- Master's Thesis -

Corporate Credit Ratings, Earnings Management and the passage of SOx and Dodd-Frank

ABSTRACT:

This thesis examines whether firms use less earnings management strategies to reach their expected credit rating after the passage of legislation aimed at increasing the quality of financial disclosure and the functioning of the Security and Exchange Commission (SEC), specifically the Sarbanes-Oxley Act (SOx) and the Dodd-Frank Wall Street Reform Consumer Protection Act (Dodd-Frank). As expected, results indicate that less accrual-based earnings management strategies have been applied after the passage of SOx and that there is an increase in real-activity based earnings management strategies compared to the period preceding in which large corporate scandals occurred. Not as expected results show that accrual-based earnings management strategies have increased and real-activity based earnings management strategies have decreased after the passage of Dodd-Frank.

Keywords: real earnings management, accrual-based earnings management, expected credit rating, SOx, Dodd-Frank, meeting and beating analyst forecasts.

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CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

This thesis examines whether firms use less earnings management strategies to reach an empirically modeled “expected” credit rating after the passage of legislation that is aimed at increasing the quality and transparency of financial markets of the United States, specifically the Sarbanes-Oxley Act of 2002 (referred to as SOx) and the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (referred to as Dodd-Frank). This follows research done by Alissa, Bonsall, Koharki and Penn (2013) that found evidence that firms below or above their expected credit ratings can move toward expected ratings through the use of directional earnings management. According to a survey done by Graham & Harvey (2001) credit ratings have become a vital part of a firm’s capital structure strategy. Firms looking for investors often turn to credit rating agencies to have the agencies rate their credit as a way to attract funds. Lenders and financial institutions will often also base their agreements and investment decisions on corporate credit ratings.

The Credit Rating Agency Reform Act of 2006 describes a credit rating as a statistical method to determine the likelihood that a firm will pay back its debt. Credit ratings are most often done by credit rating agencies. A credit rating agency is an independent agency that evaluates the creditworthiness of a firm, security, or obligation as of a specific date and assigns a rating that reflects its assessment of the issuer's ability to fulfill their financial obligations. Potential investors, customers, employees and business partners rely upon this data and objective analysis of credit rating agencies in determining the overall strength and stability of the issuer of debt. They facilitate this credit analysis and investment selection for investors by sorting the information that is available in the credit markets. They hardly produce any new information to aid access to capital. The largest and best-known rating agencies are Moody’s, S&P and Fitch (SEC 2003). Together they control about 95% of the worldwide credit rating industry (Alessi, 2012). These rating agencies have been providing opinions on the creditworthiness for the past century. Recently, especially during the most recent financial crisis (2008-2009) these rating agencies have come under intense scrutiny. They were accused of making critical errors like providing overly favorable ratings to insolvent institutions and approving extremely risky mortgage-related securities. Consequently, a large amount of

securities which were given the highest rating were downgraded to junk status[1]. New regulations, particularly the Sarbanes-Oxley Act of 2002 and the Credit Rating Agency Reform Act of 2006 and the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 have come in place to further regulate this industry (Rhee, 2015). The Credit Rating Agency Reform Act of 2006 will not be further discussed as this act was created to open the market for smaller credit rating agencies and proved mostly unsuccessful (Gordon, 2013). With these new regulations specifically aimed at credit ratings and credit rating agencies it makes one wonder if during the period in which these critical errors were made if manipulation of earnings could have played a role to obtain a certain rating, and what effect these major regulatory changes had on the ability for firms to use earnings management to meet or even beat an expected credit rating.

The analysis of the rating agencies mentioned above presents the issuer of debt's ability to pay back interest on a timely matter and the likelihood of default in the manner of a categorical scale which reflects this quality of debt. Each rating agency maintains an own scale based on their internal methodologies but this is usually reflected with a combination of letters, for example AAA being the highest rating and C the lowest in case of Standard and Poor's ratings.

Rating agencies can indirectly influence interest rates by adjusting (or assigning) a rating in a manner that can have a significant impact on a firm's access to capital. Obtaining a more favorable credit rating can lead to a significant increase in investment, for example due to barriers imposed by regulators or self-imposed barriers by investors not to invest in debt securities which are not in the highest categories. Conversely, a downgrade can lead to significant negative impact like the loss of investment due to investors having to liquidate their position or trigger new debt stipulations with their current debtors. Other significant impacts can be quality of relationship with third parties and gaining or losing an edge over competitors.

The U.S. Securities and Exchange Commission is charged with enforcing regulations regarding credit ratings and the workings of credit rating agencies, among other activities (SEC, 2015). After the collapse of Enron and during the U.S. subprime mortgage crisis of 2008 and 2009 the

[1] http://www.cfr.org/financial-crises/credit-rating-controversy/p22328

big three credit rating agencies, Moody's, S&P and Fitch, which are three out of ten nationally recognized statistical ratings organizations recognized by the SEC, were also alleged to have conducted illegal and anticompetitive practices like pressuring issuers with unsolicited ratings in order to expand their profits (Sinclair, 2005). An unsolicited rating is described by the Financial Times as an assessment of a borrower's creditworthiness by a rating agency without any involvement of the borrower itself. These ratings are usually based only on publicly available information on the quality of a borrower's credit. These types of practices could have in turn undermined the credit markets. However, my research will not go further into the detail of the practices of credit rating agencies but will in contrast focus on manipulation of earnings by firms to reach an expected credit rating.

