Contributions to Game Theory and Management, XII, 8–36

Detecting Earnings Management: a Study of German Public Companies During the Global Financial Crisis 2008

Tatiana Alexandrova[1] **and Olga Udovichenko**[2]

[1] *Head of Risk Management School, Autonomous Non-commercial Organization of Post-Graduate Professional Education "Sberbank Corporate University"*
117997 Russian Federation, Moscow, Vavilova str., 19
tatiana.a.alexandrova@gmail.com

[2] *Vice Dean, Graduate School of Public Management, Russian Academy of National Economy and Public Administration (GSPM RANEPA)*
119606, Russian Federation, Moscow, Vernadsky Prospekt, 84
ouolgaud@gmail.com

Abstract This study investigates the accounting decisions made by managers of German public companies during the financial crisis of 2008. The overall goal was to detect the usage of earnings management strategies. The list of incentives for earnings management during the financial crisis was elaborated, among which were income-increasing as well as income-decreasing and smoothing strategies.
The earnings management was detected in the event year (2008 or 2009 depending on the industry) and the year preceding the crisis. Big-bath accounting was the most preferable earnings management strategy in a year -1. For the year 0 mixed evidence was gathered. Discretional accruals turned out to be different within the same industry (except Automobile). Asset quality index, gross margin index and industry belonging was proved to have a positive correlation with the probability of earnings manipulation.

Keywords: Earnings management, discretional accruals, financial crisis 2008, German economy, income-decreasing strategies.

1. Introduction

After global financial crisis 2007-2008, economists had started to ask the same question, as after Enron fraudulent scandal followed by company's bankruptcy in 2001: can users of financial information actually rely on numbers that they observe in quarterly and annual reports of publicly traded companies; can they make well-grounding investment decisions on the base of those?

The informational role of accounting and financial statements predetermines extensive usage of accounting data. Accounting is perceived as an instrument to convey information about the financial and economic situation of a company to capital market participants. At the same time, managers are subject to numerous incentives for performing earnings management: not only pursuing an income-increasing strategy, but in some cases – also income-decreasing and smoothing ones. The fourth motivation not mentioned above is meeting analysts forecast, to which nowadays experts refer as sort of exquisite game between company representatives and analytical agencies that set forecasted numbers. If earnings manipulation does actually exist, managers behave not in favor of the company's shareholders and other interested parties.

When it comes to earnings management, we do not actually mean that companies mislead the information presented in the financial statements or use fraudulent

schemes. Just the opposite – companies can manipulate earnings because of the certain flexibility of accounting standards.

The object of the following research – publicly traded German companies from different industries that were operating on the market during global financial crisis 2007-2008. Financial crisis serves as a unique economic event that might be a motivation for the companies to perform earnings management in order to avoid reputation loss or market capitalization decrease. Industries in the German economy are different in respect of their sensitivity to financial crisis consequences (e.g., whether companies exported-oriented or depended on internal demand). It is interesting to consider Germany market as a target for two reasons: it is the largest single economy in the European Union; it has recovered after the financial crisis incredibly fast.

The empirical part of the work is opted to detect earnings management with an attempt to differentiate among industries. After conducting industry analysis of Germany, four hypotheses were formulated:

1. Managers of German public companies perform earnings management during the crisis period in order to look more appealing on the market during the investigation period;
2. Companies pursue income-decreasing earnings management strategy in year -1 (a year before event period);
3. Export-oriented German companies pursue income-decreasing earnings management strategy in year 0 (event period);
4. Internal-market oriented German companies pursue income-increasing earnings management strategy in year 0 (event period).

Modified Jones model is used as a base for the study, as it is the one that exhibits the most power in detecting earnings management according to (Dechow et al., 1995). The interest underlying the study was to track the reverse motion of earnings management that supposed to appear in preceding years.

For Automobiles and Parts industry, the hypothesis about income-decreasing earnings management strategy in year 0 was supported. The Model was able to detect earnings management during year 2007 to 2009. However, we did not witness the proposed reverse action that was suggested. We cannot accept to the full extent hypothesis that export-oriented companies pursue income-decreasing strategy in year -1 and that internal internal-market oriented German companies pursue income-increasing earnings management strategy in year 0. Although model was able to detect earnings management in denoted prediction period, the sign of earnings management strategy differs from company to company.

After receiving the results of testing hypotheses concerning earnings management probit model is used to diagnose what financial ratios could signal the existence of manipulation of earnings ex-post, aside from discretional accruals.

2. Literature review on Earnings Management

2.1. Definition and motivation for earnings management

The popularity of earning management topic is growing during recent years. Resonance about this subject increases in turbulent financial times. Even during rough periods in the economy, public companies around the world have to issue quarterly

and annual financial reports. Earnings numbers presented in the financial statements immediately mirrored in a share price of a traded company. Share price in return affects a whole range of financial analysis ratios as well as managerial decisions.

The scale of interdependency between market reaction on company behavior and managerial decision indicates the existence of motivation for directors to smooth or otherwise manage earnings of the company. It is worth mentioning however, that there is a clear boundary between misleading of financial information, fraud and earnings management. The latter involves some manipulations with accounting numbers; it is never the violation of law or accounting principles (whether it is GAAP, IFRS or RAS[1] Still, the fact that earnings management empowers companies to alter contractual agreement between interested parties (debtors, suppliers, etc.) does not say much about the motivation behind earning management concept.

First, (Healy, 1985) assumes the opportunistic behavior of managers and states that the choice of accounting policy of the company is correlated with income incentives of their bonus contracts. The logic is following: managers will choose among accounting procedures those that will maximize the amount of their annual-base bonus compensation. There are several instruments of how accounting policy choices can trigger earnings management[2]:

1. Temporal instruments:
   (a) Choice of balance sheet date.
2. Formal instruments:
   (a) Structuring the balance sheet and the profit and loss statement;
   (b) Shifting information in time;
   (c) Design of the footnotes and the management report;
   (d) Voluntary disclosure of additional information (it is so called deceptive accounting (gray area); it should be noted that if company has changed accounting method without disclosing it is still not a fraud).
3. Material instruments before earnings are realized (real transactions):
   (a) Reducing R&D expenses, other expense (e.g. SG&A)[3] in unfavorable year;
   (b) Boosting sales managerial decision (implementing a discount model to increase sales near the end of the reporting period).
4. Material instruments after earnings are realized:
   (a) A decision on whether to capitalize expenses or not;
   (b) Valuations of assets (e.g., bad debt allowances and provisions);
   (c) Estimation uncertainty (any entity must disclose information about key assumptions concerning future prospects of the company. Such information presented in the notes and may contain a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities)
   (d) "Aggressive accounting": accelerating the recognition of revenue and differing the recognition of expenses[4].

[1] RAS – Russian accounting standards

[2] Some examples are supported by according accounting principles standards (IAS – International Accounting Standards, the original name of IFRS)

[3] R&D – research and development, SG&A – selling, general and administrative expenses

[4] e.g. U.S. accounting principles (GAAP) allow some flexibility in recognizing revenue and expenses. However, company doesn't commit fraud in this case. Fraud implies improperly recognized sales revenue from invalid or non-existence transactions, creation of fake shipment documentation and other schemes, which is left here out of scope.

(Healy, 1985) study results presented that managers have an incentive not only to maximize earnings but in some cases also minimize them. The Healy theory and the relationship between CEO bonuses and earnings of the company were studied further in more recent papers (Gaver, 1995; Matsunaga, 2001). It became clear that the management bonus plan is not the only incentive for managers to perform earnings management. They are also interested in the behavior of market participants, whether their company is looking attractive and reliable in the eyes of investors, debtholders and other stakeholders. In Table 1 five motives for earnings management are listed.

In the empirical studies and research papers authors try to understand how and why managers exercise earnings management, what are the economic consequences of it. At the head of earnings management literature – is how to detect it.

Table 1. Incentives for earnings management

Incentive	Methods of achievement
Maximizing reported earnings	• Increasing corporate sales (to provide a signal of growing sales as a factor of company growth in general); • Raising/decreasing of equity or debt value (to affect leverage ratios. Debtholders are cautions about restrictive covenants plugged into borrower's contract. It was suggested that the company wants to meet all restrictive covenants: whether it is cash balance, EBITDA, etc.) (DeFond, 1994); • Enhancing career perspectives (from product line officer or regional officer of the multi-divisional company, there are some KPIs, on the base of which his performance is evaluated; such KPIs are the subject for earnings management with the high level of certainty) (Holthausen, 1995); • Increasing market capitalization and other measures of company performance (cash flows) (P. Dechow, 1994)
Minimizing reported earnings	• Reducing a company's tax burden (tax shield effect); • Avoiding dividend distribution (saving money for next-year investment plan); • Influencing share price before share repurchases (in favor of the company); • Influencing share price to reduce the exercise price of management option (it could happen when previously share options were widely distributed among employees of a company as a motivation for higher productivity); • Big bath accounting (happens when sales of the company went down due to external factors. Having in mind that the company would suffer losses in any case, managers will lower net income this year so that next year report shows growing and promising earnings) (DeAngelo, 1994).

