impairments.

We have not found a statistical significance between unexpected changes in earnings between two groups of firm-year observations when the changes were controlled for some economic factors ($U\hat{}RE_t$). Then $U\hat{}RE_t$ has been decomposed into two variables: $U\hat{}RE+_t$ and $U\hat{}RE\text{-}_t$. The distributions of $U\hat{}RE+_t$ are different for firm-year observations with long-lived asset write-offs

than in the control group. The median of $U\text{^}RE+_t$ is equal to 0.001 for observation with a disclosure and 0.023 for the control group. An interesting issue is that the distributions of $U\text{^}RE-_t$ are not different between the two groups of firm-year observations. We may conclude that negative unexpected earnings are not significantly different for firm-year observations with a disclosure than for the control group, however, the third quartile of $U\text{^}RE-_t$ for observations with a disclosure is greater to some extent than for the control group (0.051 vs. 0.045).

4. Recurrence – part of the hypothesis H7.

Companies which disclosed write-offs in preceding periods tend to continue disclosing impairments. In order to analyse the recurrence we have analysed the link between the frequency of disclosure of write-offs for a given year *t* with the frequency of disclosure of write-offs in the preceding year (t-1) – see Table 4; 4.3. The frequency of a preceding disclosure for all firm-year observations with fixed assets write-offs is 64% vs. 10% for the control group. *Chi^square* statistics (after *Yate's* correction) is equal to 181 and we have concluded that the frequency of disclosures of long-lived asset write-offs increases when it is linked with the disclosures of long-lived asset write-offs in the preceding period.

4.2. Multivariate analysis testing probability of the occurrence of asset write-offs – hypotheses H1, H2, H3, H7 analysed simultaneously

Table 5 presents the results of a logit regression performed to analyse the determinants of the frequency of long-lived asset write-offs non-disclosure. The estimates have been derived from the modelling of the probability of non--disclosing write-offs, $IMP(Y,N)_t = 0$. Table 6 presents the results of linear regression, modelling the probability of impairments disclosure, using the same set of variables.

We have provided evidence that the frequency of write-offs non-disclosure depends simultaneously on different explanatory variables: performance factors, other economic factors and the possibilities of write-off absorption, and reporting and managerial incentives. We have also observed significant recurrence.

The probability of non-disclosure is linked positively with financial performance measures: $\text{^}IND\_E_t$, $EARN_{t-1}$, FCF_{t-1}, $\text{^}RE_t$. However, the obtained estimates have a relatively high standard error, and we conclude that the estimates of $EARN_{t-1}$ and $\text{^}RE_t$ are of limited statistical significance. The pre-

-write-off earnings of the company ($EARN_{t-1}$) may be regarded as determinants of the write-offs disclosed in a given period, but taking into account the large standard error ($p = 0.06$), the relationship is of moderate significance. The probability of non-disclosure is positively linked with changes of reported earnings ($p = 0.06$), however, the change in reported earnings is also the consequence of write-offs, that is why we have carried out the sensitivity analysis of the logit model, and have exchanged variables: $\hat{}RE_t$ and $U\hat{}RE\text{-}_t$ for variables: $\hat{}EARN_t$ and $U\hat{}E\text{-}_t$ while keeping other variables (Table 5, part II). The estimates received were not statistically significant for performance factors and the estimate for $U\hat{}E\text{-}_t$ was positive. That weakens the links between the occurrence of write--offs and the preceding financial performance in the regression model.

As far as other economic factors are concerned, we have analysed the variables as follows: $logA_{t-1}$, $CURR_{t-1}$, $CASH/A_{t-2}$ and PPE_{t-1}/A_{t-1}. Having performed a logit regression, we have indicated a strong negative link between the non-disclosure of impairment and total assets in the preceding period (variable $logA_{t-1}$; $p = 0.000$). Large-sized companies tend to disclose long-lived asset write-off more frequently. Large cash reserves two periods before the write-off reduced the probability of non-disclosure. The conclusions match the expectations that the frequency of disclosing write-offs increases when companies had higher cash reserves earlier. That also relates to the preceding current ratio ($CURR_{t-1}$), but this link is not statistically significant. In line with expectations, the larger the share of *PPE* in total assets, the less frequent the non-disclosure becomes. Companies with a larger share of tangible fixed assets are more exposed to the risk of declining recoverable value of assets.

The reporting and managerial incentives have been analysed using three variables: $MNG\hat{}xAUD\_Q_t$, DA_t, $U\hat{}RE\text{-}_t$. Multiplication of management changes and quality of audit are moderately significant ($p = 0.06$) The multiplication of these two variables reduces the probability of non-disclosure. We have not found links between disclosure and total discretionary accruals which may provide evidence that accruals have not been shaped to manage earnings. The interesting finding is that we have not found links between the frequency of long-lived assets disclosure and unexpected negative changes in reported earnings.

The results of a linear regression are presented in Table 6. They confirm the conclusions of the logit regression, and reaffirm the significance of the estimates. Adjusted R^2 equals 0.37 and is significant ($p = 0.00$). We have analysed normal probability plot and it is not too far form a straight line (plot not being tabulated). The results of the sensitivity analysis of the linear regression with the exchange of variables: $\hat{}RE_t$ and $U\hat{}RE\text{-}_t$ for variables: $\hat{}EARN_t$ and

U^E-$_t$ showed non-significance of the parameters received for pre-write-offs earnings. Predicted values of this regression are not necessarily included in probability range from 0 to 1, nevertheless it is not significant for the purposes of our research questions.

4.3. Quantitative characteristics of long-lived asset write-offs for companies listed on the Warsaw Stock Exchange in the period 2007-2009

In order to give insight to economic context of write-offs we have presented basic financial and statistical information about impairments during period 2007--2009 for companies listed on Warsaw Stock Exchange. We have analysed the sample of companies which disclosed long-lived asset write-offs totalling 42, 67 and 71 in the years 2007, 2008, and 2009 respectively. Table 7 presents the quantitative characteristics of write-offs and some performance factors in respective years of the analysed period. The median write-off was equal to PLN 2,556 thousands, including PLN 1,708 thousands recognised as expenses. The median total write-off was equal to PLN 1,668 thousands (expensed PLN 1,013 thousands) in 2007; PLN 2,741 thousands (expensed PLN 1,956 thousands) in 2008, and PLN 3,703 thousands (expensed PLN 2,342 thousands) in 2009. We observe an increase in median write-offs during the analysed period. The differences between the medians of total write-offs for individual years are statistically significant (using *chi^square* test). The median expensed write-off divided by total assets is equal to 0.003 and the distributions of EXP_IMP_t/A_t in individual years are different (median EXP_IMP_t/A_t is 0.001; 0.003 and 0.004 in 2007, 2008 and 2009 respectively. In 2009 we also observe an increase in mean write-offs and write-offs to total assets.