Ali and Zhang (2008) demonstrate that firms that issue debt on capital markets tend to inflate their earnings more when they are near a broad credit rating change than firms that issue debt on capital markets that are not near a broad credit rating change. Broad credit rating change is defined as a change in rating level without a distinction of plus, middle or minus. So in essence, not a rating change of AAA+ to AAA or AAA-, but a rating change from AAA- to BBB+ or CCC+ to BBB-. Ali and Zhang (2008) suggest that for earnings management to take place management believes that the benefits from achieving a favorable broad credit rating through managing earnings is likely greater than the increased future agency costs when credit rating agencies and investors may detect these managed earnings. Jensen and Meckling (1976) describe agency costs as "a type of internal cost that arises from, or must be paid to, an agent acting on behalf of a principal". In this case management perceives the risk of being held responsible for manipulating earnings to reach a favorable credit rating less likely than the advantages of achieving this expected rating by engaging in earnings management activities. Kisgen (2006) finds that firms near a broad credit rating change avoid a downgrade by issuing less debt than firms that are not near a broad credit rating change. Alissa et al. (2013) demonstrated that firms which deviate from an empirically modeled "expected" credit rating may use directional earnings management to obtain a more favorable rating. These articles all highlight the importance of credit rating in management making decisions on their earnings.

As mentioned above the Sarbanes–Oxley Act was implemented to improve the quality of financial disclosures of public firms and prevent accounting fraud. This was in large part due to investors losing confidence in the ability of financial statements to give an accurate view of

a firm's current financial position. This confidence was lost after massive accounting scandals like Enron and WorldCom in the early 2000's led to a massive loss of capital for investors. The two most important provisions of SOx focus on strengthening corporate oversight and improving internal corporate control. Due to these provisions, it would make it more difficult for firms to take advantage of accounting flexibilities in order to obtain a more favorable rating. In contrast to SOx the Investor Protection and Securities Reform Act does not concentrate on financial reporting by firms but aims to restructure the Securities and Exchange Commission and increase the accountability and transparency of credit rating agencies apart from how investment advisors interact with customers. The act is part of a much larger act which is called the Dodd-Frank Wall Street Reform and Consumer Protection Act which was implemented in 2010. This was in response to the U.S. subprime mortgage crisis of 2007-2009. The Dodd-Frank Wall Street Reform and Consumer Protection Act influenced all federal financial regulatory agencies and almost all parts of the financial services industry in the United States. Under the Investor Protection and Securities Reform Act an Office of Credit Rating (OCR) was created by the SEC to provide oversight over the nationally recognized statistical rating organizations. It also introduces enhanced regulation of Credit Rating Agencies like for the rating agencies to maintain, enforce and document an effective internal control process and for them to submit an internal control report to the OCR. There were also provisions passed which put a stronger emphasis on the obtained credit rating of the issuer of debt, like credible information about an issuer which could impact the rating should be considered from sources other than the issuer or underwriter. A duty to report credible allegations of unlawful conduct was also implemented (United States Congress, 2009-2010). These provisions are meant to make it more difficult for firms to manage earnings to obtain a more favorable rating.

1.2 RESEARCH QUESTION

The above subsection leads to the research question for this thesis. Which is:

'Did the passage of the Sarbanes-Oxley Act (2002) and the Investor Protection and Securities Reform Act (2010) lead to firms managing their earnings less to obtain an expected credit rating?'

I answer this question by investigating whether firms deviate less from an empirically modeled "expected" credit rating after the passage of SOx and Investor Protection and Securities Reform Act. I follow Alissa et al. (2013) who employed a similar approach using an empirically modeled "expected" credit rating and found evidence that firms use real and accrual-based income-increasing and decreasing earnings management when they are below or above their expected rating. I also investigate if one of these regulations has a greater impact than the other. I perform a pooled analysis of corporate data between 1995 and 2015 to answer the main research question.

1.3 MOTIVATION

This study contributes to the literature on credit ratings by providing empirical evidence that managers employ less financial reporting strategies after the passage of SOx and Dodd-Frank to affect the perception of its firm's risk by credit rating agencies. My research contributes to the debate on the popularity and methods of earnings management prior and post to the passage SOx and Dodd-Frank and the impact of these regulations on such behavior.

1.4 STRUCTURE

The structure of this thesis is built by first explaining the main concepts and institutional setting of the subject matter. These are explained and discussed in chapter 2. This chapter elaborates on credit rating agencies, earnings management and the passage of the Sarbanes–Oxley Act in 2002 and the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010. Chapter 3 proceeds with a literature review of the most relevant subjects and discusses the results of the most important empirical studies. In chapter 4 I discuss how the main hypotheses are developed. In chapter 5, the research design is discussed, in chapter 6 the results of tests are presented, and analyzed in chapter 7. In chapter 8 I conclude by answering the main research question.

1.5 SUMMARY

This thesis examines whether firms that offer debt securities on capital markets in the United States manage earnings less after the passage of the Sarbanes–Oxley Act in 2002 and the passage of Dodd-Frank Wall Street Reform and Consumer Protection Act in 2010 in order to reach an expected credit rating. Furthermore, I investigate which regulation had more impact on the ability of firms to manage their earnings. This study contributes to the literature on

credit ratings by providing empirical evidence that managers employ less financial reporting strategies after the passage of SOx and Dodd-Frank to affect the perception of its firm's risk by credit rating agencies.