Income-smoothing	• Reducing volatility (to provide evidence that cash flow is stable) (Hayn, 1995); • Improving creditworthiness of the company (if the company chooses in favor of debt sources of financing, it could reduce bankruptcy risk (hence interest rate) by smoothing earnings to demonstrate stable performance of the company in the preceding years); • Signaling future earnings to shareholders (DeFond, 1997); • Ensuring sustainable dividend distributions (to support declared dividend policy, it is always preferable when dividend are stable or steadily growing); • Taking preventive actions against short-term projects via temporal smoothing of incomes (in order to encourage managers to be more long-term oriented).
Meeting earnings targets made by financial analysts and rating agencies	• Avoiding loss reports (reporting losses is never considered as a positive signal from market and shareholders perspective) (Bartov, 2002), (Matsumoto, 2002) • Avoiding ratchet effect (In circumstances of long stable growth period it is extremely unfavorable when a company does not beat or meet earnings estimates even if there is just a slight difference in numbers) (Barth, 1999).
Satisfy restrictions of regulatory bodies	• For banking industry: the sequential transition from Basel I to Basel II and Basel III. The necessity to meet new loan loss reserve and capital adequacy requirements (in a similar manner – in insurance sector) (Beatty, 2002); • Antitrust legislation, cases of large M&A deals; • Response to an introduction of the new law: e.g. Sarbanes-Oxley Act of 2002.

2.2. Detecting earnings management using aggregate discretional accruals models

There are several methods of detecting earnings management that is known to so far: aggregate discretional accruals; specific discretional accruals; GAAP violations detected by reinforcement agencies; the distribution of reported earnings around benchmarks; textual and verbal analysis.

Aggregate discretional accruals were under particular consideration in this study. The idea behind the method is that earnings management is primarily based on the manipulation with accruals. Accruals represent the difference between cash flow from operations and earnings, they result from the application of the recognition and matching principles of accounting[5]. Accruals method is beneficial comparing to other techniques in the sense that it can reveal the particular income-reducing or

[5] Matching principle (part of revenue recognition principle) – expenses are (1) recognized when obligations are incurred (usually when goods are transferred or services provided),

income-increasing mechanisms that managers are motivated to employ. Moreover, accruals are more difficult to detect by outside users because they are not presented as a separate line in the financial statement.

Firstly, the idea of separating discretional and non-discretional accruals appears in the Healy Model (Healy, 1985), which was mentioned previously. The author assumes that the amount of earnings management adjustments is a function of the company's earnings and managers' bonus plan parameters. Reported earnings could be decomposed into (1) cash flow from operations, (2) non-discretionary accruals (*NDA*) and (3) discretionary accruals (*DA*). Non-discretionary accruals are accounting adjustments to the firm's cash flows that are obligatory by accounting standard-setting bodies (e.g. treatment of inventories, depreciation charges). Discretional accruals, on the other hand, are conducting basing on judgment and upon the will of managers. They choose among available and generally accepted procedures defined by accounting standard-setting bodies. Discretional accruals (in Healey model the proxy is Total Accruals) enable accountants to shift, transfer earnings between reporting period, depending on what manager's intentions are (see Table 1). Specifically, in the Healy model choice of discretional accruals affects bonus plan of top-management.

It becomes clear that having a proxy of discretional accrual total accruals is a limitation of the model. R. Kaplan noticed it in his article "Comments on the Paul Healy" (Kaplan, 1985). The author emphasized depreciation charges that appear in the model. He stated that the great bulk of those arises from fixed assets acquired by the company in prior years. The amount of charges is predictable and unaffected by managerial decisions unless managers opt to dispose of an asset. The fact that non-discretional accruals and discretional accruals are not separated led to a logical conclusion that if managers did not pursue an income-maximizing strategy in the event period than expected total accruals in this year would be equal to zero, which is obviously cannot be true. This challenge was left unsolved until the 90s, but in the 80s there was one more model, which is treated as special case of the Healy model.

The study of DeAngelo (DeAngelo, 1986) is devoted to MBOs[6] of public companies during the period of MBO-boom in the U.S. history: 1973-1982. Unlike Healy model, there is a different motivation besides MBO that engage managers to perform earnings management. Despite the fact that independent investment banker is involved in the process of negotiation about the fair value of the company, public shareholders usually claim that their compensation is inadequate. This situation is caused by asymmetry of information that outsiders (shareholders) and insiders (managers) can obtain. The incentives of managers are straightforward: with a reasonable amount of earnings management employed, it could have a substantial impact on the buyout compensation amount because of the P/E multipliers effect on capitalization models.

DeAngelo approach is roughly analogous to that is used in event studies that take a comparison period return as a benchmark for the normal return. The difference between them represents so-called "abnormal" accruals. Abnormal accruals are

and (2) offset against recognized revenues, which were generated from those expenses (on the cause-and-effect basis), no matter when cash is paid out.

[6] MBO (management buyout) – a type of an acquisition, when existing managers of a company make a decision to buy a huge part or all of a corporation.

observed accruals (calculated according to the balance sheet or cash flow statement approach) minus expected accruals, derived from the model:

$$ACC_1 - ACC_0 = (DA_1 - DA_0) + (NDA_1 - NDA_0)\,,\ at\ that$$

$(NDA_1 - NDA_0)$ - the difference between the non-discretional part of accrual is supposed to be equal to zero, as it is more or less constant over time. Thus:

$$ACC_1 - ACC_0 = (NI_1 - NI_0) + (CFO_1 - CFO_0)\,,\ where$$

ACC = total accruals;
NI = net income of the company;
CFO = cash flow from operations, which is the same as in *1.2.1.a The Healy Model* that was described previously.

Ms. DeAngelo does not support Healy's hypothesis that managers systematically understated reported earnings. On the contrary, the company employs earnings management only when some event is going to happen. Such conclusion became the base for the future researched in this sphere.

There are however, several limitations in this model as well. One belongs to the model construction. It was stated that we compare total accruals in the event year with the year preceding to the event, but we cannot be sure, how far in advance managers decided to take preventive earnings management action. In addition, it became clear that without separating non-discretional and discretional accruals, the progress in the research area could not be done.

Jones Model is the most cited model on aggregate discretional accrual that exists by now. Ms. Jones, similarly to the DeAngelo study, observed a particular event that could trigger earnings manipulation. It was proposed that firms would benefit from specific regulatory actions: more exactly form import relief during an investigation by the United Stated International Trade Commission (ITC) (Jones 1991). Domestic companies would get such relief if they could prove to ITC that they have suffered from foreign competitors. EBT (earnings before taxes) was the main decision criteria for ITC, which includes the effects of all accruals accounts. As such, in order to increase the likelihood of obtaining import relief, managers have all incentives to manage earnings downwards. **S**tudy suggest that incentive to get import relief will be greater than an incentive to increase reported earnings in order to be more appealing on the market.

The first challenge that was overcome by this model is the control for the effect of current economic condition. ITC had announced import relief opportunity 5 years before the year of investigation. Companies could employ earnings management during this period. Jones Model considered this relation when measuring non-discretional accruals. The following expectation regression model was derived for accruals:

$$\frac{ACC_{it}}{TA_{it-1}} = \alpha_i \left[\frac{1}{TA_{it-1}}\right] + \beta_{1i} \left[\frac{\Delta REV_{it}}{TA_{it-1}}\right] + \beta_{2i} \left[\frac{PPE_{it}}{TA_{it-1}}\right] + \varepsilon_{it},\ where$$

ACC_{it} = total accruals in year t for firm i;
ΔREV_{it} = revenues in year t *less* revenue in year $t-1$ for firm i;
PPE_{it} = gross property, plant and equipment in year t for firm i;
TA_{it-1} = total assets in year $t-1$ for firm i;
ε_{it} = error term in year t for firm i;
i = 1,..., N firm index
t = 1,2,..., T, year index for years included in the estimation period for firm i.

Property, Plant and Equipment (PPE) measure controls for the portion of total accruals related to the non-discretional accruals (non-discretional depreciation expense), which were predicted by (Kaplan, 1985). Model controls for heteroscedasticity by scaling with total assets. Lagged assets (TA_{it-1}) are assumed to be positively associated with the variance of the disturbance term or error variable. The regression equation was used to estimate the "normal" level of total accruals. "Abnormal" discretional accruals estimate (proxy of earnings management in this situation) is an error term in this equation - ε_{it}. Total accruals were calculated similarly to the method that been used in Healy and DeAngelo models.

In the Jones study it was pointed out for the first time that managers must in some moment of time reverse any excessive earnings-decreasing (increasing) accruals that were made in the past.