As for significant differences of performance measures for individual years, we observe that the median return on equity ROE_t dropped from 0.13 in year 2007 to 0.057 in 2008 and slightly increased to 0.087 in 2009. The differences between median *ROE* in individual years are statistically significant and we have rejected the null hypothesis that the distributions of the variable in respective years are equal. The same conclusions relate to other performance measures: OP_INC_t, $EARN_t$. Cash-flows show different behaviour. Median cash-flows from operations scaled by total assets (CF_OP_t) dropped from 0.074 in 2007 to 0.049 in 2008, and increased to 0.089 in 2009. The differences between medians are statistically significant.

4.4. Correlation analysis between the magnitude of write-offs and the dependent variables – hypotheses H4, H5, H6, H8 analysed separately

To evaluate the links between the magnitude of write-offs and the considered groups of explanatory variables, we have performed a correlation analysis using *Pearson's* correlation coefficients and *Spearman's rank* correlation coefficients. The analysis has been performed only for firm-year-observations with disclosure of impairments. The magnitude of write-offs is gauged by dividing the write-off amount by total assets (variables IMP_t/A_t, EXP_IMP_t/A_t). Taking into account that relationships between IMP_t/A_t or EXP_IMP_t/A_t and explanatory variables are not linear, we have focused on Spearman's rank correlation coefficients (the relationship has been analysed through scatter graphs). Table 8 presents Pearson's correlation coefficients and Spearman's rank correlation coefficients. Coefficients significant at $p < 0.1$ are marked out in bold. We have also indicated coefficients significant at $p < 0.05$, marked underscored. The differences between *Pearson's* and *Spearman's rank* correlation coefficients indicate non-linear relationship between variables.

1. Performance factors – hypothesis H4.

A negative correlation is expected between the magnitude of impairments and financial performance of companies. We have observed statistically significant negative correlation of moderate strength between IMP_t/A_t and the following variables: $\hat{}REV_t$, $\hat{}REV_{t/t-2}$, $\hat{}OP\_INC_t$, $\hat{}OP\_INC_{t/t-2}$, $EARN_t$, $\hat{}EARN_t$, $\hat{}EARN_{t/t-2}$, $E\text{-}IND_t$, $\hat{}E\text{-}IND_t$. The conclusion is that the magnitude of long-lived asset write-offs is negatively linked with some pre-write-off financial performance measures, including changes in sales, net earnings, changes in net earnings, operating income and the excess of companies' earnings over average industry earnings. However, there are some problems in interpreting the correlations between the magnitude of impairments and *OP_INC* and *ROE* because *Pearson's* correlation coefficients are positive. As far as write-offs recognized as expenses are concerned, a similar list of significantly correlated variables might be drawn but it is reduced (see Table 8).

2. Other economic factors and capacity to absorb write-offs – hypothesis H5.

The magnitude of impairment is negatively correlated with the company size ($log\ A_{t-1}$) and it follows the expectation that smaller companies are exposed to higher risk. We have not noticed a negative correlation between the magnitude of impairment and the leverage in previous years. The magnitude of impairment is, however, linked negatively with contemporaneous current liquidity ratios and preceding cash reserves. The conclusion is that the magnitude of impairment

is not linked with the capacity to absorb the write-offs. As expected, the magnitude of write-offs is correlated positively with the share of plant, property and equipment in total assets (PPE_{t-1}/A_{t-1}) and negatively with a change in the share of *PPE*.

3. Reporting and managerial incentives – hypothesis H6.

Total accruals and discretionary accruals (TA_t, DA_t) are negatively correlated with the magnitude of long-lived asset impairments, and total accruals of the preceding period are also negatively correlated with the magnitude of impairment (TA_{t-1}). However, the correlation between the magnitude of write--offs and discretionary accruals is significant only for total impairments, not for write-offs recognised as expenses. Also, unexpected changes in reported earnings ($U\text{^}RE_t$) are correlated with the magnitude of impairment. Even if we decompose variable $U\text{^}RE_t$ into $U\text{^}RE+_t$ and $U\text{^}RE-_t$, we observe that $U\text{^}RE-_t$ is linked with the magnitude of impairment.

4. Recurrence – hypothesis H8.

The magnitude of impairment treated as expenses in period t is correlated with the magnitude of impairment in the preceding period. Spearman's correlation coefficient is equal to 0.16 and is significant at $p < 0.05$.

4.5. Multivariate analysis describing determinants for the magnitude of write-offs; hypotheses H4, H5, H6, and H8 analysed simultaneously

To analyse the joint influence of all groups of explanatory variables on the magnitude of long-lived asset impairments, we have performed multiple log-linear regression models. Consequently, all considered variables have been transformed using the logarithm. We performed the analysis separately for two dependent variables: $logIMP_t/A_t$, $logEXP\_IMP_t/A_t$. The results of the log-linear regressions are presented in Table 9 (dependent variable $logIMP_t/A_t$), and in Table 10 (dependent variable $logEXP\_IMP_t/A_t$). Adjusted coefficient of determination (R^2) is equal to 0.24 for transformed total write-offs to assets ($logIMP_t/A_t$) as a dependent variable, and the coefficient R^2 calculated using expensed write-off: $logEXP\_IMP_t/A_t$ is equal to 0.23. The coefficients are statistically significant.

Performance factors of total write-offs consists of two transformed variables: change in sales ($log\text{^}REV_t$) and change in cash flows from operations (scaled by total assets) ($log\text{^}CF\_OP_t$). The estimate for log of the change in sales is negative and statistically significant ($p = 0.02$). Total impairments are also negatively linked with changes in cash flows from operation but the estimate is not significant. According to the results of the regression, the magnitude of impairments is negatively linked with the size of the company. The estimate is statistically significant for total write-offs ($p = 0.0039$), but is not significant

for impairments recognised as expenses. The regression also confirms positive relationship between the magnitude of write-offs and the structure of assets (variable PPE_{t-1}/A_{t-1}) as far as total write-offs are concerned.

Reporting and managerial incentives have also influenced the magnitude of write-offs. The magnitude of write-offs is positively linked with changes in senior management $MNG^{\wedge}_t$ (statistically not significantly), and negatively with the quality of audit AUD_Q_t. The estimate for changes of pre-write-off earnings divided by assets, when the change is above the median of non-zero positive values, and 0 otherwise ($log^{\wedge}E+Me_t$), is positive for both models and significant for $logEXP\_IMP/A_t$. The estimate of negative large changes in pre-write-off earnings scaled by total assets, computed as positive amounts, when the change is below the median of negative values, and 0 otherwise ($log^{\wedge}E\text{-}Me_t$), is positive and significant for both models. Discretionary accruals are positively linked with the magnitude of impairment, but only for impairments recognised as expenses.