CHAPTER 2 CONCEPTS AND INSTITUTIONAL SETTING

2.1 INTRODUCTION

In this chapter I further elaborate on main concept and the institutional setting of this thesis. First by defining corporate bonds, credit ratings and credit rating agencies. Followed by defining what earnings management is and what role discretionary accruals plays in this activity. A background description is given of the Sarbanes-Oxley Act and the accounting scandals of early 2000's. The chapter ends with a discussion on the global financial crisis and the enactment of Dodd-Frank Wall Street Reform Act in 2010.

2.2 CORPORATE BONDS AND CREDIT RATINGS (AGENCIES)

When firms are looking to secure economic growth by raising money for working capital or capital expenditure they primarily have two options in the capital markets. They can issue new shares of stock to institutional investors or to individuals in a public offering, or it can use its securities on fixed-income to acquire more debt financing by selling bonds to institutional investors or individuals. A corporate bond can be described as a loan from one entity to another entity or person with a promise to repay the principal along with interest (coupons) on a specified date (maturity date) (Brown, 2006). The main motive for issuing bonds by firms is to secure economic growth or to raise capital expenditure, especially in the earlier stages of the firm (Sprengers, 2006). The capacity to absorb debt, which Sprengers (2006) quotes as the ability for the firm to repay the fixed, periodic and interest amount, is a main factor for the bond holder and for the issuing organization. This observed risk associated with the ability to absorb debt determines the amount of fixed interest the bond holder is willing to pay. Rating agencies will perform credit analyses to determine the issuer of debt's ability to pay back interest on a timely matter and to determine the likelihood of default. These agencies will then assign a rating based on their own scale representing exceptionally strong payment capacity till destressed or defaulted payment capacity. Due to a large part of the market being in the hands of such a small number of rating agencies the U.S. Securities and Exchange Commission is required by the Sarbanes-Oxley Act, section 702 to conduct a study of the role and function of credit rating agencies as a part of the United States senate's effort to restore confidence in the capital markets (SEC 2003). The basis for this thesis is that the measures of this section of the Sarbanes-Oxley Act and sections of the Dodd-Frank Wall Street Reform and Consumer Protection Act has had a large enough impact that levels of earnings management

are reduced compared to before the passage of these acts to obtain a certain credit rating. I primarily focus on ratings provided by Standard & Poor's as it is the largest of the three according to the 2015 Annual Report on Nationally Recognized Statistical Rating Organizations. According to the Standard & Poor's principles for credit ratings the agency applies an analytical framework in rating issuers of debt. This analytical framework focusses on the credit quality of the securitized assets legal and regulatory risks, payment structure and cash flow mechanics, operational and administrative risks and counterparty risk, creditworthiness before external support, external support and analysis of specific instruments. According to the S&P principles[2], credit quality is determined by the amount of credit support needed by the issuer. This is done by estimating the amount of losses that the assets would suffer under conditions of extreme stress. This is primarily done by referencing historical studies of the issuer's asset class or by comparing or benchmarking the asset classes to studies that do exist in case of no historical studies being available. Interpolation between the rating levels is also a method that is used to conclude on the credit quality of the issuer. Legal and regulatory risks primarily focus on the degree to which an issuer of debt isolates its assets from bankruptcy or insolvency. S&P will put its focus on the entity or entities that owned the assets before debt was issued. This is done to include the exposure of special purpose entities to the overall risk of the issuer to bankruptcy or insolvency risk.

Credit rating agencies will assess an issuer of debt's security on request of the issuer or it will rate the security without a request. An issuer will consider the costs, administrative burden and information required in evaluating the need for a credit rating (GFOA Best Practice, 2015). The objective of the analysis on the payment structure and cash flow mechanics is to assess whether the cash flow from the issuer is sufficient at the assigned rating to make timely payments of interest and the principal of the issued security. Distribution priorities of the payment structure is also assessed, namely the subordination hierarchy of tranches and the impact of performance covenants. The analysis of the operational and administrative risks considers the possibility that a servicer may become unable or unwilling to perform its duties during the life cycle of the transaction. The analysis of counterparty risk focusses on the issuer's obligation to third parties of debt to hold assets or make financial payments. Examples

[2]https://www.standardandpoors.com/es_LA/delegate/getPDF?articleId=1608103&type=COMMENTS&subType=REGULATORY

are institutions that have key accounts with the issuer or providers of derivatives contracts such as interest rate swaps and currency swaps. The analysis of creditworthiness before external support includes assessment of resources available to the issuer for the expected level of future income and cash flow and its potential inconsistency. This will include both quantitative and qualitative factors such as accounting principles and practices. Key financial indicators include levels of profitability, leverage, cash flow adequacy, liquidity and financial flexibility. Adjustments are made for off-balance sheet items leases, pension liabilities and derivative exposures. Qualitative factors mostly focus on country, industry and entity specific risks. An issuer can have external support in the form of a guarantor, support from affiliated business entities, governments or multilateral institutions.

Rhee (2015) elaborates on the question why credit rating agencies exist. The two standard theories for this questions are that rating agencies mitigate information asymmetries between the issuers of bonds and the investors (Boot et al, 2006), and these agencies reduce the cost of regulation. Rhee's (2015) alternative explanation is that rating agencies exist due to market rationale. In other words, that rating agencies promote a liquid credit market and a process for best investment. The theory that rating agencies reduce the cost of regulation is significant because regulators do not have to set up their own framework to provide transparency of the market. The above mention research highlight the importance of the accuracy and reliability of these ratings and the ability to influence them.