After publication many revised versions of Jones Model appeared, e.g. the Cross-sectional Jones Model (DeFond, 1991; Dechow, 1991), Modified Jones Model (Dechow, 1995). Jones model was applied for the sample of the companies within the same industry as well. Industry Model (Dechow, 1991) relaxes some strict assumption of Healy and DeAngelo models, for example, that non-discretionary accruals are constant over time. It assumes that variation of determinants for non-discretional accruals is common for a particular industry.

$$NDA_t = \gamma_1 + \gamma_2 median\left(\frac{ACC_t}{TA_{t-1}}\right),\ where$$

$median\left(\frac{ACC_t}{TA_{t-1}}\right)$ = the median value of total accruals scaled by lagged assets for all non-sample firm in the same 2-digit SIC[7] code

The model has two limitations though. Firstly, we put under consideration that non-discretionary accruals largely reflect changes in firm-specific circumstances. Then it seems that the proxy of the Industry Model could not identify all non-discretional accrual, some of them most likely will be omitted. Secondly, the model is based on the assumption that earnings management of firms in the same industry is independent. It could happen however that in really they are interdependent and correlated.

There is also Current Accruals Version of the Jones Model. It uses only current accruals instead of total discretional accruals. Motivation for this is that managers easily can manipulate and control for short-term accruals than long-term ones. The authors supposed that it would be a better proxy for earnings management. It is important to note here, that such studies analyze US GAAP account, not IFRS.

Among different models, researches specify five prime models that were developed throughout the time: the Healy model, the DeAngelo model, the Jones model, Modified Jones model and Industry model. Some of them are straightforward and

measure total accruals as a proxy to discretional accruals, the others are more sophisticated and provide a solution to the question of how to separate discretional and non-discretional accruals. The way of calculating accruals themselves also differs from model to model.

In some studies, the relative comparison of the specification and power of listed models was attempted. The specification of test statistics is evaluated by examining the frequency of type I errors. At the same time, examining the frequency of type II errors can assess the power of test statistics (the idea for this analysis is based on related analysis that was used in (McNichols, 1988)). According to the study (Dechow, 1995) Modified Jones Model exhibits the most power in detecting earnings management.

2.3. Detecting earnings management using other models

It was mentioned before that there are several methods of detecting earnings. Apart from aggregate discretional accruals, there are specific discretional accruals; GAAP; the distribution of reported earnings around benchmarks; Textual/verbal analysis from computation linguistic. It is worth to describe them in more details.

Specific discretional accruals models are an alternative proposed to aggregate discretional accruals models. For each particularly industry researchers have identified red flags or the flash point where earnings management is more likely to appear. In the Table 2 several industries and relative signals are presented, which were summarized in the (Penman, 2010).

Table 2. Industries and relative flash points

Industry	Flash Points
Computer hardware	Technological change: Quality of receivables and inventory
Retail	Credit losses: Quality of net accounts receivableInventory obsolescence: Quality of carrying values of inventoryRebate programs: Quantity of supplier rebates recognized
Manufacturing	Warranties: Quality of warranty liabilitiesProduct liability: Quality of estimated liabilities
Automobiles	Overcapacity: Quality of depreciation allowances
Pharmaceuticals	R&D: Quality of R&D expendituresProduct liability: Quality of estimated liabilities

Theoretically, the use of specific accruals better explains the behavior of non-discretional component of accruals due to industry specifics. However, most of the mentioned flash points imply detailed financial data, which is not presented in annual reports and in footnotes. It automatically reduces the power of earnings management tests and ability to generalize their results.

GAAP violations studies refer to ex-post analysis of the companies that were subject to SEC or FFRP (Financial Reporting Review Panel) investigation and were proved to have violated accounting principles. Different studies try to find the relation between those violations and financial statement information of the company (Beneish, The Detection of Earnings Manipulation 1999), or corporate governance indicators: Board of Directors composition (Beasley, 1996) or Board monitoring factors, such as independent directors (Peasnell, 2000). Ex post analysis implies that tests for earnings management are highly powerful in detecting it,

which is not surprising. The findings of these researches also provides evidence on how exactly earnings could be manipulated (using SEC filings, financial statement analysis and probit regression models), which gives a basis for further studies. At the same time, we could not generalize finding of the studies to all cases of earnings management.

Among motivation for performing earnings management is that firms attempt to avoid reporting losses or earnings decline. Instead, companies have an expected amount of their future earnings they consider as a benchmark (analysts forecast that companies always try to meet or beat). Sustainable part of researches devoted to the detecting earnings management problem examining the statistical properties of (scaled) reported earnings. They perform test for evidence of discontinuities in the distribution of reported earnings. They assume a greater-than-expected number of observations at the certain reference point (a little bit higher than zero) and fewer-than-expected number of observations at other points (lower than zero).

The theory was initially based on the anecdotal evidence suggesting that managers try to maintain consistent increasing earnings (ratchet effect). The behavioral explanation for such hypothesis comes from prospect theory (Kahneman, 1797). It suggests that the human brain automatically associate non-positive numbers with negative future scenario. The economic explanation suggests that market participants compare firms' published results against all these reference points. Not meeting them can cause reputation loss for the company. The findings of (DeAngelo, 1986) proved that: it was documented that firms that have the pattern of consistently growing earnings would face on average 14% negative abnormal share return in the year when negative changes in earnings appear. There is cross-country academic evidence on reference point of reported earnings (Burgstahler, 1997; Degeorge, 1999).

Distribution of reported earnings method has several advantages over an accrual-based model: it avoids measurement error problems with discretional accruals calculation, it captures all forms of earnings management: accruals, real operating decisions, formal instruments as structuring balance sheet information. There are recent researches that follow the distribution of reported assumption model (Daske, 2006; Jacob, 2007; Chen, 2010). However, other studies have revealed doubt about the distribution of reported earnings as a proper method to detect earnings management. (Durtschi, 2005) had outlined that difference in distribution around zero can be caused by the number of different factors, including scaling, sample selection criteria, differences between the characteristics of observations to the left of zero and observations to the right of zero.

Previously only accounting-based models attempted to uncover earnings manipulation. Recent studies are targeting to employ a different approach. They analyze linguistic features of corporate reports and especially CEO/CFO statements, phone and conference calls. Textual analysis deals with the "tone" and nuances of explanatory text and footnotes in the annual report or in press releases. It was proposed that tracking specific words that top-managers are saying (optimistic, pessimistic, neutral) and level of transparency in annual reports (level of "vagueness") could serve as a signal for earnings management.

For instance, in the study (Li, 2008), the author attempts to determine the relation between annual report transparency/readability and company's performance. Length of the document and specially computed Fog index serves as the indicator of

annual report readability. Fog index combines a number of words per sentence and number of syllabuses per word. The findings of the study support the hypothesis that annual reports of companies with lower reported earnings are harder to read, i.e. calculated Fog index is relatively higher. On the other hand, the firms with a long history of positive earnings have more transparent, short and readable reports.

Other studies are analyzing verbal information on the example of conference calls, that according to psychology researches represent natural flow of speech, especially in non-rehearsed Q&A section of the call, where real emotions of CEO/CFO could be revealed (Larcker, 2012). The study shows that deceptive company representatives use fewer positive emotion words and shareholder values/value creation references. Such companies are more likely to perform earnings management according to the study. Nevertheless, both researchers (Larcker, 2012) and other academics have concerns that linguistic-based models are statistically dominated by financial-variables-based models (mixed evidence provided).

3. Empirical study on detecting earnings management of German public companies

3.1. Germany economy overview and hypothesis development

According to GDP Germany economy wasn't touched that severely by the the global crisis 2008. However, GDP diminished by 5.1% in 2009 and then grew by 4.2% and 3.0% in 2010 and 2011 correspondingly, before dipping to 0.7% in 2012 (CIA 2013). The fact that the economy recovers so fast induces to study the peculiarities of Germany economy in more details. In order to form the hypotheses it is necessary to understand the domestic environment in which the companies perform:

- Export-orientation. Export can be characterized by constantly growing positive foreign trade balance (net export). In 2002 it was equal to 1,22 trillion EUR. GDP of the country is highly correlated with the export volume. This helped to bring modest growth period (around 1,5% a year – which is a good number for a developed country). Around 24,5% of labor force is employed in export-driven industries. Commodities occupied 2/3 of export volume of Germany (which is similar to the export structure of China). The most common export commodities are: motor vehicles, machinery, electronic products, electrical equipment, chemicals and pharmaceuticals, metals, transport equipment, and plastic products.
- Membership in European Union. Germany has entered EU in 2004. That opened its huge market for exporting products. 28% of German GDP comes from the export to EU countries and Switzerland.
- Fair trade, Low unemployment rates. German business focuses on long-term strategies, pursuing stability, count on qualified labor and implement preventive action against the unemployment. Years before crisis - 2006 and 2007 were symbolized by strong economic growth and falling unemployment. But, as a matter of fact, internal demand of German economy was stagnating and 1,5% growth was fully provided by growing export profits. Without them, the government of Germany could not hold unemployment at low levels.
- Non-price competition. Germany competes mainly in the high quality segment. Advanced technologies, reliability, strict following of all delivery and agreement details, after-sale support and service – all these factors countervail the high price on products.