Taking into account the results of regression for impairments recognised as expenses, we have found strong links between the magnitude of write-offs and reporting incentives. Large impairments are linked positively with large positive and negative changes in pre-write-off earnings. Companies therefore use impairments to increase large negative changes in earnings and decrease large positive changes in earnings.

We have also carried out the sensitivity analysis and changed the variables $log^{\wedge}E+Me_t$ and $log^{\wedge}E\text{-}Me_t$ for negative unexpected changes in pre-reported earnings. The remaining variables were not changed. The estimated parameter for $logU^{\wedge}E\text{-}_t$ was positive (as expected) but not significant statistically ($p = 0.29$). The significance of the estimates for all the remaining variables was the same as in Table 9. This means that unexpected negative changes in pre-write-off earnings are not linked with the magnitude of write-offs. The effect of recurrence is not statistically significant.

5. Conclusions, verification of hypotheses

H1 verification: In the univariate analysis, we have found rather moderate rationale to rank financial performance as a determinant of long-lived assets impairments. The occurrence of asset write-offs is linked negatively with the firms' industry financial performance. We have also found evidence that pre-write-off earnings in the preceding period are negatively linked with the probability of asset impairments. The distributions of pre-write-off returns on equity in the preceding year are different between observations with assets impairments and observations without a disclosure, and the median ROE is lower for observations with asset impairments. On the other hand, companies which disclose impairments have significantly better cash-flows performance. We have not

found evidence that disadvantageous changes in financial performance ought to be ranked as impairment determinants. No disadvantageous changes in financial performance proved to be different between the two groups of observations, apart from the change in reported earnings but it is a rather tautological link.

Multivariate analysis does not demonstrate significant links between the frequency of impairments and financial performance. When we take into account the change in pre-write-off earnings instead of the change in reported earnings, no financial performance measures are significantly linked with write-offs.

H2 verification: Large-sized companies disclose impairments more frequently. The companies which disclosed impairment were not more leveraged in the preceding periods in comparison with the control group of observations. We have observed significantly higher financial leverage in the periods of disclosure and a higher increase of leverage for companies which disclosed impairment. The companies with a greater share of property, plant and equipment tend to disclose write-offs more frequently. We have not found evidence that other indicators of the capacity to absorb long-lived asset impairments are linked with the frequency of write-offs. The liquidity of companies disclosing write--offs was generally lower in preceding periods. Only the distribution of cash reserves in two periods preceding the write-offs was different and the median value was greater than in the control group. The following factors: size of the company, the percentage of property, plant and equipment and cash reserves two years before disclosure are significantly linked with the occurrence of impairments in accordance with multivariate analysis.

H3 verification: We have proved that observations with impairment have significantly more frequent changes in senior management and higher audit quality. Total and discretionary accruals are significantly less for observations with impairment than within the control group. Total accruals were also lower in the period preceding a disclosure. Therefore, we should not expect that companies use accruals as an earning management technique while disclosing impairments. Variances of changes in reported earnings are significantly lower for observations with write-offs. Even after the changes of earnings have been controlled for some economic factors, the variances remain significantly lower. Moreover, the variances of pre-write-off earnings are also significantly lower for companies with write-offs. The earnings of companies disclosing impairments are more stable. Changes in senior management and the multiplication of changes in senior management and the quality of audit are moderately significant in terms of the multivariate analysis.

H4 verification: The magnitude of long-lived asset impairment is negatively correlated with many pre-write-off financial performance measures, including changes in sales, net earnings, changes in net earnings, and the excess of companies' earnings over average industry earnings. The links between the magnitude of impairment and cash flows are rather week.

According to the results of multivariate regression models, the magnitude of write-offs is linked significantly and negatively with the percentage change in sales. The estimates of other financial performance measures were not significant.

H5 verification: The magnitude of impairment is negatively correlated with the size of the company. As expected, the magnitude of write-offs is correlated positively with the share of plant, property and equipment in total assets. We haven't noticed a correlation between the magnitude of impairment and the leverage. The magnitude of impairment is, however, linked negatively with contemporaneous current liquidity ratios and preceding cash reserves.

According to the multivariate analysis, the estimates for the company size and the percentage of property and equipment are significant.

H6 verification: Total accruals and discretionary accruals are negatively correlated with the magnitude of long-lived asset impairments, and total accruals of the preceding period are also negatively correlated with the magnitude of impairment. Unexpected negative changes in reported earnings are linked with the magnitude of impairment.

According to the multivariate analysis, the magnitude of write-offs recognised as expenses is positively linked with large positive and negative (calculated as positive amounts) changes in pre-write-off earnings and with discretionary accruals. This means the links between the magnitude of impairments and reporting incentives are strong. Impairments are used to both increase large negative changes in earnings (big-bath) and decrease large positive changes in earnings (smoothing). The phenomenon of income smoothing does not relate to total impairments, only to those expensed. Changes in senior management $MNG\hat{}_t$, are positively linked with the magnitude of write-offs, whereas the quality of audit (AUD_Q_t) is positively linked with the extent of write-offs (statistically not significant).

H7; H8 verification: The effect of recurrence is significant as far as the frequency of impairments is concerned. As borne out by the multivariate analysis, the recurrence and extent of recurrence are not significant as far as the magnitude of write-offs is concerned, however, according to Spearman's rank correlation coefficients, the magnitude of impairments is correlated with the magnitude of impairments disclosed in the preceding year.

Table 1

Variable definitions

I. Write-offs variables:

IMP_t	= reported long-lived asset write-off (as positive amount) for period t in '000 PLN, but exceeding 100,000 PLN;
IMP_t/A_t	= reported long-lived asset write-off for period t divided by total assets;
$IMP\ (Y,N)_t$	= an indicator variable equal to 1 if the company disclosures a write-off in year t, and 0 otherwise;
EXP_IMP_t	= reported long-lived asset write-off expensed in period t in '000 PLN, but exceeding 100,000 PLN
EXP_IMP_t/A_t	= reported long-lived asset write-off expensed in period t divided by total assets;
log Any item t	= natural logarithm of any item in period t, the same for independent variables

II. Time and recurrence (selected variables)

t	= the number of the year in the period 2005-2009; in the case of dependent variables t belongs to 2007-2009;
$\hat{}Any\ Item_{t/t-2}$	= the net change of item from year *t-2* to *t*, equal to the sum of changes from year *t-1* to *t* and from *t-2* to *t-1*;