2.3 EARNINGS MANAGEMENT & DISCRETIANORY ACCRUALS

According to Ali and Zhang (2008) for earnings management to take place management believes that "the benefits from achieving a favorable broad credit rating through managing earnings is likely greater than the increased future agency costs when credit rating agencies and investors may detect these managed earnings". This fits into the costly-contracting approach described by Ronen and Yaari (2008) which implies that earnings management is "an opportunistic behavior when certain targets are set by its stakeholders which management is contractedly bound to reach". In these cases, earnings are more likely to be managed upwards. Next to the costly-contacting approach Ronen and Yaari (2008) mentions the decision-making approach and the legal-political approach.

The decision-making approach implies that the firm's social outcome is "dependent in part on the actions taken by other decision makers" (Ronen and Yaari, 2008). It views firm as a social organization whose output is made by the interaction of many decision makers. This social outcome is seen as a form of self-enforcing contracts. The expectations set by the regulators is meant to "maximize management's expected utility when there is the opportunity to manage earnings to select a more practical decision set which will result in a more favorable social outcome". In this case, earnings will only be managed when there is flexibility in accounting treatment to signal management's private information to future cash flows, also known as white earnings management which is the least harmful form of earnings management.

The legal-political approach suggests that the legal system needs to be changed in the presence of opportunistic earnings management. Opportunistic earnings management is an indication of poor information or poor governance and is mostly described as either gray or black earnings management. The most relevant to this research is the costly-contracting and legal-political approach. This as I research whether the targets set, expected credit ratings, leads to opportunistic behavior by management, and if changes made to the legal system have been effective. I further define earnings management and elaborate on the importance and different methods of earnings management.

2.3.1 Defining earnings management

Ronen and Yaari (2008) define earnings management in many different manners. It starts by defining earnings management loosely as a deliberate action to influence reported earnings and the interpretation of reported earnings, which is a darker form of earnings management. The authors continue by describing a form of earnings management that aims to enhance the transparency of financial statements which is a more beneficial form of earnings management that takes advantage of the flexibility in the choice of accounting treatment to signal the manager's private information on future cash flows, also known as white earnings management. Another form of earnings management involves misrepresentation and fraud. This is when tricks are used to misrepresent or reduce transparency of the financial reports. This is obviously a more harmful form of earnings management. Throughout earnings management research there have been many formal definitions of earnings management but for this thesis I use the formal definition provided by Healy and Wahlen (1999) which says:

"Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the firm or to influence contractual outcomes that depend on reported accounting numbers" (Healy and Wahlen, 1999, p. 368).

This definition does not fit all of forms of earnings management as not all earnings management is misleading as mentioned above but this definition is most relevant to my research.

2.3.2 The importance of accounting information and defining public companies

To fully understand why earnings management takes place we first need to know why accounting information, specifically earnings are important. Ronen and Yaari (2008) mention that previous research views the value of accounting information as having an informative role and a stewardship role. The informative role of accounting information results from investors having the need for information to predict future cash flows and assess their investment risk (Ronen and Yaari, 2008). The stewardship role results from managers acting as stewards to the shareholders as managers are typically not the owners of public firms and therefore have a self-interest. Accounting information is needed for shareholders to align this self-interest with their own interests. The difference between shareholders needing information and management providing this information creates an information asymmetry. This information asymmetry provides opportunity for incentives to manage earnings in order to fulfil a manager's own objective above the firm's objectives. Ronen and Yaari (2008) identify four objectives for these decision makers to manage earnings (1) to increase life-time compensation, (2) a departing CEO or CFO makes decisions that will increase his or her bonus in his or her last year of operation. An incoming CEO or CFO attempts to clean house as much as possible in order to have a reserve in upcoming years (3) management has insider information to make speculative gains (4) in case of a management buyout where management benefits from buying stocks of the firm at a low price in order to take the firm private. These reasons are all created out of self-interest a provide a clear motivation for managing earnings if the opportunity presents itself. The users of accounting information are primarily (1) retail investors which have little to no power over the firm, (2) Bondholders and other creditors, (3) regulators, (4) employees and (5) competitors. These users have a role in earning management because their demand for information creates a link between the

earnings figures provided by the decision makers and the stock price of the firm on the equity markets. Events mentioned in Ronen an Yaari (2008) in which decision makers have incentives to manage earnings in order to affect market price are (1) meeting and beating a benchmark like an analyst forecast or an expected credit rating, (2) issuance of shares like an initial public offering or a seasoned equity offering and (3) mergers and acquisitions. These incentives are enhanced by the fact that these are public firms which are obligated to provide information and are prized by an open market.

The advantages of a publicly traded firms are that it raises funds by offering either its debt or equity securities on the capital markets. Advantages for the users are that more information is available of public companies and analysts play a role in regulating the market. Disadvantages are that these firms are exposed to stringent regulatory scrutiny and the majority of the shareholders have less control of the firm. These circumstances form the opportunity to research of these regulations are effective.