The global financial crisis of 2007-2008 quickly has shifted from financial to the real sector of the economy. The industries that were jeopardized firstly and have been affected the most – are exported-oriented industries. ***Mechanical engineering, automotive industries*** export around 70% of their output volume. In 2008, the quantity of orders had decreased by 50%. Nevertheless, in the face of world economic crisis German automobile industry has proven to be robust in comparison with other European Union countries: in 2008 the overall car production in Europe fell by 18%, however PKW (Personenkraftwagen (de) – passenger vehicle) production has declined by more moderate 10% (G. T. GTAI, Autovotive Industry Overview in Germany 2010). In January 2009, still facing decreasing demand in the automobile industry the government had subsidized around 5 billion EUR to promote the internal demand for new vehicles. This action plan had a side effect in the next year – everyone willing to exchange the car did that in 2009 (sales growth – 25%), so the demand in 2010 had decreased again. The Germany economy overview stressed that such quick recovery became possible thanks to the innovative orientation of German's automobile industry and the retention of a highly qualified workforce.

Electronic equipment, basic materials (chemicals) industries are also export-oriented and at the same time serve as suppliers for mechanical engineering and automobile industries, this connected industries indirectly provide working places for each seventh German in the country. Companies in this sector were under pressure too and had suffered from losses. The fact that these industries are suppliers, and automobiles and machinery production reduction picked in late 2008, that decrease in sales for electronic and chemicals happened a year after – in 2009.

As for the consumer market, Germany is home to a population of 82 million, and it is the largest consumer goods market in Europe (equivalent to around 14% of the overall European market). Retail trade is the third largest generator of revenue in Germany (G. T. GTAI, The Consumer Goods Market Overview in Germany 2011). Stable and robust purchasing power is basing on several pillars: moderate living cost, low inflation rate, large number of on small- and middle-size enterprises and dynamic market conditions. During crisis, these industries were the most stable: ***consumer goods (food producers, food chemical producers, breweries), consumer services (retail)***. They supported national economy when amount of export profits had decreased after year 2008. The consumer expenditures on food and non-alcoholic beverages have decreased from 1815 EUR per Capita in 2008 to 1788 EUR per capita in 2009 – but it was only a slight decrease of 1,5% (GAIN 2012). In 2010 the expenditures level has recovered to an initial level of 2008 – 1817 EUR per capita.

The interesting situation could be observed in ***pharmaceutical, health care industries*** – the total demand for the products in these industries only has decreased for a couple of percents. Of course, from one point of view – hospital stop buying advanced medical equipment so intensively. However, the volume for orders for medicaments and medical supplies has left the same, because individuals, as well as hospitals, would not stop buying them.

Medical technology industry in Germany is also export-oriented. About 2/3 of total turnover belongs to foreign trade. In 2009 there was a decrease in the turnover of such companies earnings. Foreign turnover had decreased from 12.56 in 2008 to 11.43 billion EUR in 2009. The increase in domestic turnover offset by a

small amount in this situation: 6.57 and 6.86 billion EUR in years 2008 and 2009 correspondingly. It has been noted that medium-sized enterprises that dominated this sector had maintained results – despite the international recession – revenue went down just by 4,3% compared with 2008 figures (G. T. GTAI, The Medical Technology Industry Overview in Germany 2011). Before 2008, the industry was continuously growing. The medical technology industry had repeated the history of automotive industry recovery – but a year later: following the fall in exports experienced in 2009, the medical technology sector began recording strong levels of export growth in the third quarter of 2010. The most important target export regions were European Union countries - accounting for approximately 40% of all sales. German company had strengthened their presence in Asia as well. Exports went up by more than 26%, which means that the share of exports going to Asia increased to more than 17%.

Even better was the situation in ***biotechnological industry*** (regenerative medicine approaches, molecular diagnostic products and biopharmaceuticals). It was expected that by 2015 the percentage of "65+ of age" citizen become 15%. For Germany, the aging population became a driver for the industry development. The second driver was increasing life expectancy that had automatically resulted in the rise of chronic and age-related illnesses. Usually, in the biotechnological industry, the majority of companies are quite small (around 50 employees), only 1,5% of all of them are medium-sized enterprises that have more than 250 people employed. According to the revenue numbers the industry has been growing since 2007 without any sign of global financial crisis influence: 4,98 billion EUR in 2007, 5,31 billion EUR in 2008, 5,66 billion EUR in 2009 and finally 6,17 billion EUR in 2010 (G. T. GTAI, The Medical Biotechnology Industry Overview in Germany 2011). Overall, revenue has grown by 20% since 2007.

For hypothesis stating it was important, that global financial and economic crisis hit Germany in 2008, a year after its official beginning (for the Automobile industry that was affected the first). In respect to earnings management (whether company is pursuing maximizing, minimizing or smoothing strategy), it should be noted that such strategies should be reversed at some point in the future – maximum in a year or two. Four following hypothesizes were formulated:

H_1: Managers of German public companies perform earnings management during crisis period in order to look more appealing to the market during the investigation period[8]

H_2: Companies pursue income-decreasing earnings management strategy in year -1

This hypothesis is based on the fact that the global financial crisis has deferred effect on the European economy. Observing world trends and difficulty that had faced U.S. firms German companies can pursue income-decreasing earnings management strategy to avoid ratchet effect and decrease expectations of the market participants for the next year. Then in the event period (year 0), when companies had indeed suffered from revenue and income decrease, the drop in accounting numbers would not be so significant, market reaction will be lower. Company can avoid market capitalization losses.

[8] Investigation period: years -1, 0, +1. year 0 is 2008 for automobile industry, 2009 – for others.

H_3: Export-oriented German companies pursue income-decreasing earnings management strategy in year 0

Having affected the most during the financial crisis, 2008 export-oriented companies have no incentives for income-increasing strategy, as the results will still be negative. Such motivation for minimizing reported earnings called big bath accounting. The key assumption underlying these incentives suggests that companies prefer to postpone recognition of part of their revenues in order to look more appealing to the market in the next period (year +1) as it is not possible during current year anyway. After reverse action in year +1, the company will display confident recovery.

H_4: Internal-market oriented German companies pursue income-increasing earnings management strategy in year 0

The opposite motivation is lying underneath the fourth hypothesis. According to the industry analysis, consumer goods industry and other inter-market oriented companies were not hit by the crisis, supported by strong consumer demand. Expenditures for consumer goods per capita indicate that companies have faced only slight demand reduction. In this respect, in order to look more appealing to the market and display confidence about internal demand of German economy, companies have the motivation to increase earning that could be interpreted by the market as a sign of stability.

3.2. Descriptive analysis

The sample of German companies was gathered from DATASTREAM database. The selection criterion was that companies should be traded in 2007 on one of the four German stock exchanges, which are located in Berlin, Frankfurt-am-Main, Stuttgart and Munich. As for industries, in the sample presented industries that initially behave differently during crisis period in Germany. The company-industry choice was based on ICB (Industry Classification Benchmark), an industry classification taxonomy that is launched by Dow Jones and FTSE, and is used worldwide. ICB segregate market within the economy on industries, supsectors, sectors, and subsectors. In Table 3 below, there is a list of possible industries-supsectors-sectors-subsectors variations that were identified.

The initial sampled consisted of 169 companies from sectors, considered below. However, it was decreased down to 118 from the same range of sectors. Table 4 summarizes further decision criteria. Hereafter we would refer to the companies on the base of subsector, with the exception of "Health care" sector: here "Health Care Equipment" was separated out from the sector, as it is more exported-oriented and behaved differently during crisis period.

Different industries behaved differently during the crisis. The sample was divided into three parts: (1) automobile industry; (2) chemical, industry products and health care equipment; (3) food and beverages, retail and health care. It is assumed that these industries will behave similarly and have the same incentives to perform earnings management. The descriptive statistic presented here is based on the expectations model used by DeAngelo (DeAngelo, 1986).

Table 3. List of industries according to the ICB

Industry	Supsector	Sector	Subsector
Consumer Goods	Automobiles & Parts	Automobiles & Parts	Automobiles
Consumer Goods	Automobiles & Parts	Automobiles & Parts	Auto Parts
Consumer Goods	Automobiles & Parts	Automobiles & Parts	Tires
Basic Materials	Chemicals	Chemicals	Commodity Chemicals
Basic Materials	Chemicals	Chemicals	Specialty Chemicals
Industrials	Industrial Goods	Electronic & Electrical Equipment	Electronic Equipment
Industrials	Industrial Goods	Electronic & Electrical Equipment	Electrical Components
Health Care	Health Care	Health Care Equipment	Medical Equipment
Health Care	Health Care	Health Care Equipment	Medical Supplies
Health Care	Health Care	Health Care Services	Health Care Providers
Health Care	Health Care	Pharmaceuticals & Biotechnology	Pharmaceuticals
Health Care	Health Care	Pharmaceuticals & Biotechnology	Biotechnology
Consumer Goods	Food & Beverage	Beverages	Distillers & Vintners
Consumer Goods	Food & Beverage	Beverages	Brewers
Consumer Goods	Food & Beverage	Beverages	Soft Drinks
Consumer Goods	Food & Beverage	Food Producers	Food Products
Consumer Goods	Food & Beverage	Food Producers	Farming & Fishing
Consumer Services	Retail	General Retailers	Apparel Retailers
Consumer Services	Retail	General Retailers	Broadline Retailers
Consumer Services	Retail	General Retailers	Home Improvement Retailers
Consumer Services	Retail	General Retailers	Specialized Consumer Services
Consumer Services	Retail	General Retailers	Specialty Retailers
Consumer Services	Retail	Food & Drug Retailers	Food Retailers & Wholesalers
Consumer Services	Retail	Food & Drug Retailers	Drug Retailers