III. Performance Factors:

IND_E_t	= the average ratio of total earnings divided by assets in the firm's industry in year t;
$\hat{}IND\_E_t$	= the average change of the ratio of total earnings divided by assets in the firm's industry from year *t-1* to *t*;
IND_OPINC_t	= the average ratio of total operating income divided by assets in the firm's industry in year t;
$\hat{}IND\_OPNIC_t$	= the average change of total operating income divided by assets in the firm's industry from year *t-1* to *t*;
$\hat{}REV_t$	= the percentage change in sales from period *t-1* to *t*;
OP_INC_t	= pre-write-off operating income in year t divided by total assets;
$\hat{}OP\_INC_t$	= the change in pre-write-off operating income divided by total assets form year *t-1* to *t*;
$EARN_t$	= pre-write-off earnings in year t divided by total assets;
$\hat{}EARN_t$	= the change in pre-write-off earnings divided by total assets from year *t-1* to *t*;
$\hat{}E\text{-}_t$	= $\hat{}EARN_t$ *(-1) if $\hat{}EARNt < 0$; 0 otherwise
CF_OP_t	= the operating cash flow in year t divided by total assets;
$\hat{}CF\_OP_t$	= the change in operating cash flows divided by total assets from year *t-1* to *t*;
FCF_t	= free cash flows in year t (operating cash flows plus investment cash flows) divided by assets in year t;
$\hat{}FCF_t$	= the change in free cash flows divided by total assets from year *t-1* to *t*;
$E\text{-}IND_t$	= *EARNt* reduced by the ratio of total earnings divided by assets in the firm's industry in year t;
$\hat{}E\text{-}IND_t$	= the change in E-IND from year *t-1* to year *t*;
$OP\_INC\text{-}IND_t$	= *OP_INCt* reduced by the ratio of operating income divided by assets in the firm's industry in year t;
$\hat{}OP\_INC\text{-}IND_t$	= the change in *OP_IND* from year *t-1* to year *t*;
ROE_t	= pre-write-off earnings in year t divided by equity;
$\hat{}ROE_t$	= change in ROE from year *t-1* to t
$\hat{}RE_t$	= change of reported earnings from year *t-1* to *t* divided by total assets;
$Yield_t$	= percentage annual rate of return on stock from year *t-1* to *t*,
P/BV_t	= market to book equity in year t;
$\hat{}WC_t$	= percentage change in working capital from year *t-1* to *t*; *WC* = current assets less short-term liabilities;
$\hat{}REV\text{-}\hat{}WC_t$	= percentage change of revenues reduced by the increases in working capital form year *t-1* to *t*;

IV. Other Economic Factors & Capacity to Absorb the Write-Offs

A_t	= total assets in year t;
$LogA_t$	= log of total assets in year t;
LEV_t	= a proxy of financial gearing equal to total liabilities divided by total assets in year t;
$\hat{}LEV_t$	= the change in financial gearing from year *t-1* to *t*;
$CURR_t$	= current liquidity ratio in year t equal to current assets divided by current liabilities;
$\hat{}CURR_t$	= the change in current ratio from year *t-1* to *t*;
$CASH/A_t$	= cash reserves in year t, equal to liquid assets divided by total assets;
PPE_t/A_t	= property, plant and equipment in year t divided by total assets;
$(REV_t\text{-}REV_{t-1})/A_{t-1}$	= change of revenues from year *t-1* to *t* divided by total assets

V. Reporting & Managerial Incentives

$MNG\hat{}_t$	= a variable equal to 1 if company experiences a change in senior management in year t, and 0 otherwise;
AUD_Q_t	= an indicator variable equal to 1 if the company's financial statement was audited by one of the auditing comp. which gained at least 10th position in year t and t-1 in "Rzeczpospolita" Rating, and 0 otherwise;
TA_t	= total accruals in year t (equal to the difference between *EARNt* and *CF_OP* (all scaled by total assets);
DA_t	= discretionary accruals, equal to residuals between *TAt* and estimated *TAt* obtained from the regression:

$$TA_t = \alpha\,[1/A_t] + \beta_1[\hat{}REV_t] + \beta_2[PPE_t / A_t] + \beta_3[\hat{}PPE_t / A_{it}] + \beta_4[\hat{}FCF_t] + \beta_5[\hat{}C\_ST_t] + \zeta_{it}$$

$U\hat{}RE_t$	= total unexpected *^REt*, equal to the residuals between *^REt* and estimated *^REt* from the regression:

$$\hat{}RE_t = \alpha + \beta_1[\log A_t] + \beta_2[LEV_t] + \beta_3[\hat{}LEV_t] + \beta_4[\hat{}REV_t] + \beta_5[\hat{}C\_ST_t] + \beta_6[\hat{}IND\_E_t] + \beta_7[\hat{}L_t] + \beta_8[\hat{}PPE_t] + \zeta_{it}$$

$\hat{}PPE/A_t$	= change in plant, property and equipment in year t divided by total assets,
$\hat{}PPE_t$	= percentage change in plant, property and equipment in year t,
$\hat{}C\_ST_t$	= percentage change in shareholders' equity from year *t-1* to *t*;
$\hat{}L_t$	= percentage change in total liabilities from year *t-1* to *t*;
$U\hat{}RE+_t$	= total unexpected *^REt*, equal to U^Ret if U^REt >0, 0 otherwise;
$U\hat{}RE\text{-}_t$	= total unexpected *^REt*, equal to U^Retx(-1), if U^REt<0, 0 otherwise;

Table 2

Rejected null hypotheses: equal means (observations with a disclosure of write-offs [1] and control group [0])