2.3.3 The different methods of earnings management

There are many methods of earnings management. The most popular according to Ronen and Yaari (2008, para 2.2) are managing earnings through the choice of accounting treatments accepted under generally accepted accounting principles, such as LIFO or FIFO inventory valuation, depreciation and revenue recognition or a decision on the timing of the adoption of a new standard, judgment calls on when generally accepted accounting principles require estimates on deprecation, the valuation of bad debts or assets, the classification of items in persistent earnings versus transitory earnings, structure a transaction to attain a desired accounting outcome, timing the sales of assets, decisions to capitalize expenses, timing of a real production or investment decision to manipulate the transparency of the presentation, reporting pro-forma earnings as an addition to GAAP earnings. These are the most common forms of earnings management. More methods exist but will not be further discussed. Revenue recognition is the largest account that contains earnings management according to Ronen and Yaari (2008).

The proxies for earnings management that are used in this thesis incorporates both accrual and changes in real activities and captures aspects for these various methods of earnings management. I elaborate further on this in chapter 5.

2.3.4. Discretionary and non-discretionary accruals

An essential part for understanding earnings management is the accrual process. An accrual is an adjustment to revenue that has not yet been earned, or expenses that have occurred but still have to be recorded. By recording accruals, a firm can provide a more accurate view of its financial position by adjusting for transactions that is more relevant to the current period. Accruals can be divided into three different components, the discretionary accrual, the non-discretionary accrual and the reversal of the accrual. Ronen and Yaari (2008) describe non-discretionary accruals as “accruals that arise from transactions made in the current period that are normal for the firm given its performance level and business strategy, industry conventions, macro-economic events and other economic factors”. Discretionary accruals are described as “transactions that arise or accounting treatments chosen in order to manage earnings”. Reversing accruals are accruals originating from transactions made in the previous period.

2.4 THE SARBANES-OXLEY ACT OF 2002 AND ACCOUNTING SCANDALS OF EARLY 2000’S

2.4.1. Defining Sarbanes-Oxley and why it was created?

The end of the twentieth century the amount of accounting and corporate fraud cases had significantly risen. Companies headlined newspapers accused of questionable corporate governance practices, limited financial disclosure and inside trading. The most widely publicized example was the demise of Enron. The United States federal government’s response was to enact the Sarbanes-Oxley act in 2002 also known as the "Public Firm Accounting Reform and Investor Protection Act" in the United States Senate and "Corporate and Auditing Accountability and Responsibility Act" in the House. The purpose was stated as to “protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws, and for other purposes”. Various research has been done on the consequences of the passage of this law. Zhang (2007) finds that U.S. firms experienced a statistically significant negative cumulative abnormal return around key SOx events, Linsley & Linsley (2008) conclude that the effect on management behavior by SOx may be greater than the effects resulting from using more traditional approaches of law and economics. Bargeron, Lehn and Zutter (2010) find that several measures of risk-taking declined significantly for US versus non-US firms after the passage of SOx. Engel, Hayes and Wang (2007) conclude that SOx affected the going-private decisions of firms.

According to an interview with senator Sarbanes (Nanci, 2004) many different factors lead to the environment where large firms were able to perform corporate fraud. A few key problems were identified and addressed in the legislation, primarily auditor and securities analysts' conflicts of interest, executive compensation, banking failures, boardroom failures, inadequate funding of the SEC and the internet bubble in 2000.

Farrel (2005) elaborats on these factors. According to Farrel (2005) prior to the passage of SOx there were no regulations for audit firms performing non-audit services. It appeared that in many cases audit firms were performing consulting activities which were far more lucrative than the audit practices for the same firms. This created a situation where the audit firms had less of an incentive to challenge firms on their accounting practices in order to preserve the more lucrative consulting contracts.

According to Farrel (2005) a similar problem arose in the role of the securities analyst. Investment bankers played a dual role as they provided lucrative services with regards to mergers and acquisitions, loans etc. but also provided buy and sell recommendations on the same firms' stocks and bonds. This provided less of an incentive for investment bankers to provide recommendations that would have a negative effect on their clients to protect the lucrative banking services.

Executive compensation in the pre-SOx period were based largely on stock-based bonuses according to Farrel (2005). Managers were under pressure to meet targets by the markets that created volatility in the stock price for earnings misses. This lead to wide incentives to manage earnings to meet or beat analyst forecasts.

Banks provided large loans to firms without having done good due diligence. Lack of regulations lead firms to hide special purpose entities from lenders which resulted in banks providing bad loans.

Farrel (2005) continues by explaining that it appeared that in many cases audit committee members on the board of directors of large firms did not have the expertise required, did not exercise their responsibilities or were not truly independent of management.

The SEC also appeared not to be properly funded for it do its work effectively.

During the internet bubble that burst in 2000 it appeared that certain mutual fund managers had also advocated the purchase of certain stock while selling them. The losses also angered investors and calls for changes to regulation.

Summing up these factors it is clear that there were enough problems in the financial system for fraud to occur. The Sarbanes-Oxley Act was passed to fill these gaps in regulation.

2.4.2. How does SOx work?

The problems identified led to 11 major elements of the Sarbanes-Oxley Act and are divided in 11 titles. A quick summary of Public law 107-204 of the 107th Congress of the United States signed on the 30th of July 2002 which defines the Sarbanes-Oxley Act can be found in Appendix B.