Table 4. Summary of the sample selection criteria

Description	Automobiles & Parts	Chemicals	Industrial Goods	Health Care Equipment	Health care	Food and Beverages	Retail	Total
Total number of domestic companies	17	14	32	17	32	29	28	169
Firms omitted from the sample:								
Delisted from the stock exchange after 2007	0	(1)	(1)	0	(2)	0	(2)	(6)
Too few time-series observation	(2)	(2)	(5)	(4)	(7)	(5)	(2)	(27)
No enough accounting data available	(4)	(3)	(1)	(1)	(1)	(5)	(3)	(18)
Total number of the firm omitted from the sample	(6)	(6)	(7)	(5)	(10)	(10)	(7)	(51)
Total included in the sample	11	8	25	12	22	19	21	118

$$ACC_1 - ACC_0 = (DA_1 - DA_0) + (NDA_1 - NDA_0)\,^{9}.$$

Table 5 summarizes scaled changes in accruals and revenues for years -4 through +1. It represents mean, median change for each of the variables, as well as number of negative positive change, t-statistic (null hypothesis that average change is zero). Prior to year 0, all of the accrual changes are relatively small. The change in accruals in years -1, 0, +1 however are negative and positive. If the changes in accruals we view in isolation, t-statistic results suggest that companies are making income-decreasing (big bath accounting) and then increase reported earnings when the situation is more preferable.

However, such conclusions should be made carefully as DeAngelo model does not control for economic condition of the company. In case of financial crisis exactly this situation is observed. For automobile industry, we can observe that in the event period, 10 companies out of 11 reported decreased revenues comparing to the previous period. The same situation appeared in Chemicals, Industrial Goods, Health Care Equipment industry (34 companies has negative revenues changes, 11 positive). Also in year +1 there are more positive accruals changes than negative. That could serve as a signal to reverse action of earnings management. More favorable situation in Health Care, Food and Beverages, Retail industries (36 against 26), which supports the assumption that internal-market oriented companies suffered the least during the financial crisis.

DeAngelo model serves more as descriptive statistic for our study. It provides preliminary evidence that stated hypothesizes about earnings management could be significant. In order to determine that for sure, regression model estimation was conducted on the base of the Modified Jones Model.

3.3. Tests of hypotheses

Test of hypotheses is based on Modified Jones Model that was proved to exhibit the most power in detecting earnings management. The data, necessary for conducting the test (Changes in Revenues, changes in Net Accounts Receivables, Property Plant and Equipment, Total Assets and Total Accruals) was gathered from DATASTREAM, Orbis, Bloomberg data basis and also was searched directly in annual reports of the companies (de. der Geschäftsbericht), especially for the years 1998-2003. It should be noted that most of the companies were eliminated from the initial sample of 118 companies, because in order to get significant results of model testing company should have at least 14 years of publicly available financial information (annual reports and financial statement). In the final sample, 48 German public traded companies were presented that have financial information available since 1990 (17 years of observation prior to the financial crisis). Out of

[9] Accruals were calculated using formula: $ACC_t = [\Delta Current\ Assets - \Delta Cash] - [\Delta Current\ Liabilities - \Delta Current\ maturities\ of\ LT\ debt - \Delta Income\ tax\ payable] - Depreciation\&Amortization\ Expense$.

[10] Year 0 is considered to be 2009.

[11] The t-statistic computed cross-sectionally: $mean/[standard\ deviation * (sample\ size) \wedge -0.5]$. The significance test are one-tailed for accrual changes in years -1,0,+1 and two-tailed for changes in accruals in year -4 through -2 and for all changes in revenues. Test relies on the assumption that average change in nondiscretionary accruals is zero. * - significant on 5% level, ** - significant on 1% level

Table 5. Accrual Changes, Revenue Changes

	Year -4	**Year -3**	**Year -2**	**Year -1**	**Year 0**[10]	**Year +1**
Automobiles and Parts						
Panel A: Accrual Changes						
Mean	0,0012	0,0034	0,0631	-0,0388	-0,0441	0,0989
t-statistic[11]	0,0233	0,0744	1,4696	-1,8288*	-1,7082*	1,9624*
Median	-0,0458	0,0182	0,0313	-0,0833	0,0032	0,0250
#negative:#positive	8:3	4:7	5:6	8:3	5:6	7:4
Panel B: Revenue Changes						
Mean	0,0745	0,1119	0,1053	0,1310	0,0047	0,1165
t-statistic	2,8338	4,6286	1,6588	1,9851	0,0234	1,4010
Median	0,0483	0,1135	0,1530	0,0904	-0,1288	0,1506
#negative:#positive	1:10	0:11	2:9	3:8	10:1	2:9
Chemicals, Industrial Goods, Health Care Equipment						
Panel A: Accrual Changes						
Mean	0,0139	0,0422	-0,0517	-0,0120	-0,0139	0,1219
t-statistic	0,4670	1,0913	-0,8004	-1,1643*	-1,6866*	1,8887*
Median	0,0423	0,0272	0,0030	-0,0782	0,0136	0,0433
#negative:#positive	17:28	19:26	22:23	33:12	22:23	13:32
Panel B: Revenue Changes						
Mean	0,0860	0,1196	0,1513	0,0921	-0,1698	0,1467
t-statistic	2,1798	3,4702	3,0137	2,2572	-4,4011	3,5935
Median	0,0929	0,1513	0,1020	0,0452	-0,1293	0,1302
#negative:#positive	9:36	11:34	12:33	13:32	34:11	8:37
Health Care, Food and Beverages, Retail						
Panel A: Accrual Changes						
Mean	0,0452	-0,0335	0,0268	-0,0255	0,0139	-0,0245
t-statistic	1,3330	-1,5063	0,5832	-1,2486	1,9386*	-2,4751**
Median	0,0255	-0,0003	0,0299	-0,0340	0,0077	-0,0220
#negative:#positive	23:29	31:31	25:37	38:24	26:36	38:24
Panel B: Revenue Changes						
Mean	0,0507	0,1053	-0,1268	0,0271	-0,0406	0,0201
t-statistic	1,5990	4,6302	-0,7904	0,7217	-1,5311	0,6160
Median	0,0605	0,0686	0,0438	0,0296	-0,0075	0,0311
#negative:#positive	9:36	15:47	18:44	21:41	36:26	24:38

these 48 companies: 10 companies belong to the Automobiles and Parts sector of economy, 16 companies – to Chemicals, Industrial Goods, Health Care Equipment and remaining 22 companies – to Health Care, Food and Beverages, Retail.

Ordinary least squares approach is used to obtain estimates a_i, b_{1i} *and* b_{2i} of α_i, β_{1i} *and* β_{2i} respectively from the Modified Jones Model that assumes the relation between total accruals and the set of exogenous variables. Estimation of regression equation average with a heteroscedastic disturbance term was obtained by dividing both sides of the equation by an estimate of the variance of the disturbance term (Kmenta 1986). As lagged total assets are assumed to be positively associated with the variance of the disturbance term, dividing both sides of equation by them will result in a scaled regression equation. The prediction error hereafter will represent the level of discretionary accruals in a given period.

$$u_{ip} = \frac{ACC_{ip}}{TA_{ip-1}} - (a_i \left[\frac{1}{TA_{ip-1}}\right] + b_{1i} \left[\frac{\Delta REV_{ip} - \Delta REC_{ip}}{TA_{ip-1}}\right] + b_{2i} \left[\frac{PPE_{ip}}{TA_{ip-1}}\right] + \varepsilon_{it} \ ,$$

where

ACC_{ip} = total accruals in year p for firm i;
ΔREV_{ip} = revenues in year p *less* revenue in year $p-1$ for firm i;
ΔREC_{ip} = net receivable in year p *less* net receivable in year $p-1$ for firm i;
PPE_{ip} = gross property, plant and equipment in year p for firm i;
TA_{ip-1} = total assets in year $p-1$ for firm i;
ε_{it} = error term in year t for firm i;
i = 1,..., N firm index
p = 1,2,..., P, year index for years included in the estimation (prediction) period for firm i.

The model is estimated during the longest time series of observation available prior to year -1 for each firm. Based on industry analysis and descriptive statistic the event period for Automobiles and Parts companies is 2008 (year -1 is 2007), for other companies it is 2009 (year -1 is 2008). Table 6 provides descriptive statistics for the multiple regressions estimated for all available observations through year -2. From Table 6 it could be observed that only 19 regression models out of 48 were significant on a 10% significance level (and all variables of the model are significant as well). From these 19 companies – 4 belong to the Automobiles and Parts sector of economy, 8 companies – to Chemicals, Industrial Goods, Health Care Equipment and remaining 7 – to Health Care, Food and Beverages, Retail.