	Mean [1]	Mean [0]	t	p	Std dev [1]	Std dev [0]	F quotient	Levene's
Performance Factors:								
IND_E_t	0,0624	0,0673	-2,0255	0,0433	0,0241	0,0282	1,3622	4,7491
IND_E_{t-1}	0,0638	0,0679	-1,7570	0,0795	0,0249	0,0262	1,1087	0,7468
CF_OP_t	0,0639	0,0355	2,4703	0,0138	0,1067	0,1364	1,6365	1,7675
$\hat{}CF\_OP_{t/t-2}$	0,0146	-0,0087	1,6506	0,0994	0,1385	0,1641	1,4049	5,5968
Other Economic Factors & Capacity to Absorb the Write-Offs								
A_{t-2}	2337990	295050	5,9930	0,0000	6692662	534442	157	75,1819
A_{t-1}	2663187	385773	6,2322	0,0000	7164279	629058	130	77,6318
A_t	2872606	461002	6,3915	0,0000	7367308	791237	87	80,0192
$LogA_{t-1}$	13,4092	11,9799	10,9400	0,0000	1,5935	1,3787	1,3358	3,7979
$LogA_t$	13,5300	12,1989	10,4702	0,0000	1,5889	1,3209	1,4470	7,1462
LEV_t	0,5032	0,4660	1,7246	0,0851	0,2276	0,2449	1,1583	0,1945
$\hat{}LEV_t$	0,0283	-0,0120	2,2835	0,0228	0,1585	0,2107	1,7672	0,3469
$\hat{}LEV_{t/t-2}$	0,0296	-0,0517	1,8311	0,0676	0,2313	0,5743	6,1639	0,7144
$CURR_{t-1}$	1,7412	2,0620	-1,9624	0,0502	1,2516	2,0212	2,6077	3,8998
$CURR_t$	1,6974	2,1498	-2,4622	0,0141	1,8666	2,1137	1,2824	5,9712
PPE_t/A_t	0,4856	0,4091	4,3119	0,0000	0,1868	0,2012	1,1606	1,3806
PPE_{t-1}/A_{t-1}	0,4731	0,3909	4,6644	0,0000	0,1922	0,1971	1,0512	0,4085
Reporting & Managerial Incentives								
$MNG\hat{}_t$	0,5389	0,3615	4,0408	0,0001	0,4999	0,4811	1,0797	12,1632
AUD_Q_t	0,7556	0,5308	5,2069	0,0000	0,4310	0,4997	1,3444	128,0451
$MNG\hat{}xAUD\_Q$	0,4056	0,2179	4,7339	0,0000	0,4924	0,4134	1,4187	61,4949
TA_{t-1}	-0,0070	0,0252	-2,3634	0,0184	0,1605	0,1469	1,1938	0,0548
TA_t	-0,0582	-0,0111	-2,2385	0,0256	0,1682	0,2580	2,3534	0,0374
DA_t	-0,0249	0,0181	-2,1648	0,0308	0,1651	0,2417	2,1412	0,0005
Recurrence								
$IMP\ (Y,N)_{t-1}$	0,6444	0,1000	16,48049	0,000000	0	0,3	2,5536	209,0961

Table 3

Rejected hypotheses on the same distributions for observations with write-offs [1] and control group [0]

	Sum of the ranks [1]	Sum of the ranks [0]	U	Z	p	Z correct.	p
Performance Factors:							
IND_E_t	47177	115559	30887	-2,3051	0,0212	-2,3060	0,0211
IND_E_{t-1}	47841	114895	31551	-1,9418	0,0522	-1,9427	0,0521
$EARN_{t-1}$	47535	115200	31245	-2,1090	0,0349	-2,1090	0,0349
CF_OP_{t-1}	56019	106716	30471	2,5325	0,0113	2,5325	0,0113
CF_OP_t	56773	105962	29717	2,9450	0,0032	2,9450	0,0032
FCF_{t-1}	55358	107377	31132	2,1708	0,0299	2,1708	0,0299
$\hat{}FCF_{t-1}$	54506	108229	31984	1,7046	0,0883	1,7046	0,0883
$\hat{}FCF_{t/t-2}$	54400	108335	32090	1,6466	0,0996	1,6466	0,0996
ROE_{t-2}	47193	115543	30903	-2,2964	0,0217	-2,2964	0,0217
ROE_{t-1}	46593	116142	30303	-2,6244	0,0087	-2,6244	0,0087
$\hat{}RE_t$	47897	114838	31607	-1,9109	0,0560	-1,9109	0,0560
Other Economic Factors & Capacity to Absorb the Write-Offs							
A_{t-2}	69609	93127	16882	9,9679	0,0000	9,9679	0,0000
A_{t-1}	68914	93821	17576	9,5879	0,0000	9,5879	0,0000
A_t	68032	94703	18458	9,1053	0,0000	9,1053	0,0000
$LogA_{t-1}$	68914	93821	17576	9,5879	0,0000	9,5879	0,0000
$LogA_t$	68032	94703	18458	9,1053	0,0000	9,1053	0,0000
LEV_t	55047	107688	31443	2,0006	0,0454	2,0006	0,0454
$\hat{}LEV_t$	55795	106940	30695	2,4099	0,0160	2,4099	0,0160
$\hat{}LEV_{t/t-2}$	57888	104847	28602	3,5551	0,0004	3,5551	0,0004
$CURR_{t-1}$	47245	115490	30955	-2,2677	0,0234	-2,2677	0,0234
$CURR_t$	45236	117499	28946	-3,3669	0,0008	-3,3669	0,0008
$\hat{}CURR_{t/t-2}$	45658	117077	29368	-3,1360	0,0017	-3,1360	0,0017
$CASH/A_{t-2}$	54633	108103	31858	1,7739	0,0761	1,7739	0,0761
PPE_t/A_t	58992	103743	27498	4,1591	0,0000	4,1591	0,0000
PPE_{t-1}/A_{t-1}	59572	103163	26918	4,4765	0,0000	4,4765	0,0000
Reporting & Managerial Incentives							
$MNG\hat{}_t$	57615	105120	28875	3,4057	0,0007	3,9872	0,0001
AUD_Q_t	59280	103455	27210	4,3167	0,0000	5,0910	0,0000
$MNG\hat{}xAUD\_Q_t$	57975	104760	28515	3,6027	0,0003	4,6469	0,0000
TA_{t-1}	44339	118396	28049	-3,8577	0,0001	-3,8577	0,0001
TA_t	44081	118654	27791	-3,9988	0,0001	-3,9988	0,0001
DA_t	43105	119630	26815	-4,5328	0,0000	-4,5328	0,0000
$U\hat{}RE+_t$	48066	114670	31776	-1,8187	0,0690	-1,8965	0,0579
Recurrence							
$IMP\ (Y,N)_{t-1}$	70500	92235	15990	10,4557	0,0000	13,5668	0,0000

Table 4

Chi-2 tables for qualitative variables

4.1. Chi^2 for senior management change

$IMP(Y,N)_t$	$MNG^{\wedge}_t=0$	$MNG^{\wedge}_t=1$	Row
0	249	141	390
1	83	97	180
Total	332	238	570

	Chi^2	df	p
Chi^2 Yates cor	15	df=1	p=.00010

4.2. Chi^2 for audit quality

$IMP(Y,N)_t$	$AUD\_Q_t=0$	$AUD\_Q_t=1$	Row
0	183	207	390
1	44	136	180
Total	227	343	570

	Chi^2	df	p
Chi^2 Yates cor	25	df=1	p=.00000

4.3. Chi^2 for the recurrence

$IMP(Y,N)_t$	$IMP(Y,N)_{t-1}=0$	$IMP(Y,N)_{t-1}=1$	Row
0	351	39	390
1	64	116	180
Total	415	155	570