The most relevant provisions for my thesis are section 302, which mandates signing officers to certify that they are responsible for establishing and maintaining internal controls. It also states that "signing officers must design internal controls in such a manner that material information relating to the firm and all of its subsidiaries is known to its officers, particularly during the period that the periodic reporting is being prepared". Section 404, requires management and the auditors to attest to, and report on the assessment made on the adequacy of the firm's internal controls for financial reporting. 702

2.5 THE GLOBAL FINANCIAL CRISIS AND THE ENACTMENT OF DODD-FRANK WALL STREET REFORM AND CONSUMER PROTECTION ACT

2.5.1. Defining Dodd-Frank and why it was created?

The Wall Street Reform and Consumer Protection Act of 2010, also known as the Dodd-Frank act is a set of regulations meant to target systematic risk associated with commercial and investment banking as well as protect consumers from financial products. This was a direct reaction to the global financial crisis of 2007-2009 where specifically investment banks were overleveraged and took great risks which ultimately lead to the federal government having to use tax money to bail out these large banks (Torres, 2012).

The act was hailed as a new financial foundation by the president of the United States and was meant to be a sweeping overhaul of the financial regulatory system[3].

2.5.2. How does Dodd-Frank work?

The proposal addressed regulations with regards to financial markets, financial firms, the protection of consumers and investors, it also provided the government with more tools to manage crises and provided regulation in the international domain. Specifically, it proposes that the over-the-counter derivatives and asset-backed securities markets be executed through public exchanges, it also proposed more conservative capital requirements and stricter rules on the amount of credit exposure held by financial institutions, it heighten the entry barrier for trading certain derivatives through stricter laws, clarified rules between the Securities and Exchange Commission and the Commodity Futures Trading Commission, strengthened regulation on credit rating agencies for disclosing conflicts of interests and clearly stating risks of financial products, it also reduced the dependency of regulators on credit rating agencies among a long list of other reforms (United States Congress, 2010).

The main aim of the act is "to promote the financial stability of the United States by improving accountability and transparency in the financial system, to end ''too big to fail'', to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes." (United States Congress, 2010).

A summary of the sixteen titles of the act can also be found in Appendix B.

It is clear that Dodd-Frank is a wide-ranging act aimed at enhancing regulation and transparency on various sections of the financial markets. Title IX the Investor Protection and Securities Reform Act of 2010 is specifically aimed at credit rating agencies and is therefore most relevant to this thesis.

2.5.3. The Investor Protection and Securities Reform Act

The main aim of the Investor Protection and Securities Reform Act is to revise the authority of the Securities and Exchange Commission, the credit rating agencies and the obligations of

[3] Wall Street Journal, Obama's Financial Reform Plan (2009)

brokers, dealers and investment advisors. The most important provisions of the Dodd-Frank Wall Street Reform and Consumer Protection Act are mentioned in short below.

The first subtitle aims to increase investor protections by establishing an investor advisory committee with the purpose of advising and consulting the SEC on regulatory priorities, issues with regard to regulation of securities product, trading strategies, fee structures and effectiveness of disclosures. The committee also forges initiatives to protect investor interests and promote investor confidence and the integrity of the financial markets. Also, part of this subtitle are studies with regards to the obligations of brokers, dealers and investment advisors to evaluate the effectiveness of existing regulation and find legal or regulatory gaps, short comings or overlaps in standards that should protect retail consumers. Further studies mentioned are a study on the financial literacy of retail investors which also forges methods on improving the timing, content and format of investment information to retail investors and forges methods to increase transparency of expenses and reduce conflicts of interest with regards to investment services and increase efforts to educate retail investors.

Subtitle two details incentives and protections to securities whistleblowers. The third subtitle focusses on improving regulation for credit rating agencies. Congress concluded that due to the reliance placed by individual and institutional investors and financial regulators on credit rating agencies, and the central role they play in capital formation, investor confidence and the efficient performance of the economy the activities of credit rating agencies is a part of the national public interest. Congress also concluded that due to the gatekeeper role, which entails that the agencies perform evaluative and analytical services on behalf of their clients, and the commercial nature of their activities the agencies should be subject to the same standards and oversight as auditors, securities analysts and investment bankers. This subtitle requires each agency to establish, maintain, enforce and document an effective internal control structure for determining credit ratings. This includes annually submitting an internal control report to the commission which describes the responsibility of management, an assessment of the effectiveness of the internal control structure and an attestation by the Chief Executive Officer of the agency. This subtitle also issues rules that prevent sales and marketing activities from influencing the production of credit ratings and rules on employment of officers of firms which the agency has rated in prior periods.

An office of credit ratings has been established with the responsibilities of administering the rules with regards to practices in determining the credit rating, promote accuracy in credit ratings and prevent conflicts of interest. It issues a study on the independence of credit ratings agencies influencing credit ratings and a study on the rating process and the conflicts of interest associated with the issuer-pay and the subscriber-pay models. Subtitle four prescribes improvements to the asset backed securitization process. The fifth subtitle discusses accountability and compensation of executives. It requires the SEC to establish rules which prohibit the securities exchanges and associations from listing any security which is not in compliance with the requirements. The subtitle requires at least once in every three years the executive compensation package to be approved by the shareholders and once every six years a vote from the shareholders if the compensation package should be approved more than once every three years. The sixth subtitle require improvements to the management of the securities and exchange commission. It requires the heads of the divisions and offices of the commission to be directly responsible for establishing and maintaining the internal supervisory controls. Once every three years the comptroller general of the U.S shall submit a report which evaluates the effectiveness of supervisors, the promotion criteria and the fairness of application of promotion criteria for employees of the commission to supervisory positions. The seventh subtitle elaborates on strengthening of corporate governance. It requires that the solicitation to acquire a rating be done by a nominee which is part of the board of directors of the issuer. It also contains further rules on soliciting ratings by the issuer. The eighth subtitle discusses municipal securities. The ninth subtitle elaborates on Public Company Accounting Oversight Board, Portfolio Margining, and Other Matters. It primarily promotes the sharing of information with the inspectors general. The tenth and last subtitle discusses match funding for the securities and exchange commission, which entails that the commission shall collect transaction fees and assessments that are designed to recover the costs to the government of the annual appropriation to the commission by congress (United States Congress, 2010).