The result of multiple regressions were obtained using STATA statistical software package. Negative estimated coefficients for Property, Plant and Equipment are related to income-decreasing earnings management strategy (special treatment of depreciation expenses); the opposite is proposed for positive coefficient. A sign for the change in revenues and receivables cannot be interpreted exactly: in general it was proposed that income-decreasing strategy results in increases of accounts payable. Modified Jones Model is controled for the change in accounts receivables. Otherwise, some portion of earnings management could be omitted (due to change in working capital, channel stuffing and bad debt allowances). The average R^2 for the regressions is 55,78%.

Table 6. Descriptive statistics for the Modified Jones Model regression equation

##	a_i	b_{1i}	b_{2i}	R^2 (%)	Durbin-Watson
1	-446230 (0.002)***	-0,24548 (0.059)*	0,70559 (0.077)*	25,28	2,5913
2	4543,516 (0.013)**	0,11462 (0.091)*	1,12916 (0.062)*	40,57	1,8798
3	18316,89 (0.000)***	0,34178 (0.073)*	-0,08584 (0.050)**	46,98	2,5691
4	80980,55 (0.001)***	0,23730 (0.048)**	0,35856 (0.005)***	70,75	2,5382
5	172785,5 (0.050)**	0,16644 (0.000)***	-0,66107 (0.018)**	45,00	2,6358
6	-11930,69 (0.058)*	0,13702 (0.021)**	-0,13213 (0.079)*	51,72	2.6552
7	-1228,925 (0.019)**	0,17383 (0.005)***	-0,22467 (0.011)**	48,32	1,4573
8	2134,382 (0.093)*	0,17098 (0.000)***	0,46163 (0.018)**	47,24	1,9435
9	18070,83 (0.004)***	-0,06892 (0.003)***	0,43299 (0.015)**	52,40	2,3558
10	-34876,44 (0.061)*	0,38794 (0.014)**	-0,32674 (0.000)***	40,16	2,8949
11	-18445,97 (0.065)*	0,78726 (0.019)**	0,49989 (0.000)***	74,49	2,6710
12	-33110,8 (0.073)*	0,06967 (0.064)*	-1,05839 (0.001)***	46,48	2,8071
13	139475,4 (0.066)*	0,01053 (0.050)**	-0,43334 (0.004)***	37,34	1,9168
14	4120,394 (0.018)**	-0,00688 (0.009)***	-0,69114 (0.001)***	67,05	1,6210
15	1616,931 (0.019)**	-0,54466 (0.001)***	-1,45948 (0.003)***	62,75	2,9982
16	-20817,45 (0.001)***	-0,15798 (0.071)*	-0,02447 (0.032)**	87,21	2,5199
17	2373,265 (0.003)***	0,169839 (0.070)*	1,06111 (0.013)**	78,7	2,7569
18	-114945,9 (0.004)***	0,43493 (0.045)**	1,06743 (0.001)***	61,09	1,5629
19	97467,84 (0.010)**	-0,02279 (0.001)***	0,48436 (0.028)**	76,32	1,8708
* - significant on 10% level; ** - significant on 5% level; *** - significant on 1% level.					

The issue of autocorrelation[12] was considered using Durbin-Watson[13] test[14] (Dougherty 1992). Null hypothesis that suggests there is zero autocorrelation in the residuals against the alternative of positive first-order autocorrelation. In the significance tables, lower and upper bounds for critical values are established[15]. For 17 observations and 3 regressors the significant interval is [0.897; 1.710]. Hence, first-order autocorrelation is not significant at the 5% level for 16 firms (for the rest 3 firms first-order autocorrelation is not significant at the 10% level).

Test for earnings management is based on the computation of discretional accruals, which in our case depicted as u_{ip}, they were calculated for year (-1; +2) prediction period for each of the 19 companies. According to (Theil, 1971) prediction errors should be normally distributed. If it is so, standardized prediction errors have a t-distribution with $T_i - 3$ degrees of freedom. Following (Patell, 1976) test statistic could be computed for discretional accruals:

$Z_{V_p} = \sum_{i=1}^{N} V_{ip} / \left[\sum_{i=1}^{N} (T_i - 3)/(T_i - 5)\right]^{.5}$, where T_i is the number of years in the estimation periods. Table 7 summarizes standardized prediction errors[16] and related Z_{V_p}statistics from Modified Jones Model over historical period to Year -1.

It is observed from the Z_{V_p} statistics computation that with help of Modified Jones Model it became possible to detect earnings management on the sample German public companies during global financial crisis 2008 and after.

For Automobiles and Parts the hypothesis about income-decreasing earnings management strategy in year 0 was supported. In general, the Model was able to detect earnings management during the year 2007 to 2009. However, we cannot witness the proposed reverse action that was suggested. During all three periods all companies belong to this sector pursue income-decreasing strategies. It contradicts earnings management theory in a way that if companies manipulate their earnings

---

[12] Positive autocorrelation have more possibility in appearance when we use long-time series. Occurred likelihood of structural change can lead to autocorrelation. Negative correlation means that positive observation in one period of time will lead to non-positive observation in the next one. Clearly, having such pattern of discretional accruals throughout the time can bring any value in detecting earnings manipulation.

[13] Assume residual first order autocorrelation: $u_t = \rho u_{t-1} + \varepsilon_t$. The only way to estimating ρ is by using OLS method, assessing interdependence of e_t and e_{t-1}. In this case the estimator for $= \frac{Cov\ (e_{t-1},\ e_t)}{Var(e_{t-1})}$. If there is an assumption that $\overline{e_{t-1}}$ (mean) is equal to zero and $\overline{e_t}$ are close to zero, then we got the approximation for this equation. Hence, $\rho = \frac{\sum e_{t-1} e_t}{\sum e_t^2}$. Durbin-Watson statistic is equal to: $d = \frac{\sum_{t=2}^{T} (e_t - e_{t-1})^2}{\sum_{t=1}^{T} {e_t}^2}$. When number of observations is huge enough then: $d \to (2 - 2\rho)$. In STATA we using function .dwstat to compute Durbin-Watson critical value.

[14] Durbin-Watson test can be performed if the model does not use as an independent variable a lagged version of dependent variable.

[15] If the test statistics value is greater than upper bound (dU) the null hypothesis will be accepted.

[16] Standardized prediction errors (V_{ip}) were computed as $u_{ip}/(s_i \left(1 + C_{ip}^{-1}\right))$, where $C_{ip} = [X_p (X^{'} X)^{-1} X_p^t]$ where X – is the matrix of exogenous variables for the estimation period (through year -2), X_p - is the matrix of exogenous variables for the event period (years -1 to +2), u_{ip} – calculated discretional accruals, s_i – standard error from regression model estimation (computed as $\sqrt{\frac{SSR}{n-2}}$). $X^{'}$ is the transpose of the matrix and $(X^{'} X)^{-1}$ – invertible matrix (see Appendix G).

Table 7. Firm individual standardized prediction errors and test statistics

##	V_{ip}			
	Year -1	Year 0	Year +1	Year +2
Automobiles and Parts				
1	-3,017	-1,175	-2,517	-0,729
2	-0,657	-0,705	-1,536	-0,913
3	-0,215	-0,945	-0,219	-0,859
4	-0,216	-0,329	-0,388	-0,161
Z_{V_p} Statistics	-1,887**	-1,450*	-2,143**	-1,224
Chemicals, Industrial Goods, Health Care Equipment				
5	0,253	2,657	0,991	0,530
6	-0,169	1,318	0,638	0,298
7	-0,005	0,083	0,005	-0,002
8	-1,509	-1,674	-1,818	-1,914
9	-3,802	-0,140	-0,066	-0,072
10	0,229	0,210	0,333	0,098
11	-0,167	-0,084	-0,113	-0,088
12	0,591	0,428	2,858	0,000
Z_{V_p} Statistics	-1,499*	0,916	0,926	-0,377
Health Care, Food and Beverages, Retail				
13	-0,055	0,025	-0,008	-0,095
14	-2,251	-2,793	-1,468	-0,366
15	-0,277	0,087	-0,109	-0,092
16	0,149	0,048	0,073	0,065
17	-0,108	-0,062	0,017	-0,196
18	0,526	1,813	0,236	0,171
19	-0,179	-1,360	-0,157	-0,461
Z_{V_p} Statistics	-0,768	-1,298*	-0,496	-0,341
* - significant on 10% level; ** - significant on 5% level				

using accruals, it should recognize revenues at some point in the future. In studies, it is suggested that it could happen most, possibly in year +1 or +2 after earnings management was detected. The reasonable explanation for that could be narrow sample of the companies and the general situation in the industry. The Model as it became clear from its description, takes into account only firm-individual behavior, ignoring structural crisis effects and behavior of industry in general. It could happen that the firm, in reality, performs income-increasing strategy, but as the industry is in recession, it seems like it manages its earnings down comparing to everyone else in the industry.