	Chi^2	df	p
Chi^2 Yates cor	181	df=1	p=0.0000

Table 5

Logit Regression: The determinants of the Probability of Long-Lived Asset Write-Offs

Variable	I. Model Parameter	Wald's stat.	p	Log. High Reliability	p	II. Sensitivity analysis Variable	Parameter	p
Intercept	**7,9069**	**41,7198**	**0,0000**			*Intercept*	**7,47054**	**0,000000**
Performance Factors:								
$\wedge IND\_E_t$	2,8058	0,3900	0,5323	-239,9047	0,5310	$\wedge IND\_E_t$	3,98790	0,366732
$EARN_{t-1}$	**2,5610**	**3,5509**	**0,0595**	**-241,4679**	**0,0607**	$EARN_{t-1}$	1,06250	0,558245
FCF_{t-1}	0,3223	0,3164	0,5738	-239,8600	0,5820	FCF_{t-1}	0,96967	0,129730
$\wedge RE_t$	**2,4887**	**3,4267**	**0,0641**	**-241,4988**	**0,0585**	$\wedge EARN_t$	0,71824	0,748211
Other Economic Factors & Capacity to Absorb the Write-Offs								
$LogA_{t-1}$	**-0,4303**	**20,8096**	**0,0000**	**-251,0613**	**0,0000**	$LogA_{t-1}$	**-0,37952**	**0,000074**
$CURR_{t-1}$	-0,0102	0,0212	0,8842	-239,7188	0,8856	$CURR_{t-1}$	-0,02765	0,678997
$CASH/A_{t-2}$	**-2,3558**	**4,7291**	**0,0297**	**-241,9626**	**0,0337**	$CASH/A_{t-2}$	**-2,36778**	**0,027911**
PPE_{t-1}/A_{t-1}	**-1,5031**	**4,5446**	**0,0330**	**-242,0024**	**0,0322**	PPE_{t-1}/A_{t-1}	**-2,02968**	**0,005367**
Reporting & Managerial Incentives								
$MNG^{\wedge}xAUD\_Q_t$	**-0,4764**	**3,5607**	**0,0592**	**-241,4699**	**0,0605**	$MNG^{\wedge}xAUD\_Q_t$	**-0,46677**	**0,061218**
DA_t	-1,0387	1,0964	0,2951	-240,2396	0,3027	DA_t	1,34878	0,331850
$U^{\wedge}RE-_t$	1,9333	1,3550	0,2444	-240,4234	0,2318	$U^{\wedge}E-_t$	1,63644	0,430767
Recurrence								
$IMP(Y,N)_{t-1}$	**-2,4165**	**89,6821**	**0,0000**	**-290,1996**	**0,0000**	$IMP(Y,N)_{t-1}$	**-2,39034**	**0,000000**

Table 6

Linear Regression: The determinants of the Probability of Long-Lived Asset Write-Offs

		I. Model				II. Sensitivity analysis				
Variable		Param.	t	p		Param.	t	p		
Intercept		**-0,6042**	**-4,2129**	**0,0000**	*Intercept*	**-0,564889**	**-3,78966**	**0,000167**		
Performance Factors:										
$\hat{}IND\_E_t$		-0,4304	-0,7263	0,4680	$\hat{}IND\_E_t$	-0,553412	-0,93783	0,348741		
$EARN_{t-1}$		**-0,3245**	**-1,8582**	**0,0637**	$EARN_{t-1}$	-0,201083	-0,88487	0,376609		
FCF_{t-1}		-0,0240	-0,2917	0,7706	FCF_{t-1}	-0,090218	-1,06091	0,289192		
$\hat{}RE_t$		**-0,3190**	**-1,8882**	**0,0595**	$\hat{}EARN_t$	-0,164651	-0,58799	0,556776		
Other Economic Factors & Capacity to Absorb the Write-Offs										
$LogA_{t-1}$		**0,0543**	**4,6382**	**0,0000**	$LogA_{t-1}$	**0,049779**	**4,09330**	**0,000049**		
$CURR_{t-1}$		0,0004	0,0421	0,9665	$CURR_{t-1}$	0,002318	0,25819	0,796353		
$CASH/A_{t-2}$		**0,2900**	**2,0124**	**0,0447**	$CASH/A_{t-2}$	**0,288797**	**1,99785**	**0,046219**		
PPE_{t-1}/A_{t-1}		**0,1859**	**1,9959**	**0,0464**	PPE_{t-1}/A_{t-1}	**0,242390**	**2,58995**	**0,009850**		
Reporting & Managerial Incentives										
$MNG\hat{}xAUD\_Q_t$		**0,0722**	**2,0113**	**0,0448**	$MNG\hat{}xAUD\_Q_t$	**0,069705**	**1,94172**	**0,052675**		
DA_t		0,1358	1,0173	0,3094	DA_t	-0,099473	-0,62394	0,532921		
$U\hat{}RE\text{-}_t$		-0,1695	-0,8301	0,4068	$U\hat{}E\text{-}_t$	-0,208380	-0,78022	0,435591		
Recurrence										
$IMP\ (Y,N)_{t-1}$		**0,494387**	**12,65763**	**0,000000**	$IMP\ (Y,N)_{t-1}$	**0,492063**	**12,58074**	**0,000000**		
Adjusted R^2	SS Model	SS E	F	p	Adjusted R^2	SS Model	MSE	F	p	
0,369068	**47,09237**	**76,06552**	**28,73669**	**0,0000**	0,365502	46,66244	0,137335	28,31429	0,0000	

Table 7

Quantitative characteristics of the impairment and selected performance measures in period 2007-2009