2.6 SUMMARY

In this chapter the main concept and the institutional setting of this thesis is discussed. First beginning with corporate bonds and the functioning of credit rating agencies. According to Boot et al. (2006) rating agencies mitigate information asymmetries between the issuers of

bonds and the investors and reduce the cost of regulation. Rhee (2015) proposes an alternative explanation that rating agencies promote a liquid credit market and a process for best investment. Then the chapter continues by discussing earnings management and how it is defined. Healy and Wahlen (1999) define earnings management as "occurring when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the firm or to influence contractual outcomes that depend on reported accounting numbers". This definition is most relevant to my thesis. Also, the accrual process is discussed, which is an adjustment to revenue that has not yet been earned, or expenses that have occurred but still have to be recorded. Accruals can be divided into three different components, the discretionary accrual, the non-discretionary accrual and the reversal of the accrual. Ronen and Yaari (2008) describe discretionary accruals as "transactions that arise or accounting treatments chosen in order to manage earnings". Non-discretionary accruals as "accruals that arise from transactions made in the current period that are normal for the firm given its performance level and business strategy, industry conventions, macro-economic events and other economic factors". Reversing accruals are accruals originating from transactions made in the previous period. The chapter continues by defining the Sarbanes-Oxley and Dodd-Frank acts. The purpose of the SOx act was stated by congress as to "protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws, and for other purposes". The most relevant provisions for my thesis are section 302, which mandates signing officers to certify that they are responsible for establishing and maintaining internal controls. It also states that "signing officers must design internal controls in such a manner that material information relating to the firm and all of its subsidiaries is known to its officers, particularly during the period that the periodic reporting is being prepared". Section 404, requires management and the auditors to attest to, and report on the assessment made on the adequacy of the firm's internal controls for financial reporting. The Dodd-Frank act is a set of regulations meant to target systematic risk associated with commercial and investment banking as well as protect consumers from financial products. This was a direct reaction to the global financial crisis of 2007-2009 where specifically investment banks were overleveraged and took great risks (Torres, 2012). Title IX the Investor Protection and Securities Reform Act of 2010 is the most relevant to this thesis because it is specifically aimed at credit rating agencies.

CHAPTER 3 LITERATURE REVIEW

3.1 INTRODUCTION

In this chapter empirical research is discussed which is relevant for answering the main research question 'Did the passage of the Sarbanes-Oxley Act (2002) and the Investor Protection and Securities Reform Act also known as Dodd-Frank (2010) lead to firms managing their earnings less in order to obtain an expected credit rating?' First, I elaborate on Alissa et al. (2013) who examines whether firms that deviate from an empirically modeled ('expected') credit rating engage in earnings management activities, as measured by accruals-based and real-activity based earnings management. This forms the basis for my research to examine if earnings management declined over the periods after SOx and Dodd-Frank were implemented.

3.2 EMPIRICALLY MODELED 'EXPECTED' CREDIT RATING

Alissa et al. (2013) find evidence that earnings management activities for firms with a credit rating above or below an empirically modeled expected credit rating are associated with future changes in credit ratings. Their research proceeded research by Graham and Harvey (2001) and Kisgen (2006) who find evidence that firms do focus on the details of their credit ratings and that these credit ratings are important for management.

Graham and Harvey (2001) conducted a survey which provides evidence that chief financial officers pay strong attention to the corporate credit ratings and base their capital structure decisions on these ratings. The CFOs indicated that credit ratings are their second highest priority when determining the firm's capital structure. Kisgen (2006) provides evidence that firms are likely to change their capital structure to offset negative changes in their credit ratings. Most importantly Hovakimian, Kayhan and Titman (2009) show that managers base certain operating financing and investing decisions on achieving an expected credit rating. Anecdotal evidence suggests that firms base their capital structure policy on making different financing, hedging and investment decisions to obtain a certain target rating. Hovakimian et al. (2009) suggest that credit rating has an advantage over other debt ratios because it is a single measure of financial leverage that contains various elements of the firm's capital structure.

Graham, Harvey and Rajgopal (2005) and Bhojraj, Hribar, Picconi and McInnis (2009) provide evidence that managers are willing to sacrifice economic value to meet short-run earnings objectives. Survey research by Graham et al. (2005) suggests that approximately 80% of managers would decrease discretionary spending to meet an earnings target. Bhojraj et al. (2009) show that firms that just beat analyst forecasts exhibit a short-term stock price benefit compared to firms that just miss forecasts. This meeting and beating behavior might also be applicable to meeting or beating an expected credit rating. I elaborate on this topic in section 3.4.