We cannot accept to the full extent neither second hypothesis that export-oriented companies pursue income-decreasing strategy in a year -1 nor that internal internal-market oriented German companies pursue income-increasing earnings management strategy in year 0. Although model was able earnings management in denoted prediction period the sign of to detect earnings management strategy differs from company to company. For chemicals, industrial goods and health care equipment 5 companies out of 8 applied income-decreasing strategy in year -1, which support big-bath motivation for earnings management. For health care, food and beverages, retail sector half of the firms have applied income-increasing strategy (as it was proposed in order to look more appealing on the market and reassure stable internal demand for products of daily use), half of the firms pursued income-decreasing strategy. The results that were gathered suggest that crisis is not the only motivation for companies' behavior concerning earnings management. We have face the situation of conflicting incentives and it seems that economic condition of each individual firm, debt covenants constraints, management compensation plan and other incentives can outplay the ones that were proposed for the crisis period.

The Model was not able to detect earnings management for year +2, which could mean that model is not powerful enough to forecast total accrual in +4 prediction period, which is reasonable.

4. Discussion of Results and Implications

The results gathered after Modified Jones Model estimation supports the applicability of the model under different set of circumstances. Difference between change in revenues and change in receivables as a variable that controls for the financial situation of the firm in general makes it possible to test hypothesis of existence of earnings management during financial crisis. However some concerns have appeared.

Income-decreasing earnings management strategy that was proved for automobile sector during 3 years in a row could imply that some external factor variable that control for overall situation in the industry omitted from the model. Industry growth rate, analogue of ISM Manufacturing Index and Consumer Confidence Index – CCI (U.S. practice) could serve as possible indicators. If we introduce industry-controlling variable to the accrual model it should be noted that it will lead to the reduction of degrees of freedom in the regression analysis. This will require more years of observation for estimation period in order model to be significant.

The results that we got for export-oriented and internal-market-oriented companies contradict some basics of Industry Model of estimating Total Accruals. Discretional accruals in this research turned out to be individual for each firm. Companies within the same sector that are suffering from the same external factors will choose different earnings management strategies. Non-discretional accruals in the Industry

model are positively correlated with the median value of total accruals among firm sample. It could be proposed that Industry model could be partially rejected due to results of this paper.

The necessity of a long history of financial statement information to perform regression model analysis – is the most important limitation of this model. There is a limited number of companies on every market that operates on the market for more than 25 years. Moreover, according to IFRS companies are obliged to report consolidated financial statement, whereas RAS has implemented such norms only recently. These two factors make it challenging to provide evidence of earnings management on the sample of Russian companies, using aggregate accruals techniques.

Even if the researcher had obtained financial statements of the company for more than 25 years the consistency of such estimates will also be a matter of concern. Throughout 30 years the period economy in general and each firm had gone through several structural changes, was in growing, stagnating and recession part of its life cycle. As regression is averaging process after all, there can be doubts that total accrual that will be forecasted after model estimation will truly reflect the modern situation in a company or in the economy.

On the other hand, several regressions have shown substantial R^2, which indicates that the major part of total accruals behavior is explained by the model (the highest results among 19 significant regressions are: 70,75%; 74,49%; 76,32%; 87,21%).

The results of the study provide evidence that this methodology of detecting earnings management could be performed on practice event during the period of extreme behavior of companies. With the importance of information role of accounting and growing concern of market participants whether financial statements are fairly stated, aggregated discretional accruals model could be useful tool for many professional, who act as stakeholders of the companies.

Moreover, this model could help to detect earnings management de-facto after the historical event has happened. After gathering historical information from financial statements of the companies, the predictions about earnings management on the future could be made. Familiar to the assumption that lie beyond Discounted Cash Flow Model financial analysts could predict firm revenues, accounts receivables, and property, plant and equipment (using future CAPEX and depreciation projections) for the next 2 or 3 years with a high level of certainty, taking in account overall market and industry trends. Conducting the same procedures as in this paper, users can form their expectation of company behavior in the nearest future – whether or not it has motivation for performing earnings management and alter financial reports.

Certain indicators can serve as a signal that companies do perform earnings management. Users of financial information can track such red flags and form their judgment about company managerial decisions concerning financial reporting without conducting a rather complex and complicated procedure described in the paper. The first indicator could be Total Accruals and their dynamics over historical horizon. As it was proved by DeAngelo theory testing sudden change of a sign of total accruals (from negative to positive or otherwise) could serve as a signal that company has changed its accounting policy dramatically or it has incentives for earnings management.

A couple of indicators could be determined by running Probit model using results that were gathered previously. We set our dependent variable as 1 – if earnings management was detected in this year and 0 – if it was not. The industry dummy variable is equal 1 – for Automobiles sector, as it had been under particular pressure during the financial crisis 2008, and 0 – for other sectors of the German economy. In Table 8 there is the full list of independent variable that was used in the study (Beneish, The Detection of Earnings Manipulation 1999):

Table 8. List of independent variable for probit model estimation

Index	Predicted sign	Formula
Day's Sales in Receivables	+	$DSales = \frac{Receivables_t/Sales_t}{Receivables_{t-1}/Sales_{t-1}}$
Gross Margin	+	$GM = \frac{(Sales_{t-1}-COGS_{t-1})/Sales_{t-1}}{(Sales_t-COGS_t)/Sales_t}$
Asset Quality	+	$AQ = \frac{(1-Current\ Assets_t-PPE_t)/TA_t}{(1-Current\ Assets_{t-1}-PPE_{t-1})/TA_{t-1}}$
Depreciation Index	+	$Depr = \frac{Depr_{t-1}/(Depr_{t-1}+PPE_{t-1})}{Depr_t/(Depr_t+PPE_t)}$
SG&A Expenses	+	$SGA = \frac{SG\&A_t/Sales_t}{SG\&A_{t-1}/Sales_{t-1}}$

Asset Quality, Gross Margin Indexes, and Industry variable proved to be significant at 5% level. Gross Margin Index was proposed by (Lev 1993). Having GM index higher than 1 suggest unfavorable expectation about companies prospects. Such companies are more likely to be a subject to earnings management, the positive sign of the coefficient proved a positive correlation between gross margin index and the probability of earnings management. At the same time, the impact of this signal is rather low: with the increase of the coefficient by one unit measure, the probability of earnings management increases only 1,67%.

Increase in Asset Quality Index is also proved to result in increasing expectation about earnings management. Opposite to Gross Margin Index, Asset Quality Index affected our expectations about earnings management considerably: with the increase of the coefficient by one unit measure, the probability of earnings management increases by 40,43%. Asset Quality Index takes into consideration non-current assets as a part of total assets for which future benefits towards the firm are more uncertain. The index represents so-called asset realization risk (Siegel, 1991), if it is higher than 1 it could lead to postponed costs (cost deferral). For our sample of companies operating in Automobile and Parts sector increases the probability of earnings manipulation.

5. Conclusion and Implications

The behavior of German public companies during the global financial crisis was under consideration in this study. Having in mind that financial statements play a crucial role in the decision-making process of the majority of the company's stakeholders, the concern about the fairness of reported earnings emphasizes the importance of research topic nowadays.

Companies may not only be interested in maximizing reported earnings and reporting an increase in sales to look more appealing to the market participants. During the turbulent and unstable period, there is number of factors were revealed that say in favor of income-decreasing and income-smoothing earnings management

strategies. Targeting at maintaining creditworthiness of the company, reducing share price volatility and avoiding ratchet effect managers of the company may have more incentive for pursuing income-smoothing strategy.

Combining with the results of Germany country and industry analysis, several hypothesis were formulated that were based on these assumptions:

1. Financial crisis hit Germany a year after its official beginning that could be dated from August 2007 – in 2008 (for Automotive industry that was affected the first).
2. The behavior of export-oriented companies and internal-market-oriented companies was different during the investigation period, which led to the different hypothesis for these two clusters of German companies.
3. From year to year the earnings-management strategy of the companies within the same cluster can change.

The sequence of tests was conducted in an attempt to detect earnings management in the years preceding and flowing the financial crisis. For Automobiles and Parts the hypothesis about income-decreasing earnings management strategy in year -1 was supported. Neither hypothesis that export-oriented companies pursue income-decreasing strategy in year 0 nor the one that internal market-oriented German companies pursue income-increasing earnings management strategy in year 0 could not be accepted to the full extent, basing on the result of standardized prediction error estimation.

Although the model was able to detect earnings management in denoted prediction years that sign of earnings management strategy differed from company to company and was not the same for all companies within one "cluster". Such findings support the theory of conflicting incentives. In some cases, economic condition of each individual firm, debt covenants constraints, management compensation plan and other incentives can outplay the ones that were proposed for the crisis period. Discretional accruals turned out not to follow one pattern if companies of the same industry were taken into consideration.

The fact that income-decreasing earnings management was detected for the Automobile industry for three years in the row led to the conclusion that perhaps a variable that would control for industry situation, in general, was omitted from the model (the model controls only for structural changes on the individual-firm level). It could happen that the firm, in reality, performs income-increasing strategy, but as the industry is in recession, it seems like it manages its earnings downward as everyone else in the industry. Industry growth rate, an analogue of ISM Manufacturing Index, and Consumer Confidence Index – CCI (U.S. practice) could serve as possible indicators. However, the introduction of the new variable to the model will lead to a number of unfavorable consequences. Decreased number of degrees of freedom will require even more years of observation for estimation period in order model to be significant.