	All observations		2009	2009	2008	2008	2007	2007	Diff. sign. p<0.1	
	Mean	Median	Mean N	Median	Mean N = 67	Median	Mean	Median	Kruskal-	Median
	N = 180	N = 180	= 71	N = 71		N = 67	N = 42	N = 42	Wallis test	test
Variable										
EXP_IMP_t	38570	1708	17528	2342	55715	1956	46792	1013	p =.1731	**p =.0751**
EXP_IMP_t/A_t	0,022	0,003	0,029	0,004	0,016	0,003	0,018	0,001	**p =.0219**	p = .3281
IMP_t	40011	2556	18890	3703	57263	2741	48195	1668	p =.5934	**p =.0952**
IMP/A_t	0,029	0,004	0,039	0,004	0,024	0,005	0,020	0,003	p =.1128	p =.1706
$IMP\ (Y,N_{t-1}$	0,644	1,000	0,690	1,000	0,552	1,000	0,714	1,000	p =.1350	p = 1.000
EXP_IMP_{t-1}	34129	298	52311	1232	29039	0	11513	254	**p =.0126**	**p =.0232**
EXP_IMP_{t-1}/A_{t-1}	0,008	0,000	0,014	0,001	0,003	0,000	0,003	0,000	**p =.0059**	**p =.0306**
$\hat{}REV_t$	1,212	1,107	0,988	0,978	1,234	1,153	1,557	1,208	**p =.0000**	**p =.0006**
OP_INC_t	0,047	0,062	0,020	0,052	0,044	0,047	0,096	0,078	**p =.0114**	**p =.0126**
$EARN_t$	0,006	0,040	-0,034	0,038	0,000	0,029	0,081	0,062	**p =.0003**	**p =.0037**
CF_OP_t	0,064	0,072	0,079	0,089	0,047	0,049	0,065	0,074	p =.1948	**p =.0383**
$LogA_t$	13,530	13,614	13,409	13,560	13,475	13,595	13,823	14,062	p =.3165	p = .3281
ROE_t	0,066	0,087	0,022	0,087	0,053	0,057	0,161	0,131	**p =.0015**	**p =.0273**
$\hat{}RE_t$	-0,035	-0,007	-0,042	0,000	-0,060	-0,028	0,019	0,010	**p =.0001**	**p =.0007**
$U\hat{}RE_t$	-0,003	0,001	-0,005	-0,008	-0,008	0,002	0,009	0,013	p =.6268	p =.4579

Table 8

Coefficients of correlation between magnitude of impairment and explanatory variables

	Pearson's corr. coef.		Spearman's corr. coef.			Pearson's corr. coef.		Spearman's corr. coef.	
	EXP_IMP $_t/A_t$	*IMP* $_t/A_t$	*EXP_IMP* $_t/A_t$	*IMP* $_t/A_t$		*EXP_IMP* $_t/A_t$	*IMP* $_t/A_t$	*EXP_IMP* $_t/A_t$	*IMP* $_t/A_t$
EXP_IMP $_t/A_t$	1,0000	**0,8714**	1,0000	**0,7809**	*EXP_IMP* $_t/A_t$	1,0000	**0,8714**	1,0000	**0,7809**
IMP $_t/A_t$	**0,8714**	1,0000	**0,7809**	1,0000	*IMP* $_t/A_t$	**0,8714**	1,0000	**0,7809**	1,0000
EXP_IMP $_{t-1}/A_{t-1}$	-0,0293	0,0181	**0,1553**	0,0566	*EXP_IMP* $_{t-1}/A_{t-1}$	-0,0293	0,0181	**0,1553**	0,0566
Performance Factors:					*Other Economic Factors & Capacity to Absorb Write-Offs*				
^REV $_t$	**-0,1581**	**-0,1901**	**-0,1849**	**-0,2455**	*LogA* $_{t-1}$	**-0,1501**	**-0,2222**	**-0,1270**	**-0,2832**
^REV $_{t/t-2}$	**-0,1397**	**-0,1674**	-0,1195	**-0,1631**	*LogA* $_t$	**-0,2030**	**-0,2880**	**-0,1810**	**-0,3324**
OP_INC $_{t-1}$	-0,0499	**-0,1640**	-0,0258	-0,0676	*LEV* $_{t-2}$	-0,0521	-0,0327	**-0,1360**	-0,0753
OP_INC $_t$	**0,2908**	0,0131	-0,0336	**-0,1293**	*LEV* $_t$	**0,2087**	**0,4318**	0,0390	0,1154
^OP_INC $_t$	**0,3821**	**0,1416**	-0,0946	**-0,1745**	*^LEV* $_t$	**0,2821**	**0,4891**	**0,1943**	**0,2542**
^OP-INC $_{t-1}$	-0,0096	**-0,1749**	-0,0235	-0,1041	*^LEV* $_{t-1}$	0,0855	**0,1723**	0,0725	0,0848
^OP_INC $_{t/t-2}$	**0,3158**	0,0221	-0,1176	**-0,2221**	*^LEV* $_{t/t-2}$	**0,2524**	**0,4542**	0,1732	0,2157
EARN $_{t-1}$	-0,0753	**-0,1959**	-0,0511	-0,0995	*CURR* $_{t-1}$	-0,0864	**-0,1323**	0,0139	-0,0778
EARN $_t$	-0,0838	**-0,3364**	-0,0882	**-0,1949**	*CURR* $_t$	-0,0819	-0,0983	**-0,1333**	**-0,1841**
^EARN $_t$	-0,0461	**-0,2623**	**-0,1392**	**-0,2564**	*^CURR* $_t$	-0,0234	-0,0094	**-0,1799**	**-0,1687**
^EARN $_{t-1}$	-0,0453	**-0,1930**	**-0,1289**	**-0,1941**	*CASH/A* $_{t-2}$	-0,0798	-0,1213	-0,0631	**-0,1549**
^EARN $_{t/t-2}$	-0,0633	**-0,3241**	**-0,2132**	**-0,2972**	*CASH/A* $_{t-1}$	**-0,1285**	**-0,1766**	-0,1018	**-0,2126**
FCF $_{t-2}$	**-0,2682**	**-0,3185**	-0,0914	**-0,1958**	*PPE* $_t/A_t$	**0,1346**	**0,1371**	0,0490	0,1097
^FCF $_t$	-0,0790	**-0,1305**	-0,1034	**-0,1392**	*PPE* $_{t-1}/A_{t-1}$	**0,1628**	**0,2079**	0,1131	**0,2028**
^FCF $_{t-1}$	**0,1467**	**0,2050**	**0,1768**	**0,2554**	*^PPEt*	-0,0857	-0,1115	**-0,2366**	**-0,3073**
^FCF $_{t/t-2}$	**0,1506**	**0,1849**	0,0702	**0,1246**	*Reporting & Managerial Incentives*				
E-IND $_{t-1}$	-0,1039	**-0,2154**	-0,0813	**-0,1271**	*U^RE* $_t$	**-0,2991**	**-0,1790**	-0,1162	**-0,1301**
E-IND $_t$	-0,1011	**-0,3449**	-0,0799	**-0,1906**	*TA* $_{t-1}$	-0,0513	**-0,1463**	-0,0554	**-0,1323**
^E-IND $_t$	-0,0473	**-0,2628**	-0,0718	**-0,1986**	*TA* $_t$	-0,0632	**-0,3043**	**-0,1599**	**-0,2336**
OP_INC-IND $_{t-1}$	-0,0709	**-0,1640**	-0,0621	-0,0855	*^TA* $_t$	-0,0129	**-0,1489**	**-0,1496**	**-0,1628**
OP_INC-IND $_t$	**0,2692**	0,0071	-0,0372	**-0,1283**	*DA* $_t$	0,0119	**-0,2293**	-0,0841	**-0,1413**
^OP_INC-IND $_t$	**0,3700**	**0,1369**	-0,0482	-0,1182	*U^RE-* $_t$	**0,426446**	**0,374358**	**0,1411**	**0,1741**
ROE $_t$	**0,3325**	**0,4818**	**-0,1294**	-0,0635					
^ROE $_t$	**0,3036**	**0,3587**	-0,1160	-0,1038					
^ROE $_{t/t-2}$	**0,2801**	**0,4002**	**-0,1934**	-0,1197					
^RE $_t$	**-0,5166**	**-0,6087**	**-0,2999**	**-0,3610**					

Coefficients significant at $p < 0.1$ are marked out in bold. Coefficients significant at $p < 0.05$ are marked underscored.

Table 9

Regression model. Dependent variable: logIMP/At

	I. Model				II. Sensitivity analysis				
	Param.	St. error	t	p					
Intercept	0,51057	1,534155	0,33280	0,739704	*Intercept*	1,41773	1,473873	0,96191	0,337495
Performance Factors:									
log^REV_t	**-1,48942**	**0,642159**	**-2,31940**	**0,021599**	log^REV_t	**-1,63511**	**0,649264**	**-2,51841**	**0,012735**
$log^CF\_OP_t$	-0,26535	1,239544	-0,21407	0,830756	$log^CF\_OP_t$	-0,02216	1,252392	-0,01769	0,985906
Other Economic Factors & Capacity to Absorb the Write-Offs									
$LogA_{t-1}$	**-0,29118**	**0,099458**	**-2,92764**	**0,003898**	$LogA_{t-1}$	**-0,33179**	**0,098150**	**-3,38040**	**0,000902**
$logCURR_t$	-0,00952	0,386629	-0,02463	0,980378	$logCURR_t$	-0,17115	0,386224	-0,44313	0,658246
$logCASH/A_{t-1}$	-2,25958	1,965975	-1,14934	0,252077	$logCASH/A_{t-1}$	-2,67941	1,984319	-1,35029	0,178760
$logPPE_{t-1}/A_{t-1}$	**0,84726**	**0,282833**	**2,99562**	**0,003161**	$logPPE_{t-1}/A_{t-1}$	**0,80985**	**0,282591**	**2,86581**	**0,004698**
Reporting & Managerial Incentives									LogAt-1
$logDA_t$	0,56626	0,992454	0,57057	0,569068	$logDA_t$	-1,01820	0,759367	-1,34085	0,181802
log^E+Me_t	1,10856	2,587183	0,42848	0,668860	$logU^E-_t$	10,32136	9,761085	1,05740	0,291866
log^E-Me_t	**5,79808**	**2,158081**	**2,68668**	**0,007955**					
$MNG^_t$	0,34745	0,256803	1,35297	0,177917	$MNG^_t$	0,41696	0,259044	1,60961	0,109382
AUD_Q_t	-0,51651	0,326457	-1,58217	0,115525	AUD_Q_t	-0,60429	0,329555	-1,83365	0,068497
Recurrence									logU^Et
$IMP\ (Y,N)_{t-1}$	0,14380	0,302567	0,47525	0,635235	$IMP\ (Y,N)_{t-1}$	0,09020	0,305954	0,29483	0,768493
$logEXP\_IMP_{t-1}/A_{t-1}$	2,42898	7,378331	0,32920	0,742419	$logEXP\_IMP_{t-1}/A_{t-1}$	4,96334	7,497916	0,66196	0,508913
Adjusted R^2	MS Model	SS E	F	p	Adjusted R^2		SS E	F	p
0,243376	14,67972	448,1933	5,404263	0,000000	0,219813		464,9518	5,179199	0,000000

Table 10

Regression model. Dependent variable: logEXP_IMP/At

	I. Model				II. Sensitivity analysis				
	Param.	St. error	t	p					
Intercept	**0,121386**	**0,048538**	**2,50082**	**0,013366**	***Intercept***	**0,213929**	**0,049136**	**4,35380**	**0,000023**
Performance Factors:									
log^REV_t	**-0,055916**	**0,020317**	**-2,75220**	**0,006582**	log^REV_t	**-0,066933**	**0,021645**	**-3,09227**	**0,002331**
$log^CF\_OP_t$	-0,010111	0,039217	-0,25781	0,796875	$log^CF\_OP_t$	0,017800	0,041752	0,42633	0,670420
Other Economic Factors & Capacity to Absorb the Write-Offs									
$LogA_{t-1}$	-0,001917	0,003147	-0,60922	0,543217	$LogA_{t-1}$	**-0,005647**	**0,003272**	**-1,72573**	**0,086257**
$logCURR_t$	**-0,022873**	**0,012232**	**-1,86987**	**0,063273**	$logCURR_t$	**-0,036449**	**0,012876**	**-2,83075**	**0,005218**
$logCASH/A_{t-1}$	-0,005223	0,062201	-0,08397	0,933182	$logCASH/A_{t-1}$	-0,017017	0,066153	-0,25723	0,797317
$logPPE_{t-1}/A_{t-1}$	0,013296	0,008948	1,48583	0,139233	$logPPE_{t-1}/A_{t-1}$	0,014165	0,009421	1,50359	0,134586
Reporting & Managerial Incentives									
$logDA_t$	**0,077348**	**0,031400**	**2,46333**	**0,014792**	$logDA_t$	0,019059	0,025316	0,75286	0,452603
log^E+Me_t	**0,306305**	**0,081855**	**3,74206**	**0,000252**	$logU^E-_t$	**-0,567709**	**0,325415**	**-1,74457**	**0,082911**
log^E-Me_t	**0,270173**	**0,068279**	**3,95691**	**0,000113**					
$MNG^_t$	0,002773	0,008125	0,34126	0,733344	$MNG^_t$	0,007341	0,008636	0,85006	0,396517
AUD_Q_t	-0,003993	0,010329	-0,38655	0,699584	AUD_Q_t	-0,008709	0,010987	-0,79270	0,429084
Recurrence								LogAt-1	
$IMP\ (Y,N)_{t-1}$	-0,012075	0,009573	-1,26135	0,208964	$IMP\ (Y,N)_{t-1}$	-0,015600	0,010200	-1,52946	0,128055
$logEXP\_IMP_{t-1}/A_{t-1}$	-0,312047	0,233440	-1,33674	0,183149	$logEXP\_IMP_{t-1}/A_{t-1}$	-0,258162	0,249966	-1,03279	0,303205
Adjusted R^2	MS Model	SS E	F	p	Adjusted R^2	MS Model	SS E	F	p
0,232769	0,014014	0,448641	5,154091	0,000000	0,121603	0,009506		3,053485	0,000655

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