Some indicators that serve as signals that companies do perform earnings management were identified after running the probit model. For instance, Gross margin index indicates that if it is higher than one company have unfavorable prospects, which increases the probability of earnings management. It was estimated that with the increase of the coefficient by one unit measure, the probability of earnings management increases by 1,67%. The similar but more valuable result was received for

Asset Quality Index, which takes into consideration non-current assets as a part of total assets for which future benefits towards the firm are more uncertain. With the increase of the coefficient by one unit measure, the probability of earnings management increases by a considerable amount of 40,43%.

Also, it was proved that belonging to the automotive industry in Germany increases the probability of such a company to perform earnings management. One reason for that can be the fact that the automobile industry suffered from the crisis the most and was under special pressure during the prediction period. Moreover, Germany is the most competitive car location in the world that intensifies competition even more.

The sequence of follow-up researches is supposed to be conducted. The similar hypotheses of how companies behave during a crisis could be tested on different markets: developed (U.S., U.K., France), emerging (BRICS) and those that were in the recession (Greece, Spain, Portugal, Ireland). The area of particular concern here: the existence of country-specific earnings management strategies that were performed during the crisis; do the managers of the companies behave and have the same rationally behind earnings management or they differ across countries; do the accounting standards and corporate governance model (institutional environment) of a particular country influence the choice of whether or not to perform earnings management and to which extent.

References

Barth, M. E., Elliott, J. A., and Finn, M. W. (1999). *Market Rewards Associated with Patterns of Increasing Earnings.* Journal of Accounting Research, **37**, 387–413.

Bartov, E., Givoly D., and Hayn, C. (2002). *The Reward to Meeting or Beating Earnings Expectations.* Journal of Accounting and Economics, **33**, 173–204.

Beasley, M.S. (1996). *An Empirical Analysis of the Relation between the Board of Director Composition and Financial Statement Fraud.* The Accounting Review, **71**, 443–465.

Beatty, A., Ke, A., and Petroni, K. (2002). *Differential Earnings Management to Avoid Earnings Declines and Losses Across Publicly and Privately Held Banks.* The Accounting Review, **77**, 547–570.

Beneish, M. D. (1997). *Detecting GAAP Violation: Implications for Assessing Earnings Management Among Firms with Extreme Financial Performance.* Journal of Accounting and Public Policy, **16(3)**, 271–309.

Beneish, M. D. (1999). *The Detection of Earnings Manipulation.* Financial Analysts Journal, **55(5)**, 24–36.

BMBF, Federal Ministry of Education and Research of Germany. "Strategic Planning and Management of Research and Innovation in Germany."

Burgstahler, D., Ditcev, I. (1997). *Earnings management to avoid earnings decreases and losses.* Journal of Accounting and Economics, **24**, 99–126.

Chen, S. K. Lin, B.-X. Wang, Y., Liansberg, W. (2010). *The frequency and magnitude of earnings management: time-series and multi-threshold comparison.* International Review of Economics and Finance, **19**, 671–685.

CIA, Central Intelligence Agency (2013). "World Factbook: Germany." CIA, Central Intelligence Agency. https://www.cia.gov/library/publications/the-world-factbook/geos/gm.html.

Daske, H., Gebhardt, G., McLeay, S. (2006). *The Distribution of Earnings Relative to Targets in the European Union.* Accounting and Business Research, **36**, 137–167.

DeAngelo, H., DeAngelo L., Skinner, D. J. (1994). *Accounting Choice in Troubled Companies.* Journal of Accounting and Economics, 17 113–144.

DeAngelo, L. (1986). *Accounting Numbers as Market Valuation Substitutes: A Study of Management Buyouts of Public Stockholders.* The Accounting Review, **61**, 400–420.

Dechow P. M., Sloan R. G. (1991). *Executive Incentives and Horizon Problem.* Journal of Accounting and Economics, 51–89.

Dechow, P. M. (1994). *Accounting Earnings and Cash Flows as Measures of Firm Performance: the Role of Accounting Accruals.* Journal of Accounting and Economics, **18**, 3–42.

Dechow, P. M., Sloan, R. G. and Sweeney, A. P. (1995). *Detecting Earnings Management.* The Accounting Review, 193–225.

DeFond, M., J. Jiambalvo (1991). *Incidence and Circumstances of Accounting Errors.* The Accounting Review, 643–655.

DeFond, M., J. Jiambalvo (1994). *Debt Covenants Violation and Manipulation of Accruals.* Journal of Accounting and Economics, 145–176.

DeFond, M. L., Park, C. W. (1997). *Smoothing Income in Anticipation of Future Earnings.* Journal of Accounting and Economics, **23**, 115–139.

Degeorge, F., Patel, J., and Zeckhauser, R. (1999). *Earnings Management to Exceed Thresholds.* Journal of Business, **72**, 1–33.

Dougherty, C. (1992). Introduction to Econometrics. Oxford: Oxford University Press.

Durtschi, C., Easton, P. (2005). *Earnings Management? The Shapes of the Frequency Distributions of Earnings Metrics Are Not Evidence Ipso Facto.* Journal of Accounting Research, **43**, 557–592.

European Commision, Enterprise and Industry (2008). *Small Business Administration: Fact Sheet Germany.* European Commistion Official Site.

Freeman, E. R. (1984). Strategic Management: A Stakeholder Approach. Cambridge: Cambridge University Press.

GAIN, Global Agricultural Information Network (2012). *German Food Retail Market Overview.* GAIN, Global Agricultural Information Network.

Gaver, J. J., Gaver, K. M., Austin, J. R. (1995). *Additional Evidence on Bonus Plans and Income Management.* Journal of Accounting and Economics, **19**, 3–28.

GTAI, German Trade and Invest. (2010). *Autovotive Industry Overview in Germany.* GTAI, German Trade and Invest.

— (2011). *The Consumer Goods Market Overview in Germany.* GTAI, German Trade and Invest.

GTAI, Germany Trade and Invest. (2011). *The Medical Biotechnology Industry Overview in Germany.* Germany Trade and Invest.

— (2011). *The Medical Technology Industry Overview in Germany.* GTAI, Germany Trade and Invest.

Gu, Z., & Wu, J. S. (2003). *Earnings skewness and analyst forecast bias.* Journal of Accounting and Economics, **35**, 5–29.

Hayn, C. (1995). *The Information Content of Losses.* Journal of Accounting and Econ, **20**, 125–153.

Healy, M. P. (1985). *The Effect of Bonus Schemes On Accounting Decisions.* Journal of Accounting and Economics, 85–107.

Holthausen, R., Larcker, D., Sloan, R. (1995). *Annual Bonus Schemes and The Manipulation of Earnings.* Journal of Accounting and Economics, **19**, 29–74.

Jacob, J., Bjorn, N. J. (2007). *Earnings Management and Accounting Income Aggregation.* Journal of Accounting and Economics, **47**, 369–390.

Jones, J. J. (1991). *Earnings Management During Import Relief InvestigationsAuthor.* Journal of Accounting Research, **29**, 193–228.

Kahneman, D., Tversky, A. (1979). *An Analysis of Decision under Risk.* Econometrica, **47**, 262–292.

Kaplan, R. S. (1985). *Comments on Paul Healy Evidence on the Effect of Bonus Schemes on Accounting Procedure and Accrual Decisions.* Journal of Accounting and Economics, **7**, 109–113.

Kmenta, J. (1986). Elements of Econometrics. New York: Macmillan.

Larcker, D., Zakolyukina, A. (2012). *Detecting Deceptive Discussions in Conference Calls.* Journal of Accounting Research, **50**, 495–540.

Lev, B., Thiagarajan, S. R. (1993). *Fundamental Information Analysis.* Journal of Accounting Research, **2**, 190–215.

Li, F. (2008). *Annual Report Readability, Current Rarnings and Rarnings Persistence.* Journal of Accounting and Economics, **45**, 221–247.

Matsumoto, D. (2002). *Management's Incentive to Avoid Negative Earnings Surprises.* The Accounting Review, **77**, 483–514.

Matsunaga, S. R., Park, C. W. (2001). em The Effect of Missing a Quarterly Earnings Benchmark on the CEO's Annual Bonus. The Accounting Review, **76**, 313–332.

McNichols, M., Wilsom, G. P. (1988). *Evidence of Earnings Management from the Provisions for Bad Debts.* Journal of Acoounting Research, **26**, 1–31.

Patell, J. M. (1976). *Corporate Forecasts of Earnings per Share and Stock Price Behavior: Empirical Tests.* Journal of Accouting, **14**, 246–276.

Peasnell, P., Pope, P., Young, S. (2000). *Board Monitoring and Earnings Management: Do Outside Directors Influence Abnormal Accruals?* Lancaster University, working paper.

Penman, S. (2010). Financial Statement Analysis and Security Valuation . New York: The McGraw-Hill Companies.

Siegel, J. G. (1991). How to Analyze Businesses, Financial Statements and the Quality of Earnings. Englewood Cliffs: Prentice-Hall.

Theil, H. (1971). Principles of Econometrics. Santa Barbara: Wiley.