Other reasons mentioned by Alissa et al. (2013) and Kisgen (2006) why managers pay strong attention to credit ratings is because a downgrade could force investors to liquidate their positions if it triggers a ratings-based covenant. Other implications are that a ratings change signals the recent state of the capital structure of the firm to suppliers and customers and can affect the relationships with these parties. Managers may also want to keep credit ratings in line with their competitors. If a manager wants to signal a certain quality, it might want to influence the credit rating upwards. To the contrary, managers would want to avoid a downgrade to avoid an increase in close examination of market participants.

Alissa et al. (2013) motivate their estimation of a firm's expected credit rating from target leverage literature, which find proxies for uniqueness to estimate expected credit rating (Hovakimian et al. 2009). I follow the same methodology in my research. Literature on target leverage, specifically Hovakimian, Kayhan and Titman (2009) concludes that firms do target a specific credit rating that matches the costs and benefits related to higher bankruptcy risk. Hovakimian et al. (2009) also include results on firm characteristics which raise the tendency of participating in public debt markets, and therefore influencing the firm's credit rating. The most influential firm characteristics according to Hovakimian et al. (2009) are:

I) Operating risk. Firms with volatile earnings and cash flows have a greater likelihood of going bankrupt and therefore mostly have a lower credit rating.

II) Profitability. Profitability is negatively associated with market-to-book and debt ratios. Therefore, the higher the profitability, the lower the debt ratio and the higher the credit rating.

III) Firm size. Small firms tend to have lower ratings because they are more susceptible to risk and therefore have higher bankruptcy costs. Larger firms have more capacity to operate with more leverage and have greater access to the public debt market. Therefore, larger firms tend to have higher credit ratings.

IV) Tangibility of assets. Firms with more tangible assets tend to have higher debt ratios. This is because firms with tangible assets have high collateral value and therefore allows these firms to have a more levered capital structure.

V) Future growth opportunities. Firms that have significant future growth opportunities (high market-to-book ratios) target a capital structure with a lower probability of default to protect that potential. Therefore, have a higher expected credit rating.

To answer the hypotheses, if income increasing (decreasing) earnings management activities are negatively (positively) associated with deviations from their expected credit rating, Alissa et al. (2013) posit the distribution of deviations of actual credit ratings from expected credit ratings and examine if the deviation shows mean reversion over time. I take the same approach to examine meet and beat behavior over the three periods. Instead of examining mean reversion over time I examine if there is a significant difference in the amount of earnings management between the different periods.

3.3 REAL AND ACCRUAL-BASED EARNINGS MANAGEMENT PRE- AND POST-SARBANES-OXLEY AND POST-DODD-FRANK PERIODS

There has been a lot of research on the evolvement of real and accrual-based earnings management over time. Cohen, Dey and Lys (2008) specifically research the change in real and accrual-based earnings management before and after the passage of SOx. This research is highly relevant to my thesis. Cohen et al. (2008) also research the development of executive compensation over the same period. This will not be part of my thesis. Cohen et al. (2008) motivate their research by the results of Brown (2001) indicating that management's willingness to use earnings management to avoid a negative earnings surprise has risen considerably in the period between 1984 and 1999 right before major corporate accounting scandals occurred that lead to the passage of SOx. A survey by Graham et al. (2005) finds that managers take real operational actions to influence financial reporting over the same period. A majority of survey participants indicated that they would decrease discretionary spending

on research and development, advertising and maintenance or delay starting a new project in order to meet an earnings target even if this meant a small sacrifice in value. Cohen et al. (2008) divide their sample in a period prior to major corporate accounting scandals, a period immediately preceding the passage of SOx and a period after the passage of SOx. They also mention three specific subsets of firms that are more likely to have managed their earnings according to the survey by Graham et al. (2005). These subsets are firms that have an incentive to meet or beat last year's earnings, firms that have an incentive to meet or beat the consensus analysts' forecast and firms that have an incentive to avoid reporting losses. These incentives form a part of my motive to investigate meeting or beating behavior of firms in relation to an expected credit rating. Cohen et al. (2008) proceeds by using a modified cross-sectional Jones model (Jones, 1991) as the primary measure for discretionary accruals. As proxies for real earnings management abnormal levels of cash flow from operations, production costs and discretionary expenses is used following Roychowdhury (2006), Zang (2012) and Gunny (2005). I follow the same approach, I further modify the cross-sectional Jones model (Jones, 1991) by adding a performance measure as mentioned by Kothari, Leone and Wasley (2005).

Following reasoning by Cohen et al. (2008) explanation for these methods for calculating abnormal levels of cash flow from operations, abnormal levels of production costs and abnormal levels of discretionary expenses are as follows:

Abnormal levels of cash flow from operations are created due to a temporary increase in sales volumes caused by an increase in price discounts or more lenient credit terms. The increase in price discounts or more lenient credit terms will in turn lead to lower cash flows in the current period but a boost in current period earnings when the margins are positive.

Abnormal levels of production costs are created through increased production. When more units are produced fixed overhead costs can be spread over a larger number of units. This will lead to a decrease in the reported cost of goods sold which enables the firm to report higher operating margins.

Abnormal levels of discretionary expenses are created by decreasing expenses on advertising, research and development and in selling, general and administrative expenses. This will lead to higher current period cash flows and boost current period earnings.

Results by Cohen et al. (2008) indicate that there is an increase in earnings management in the period preceding the passage of SOx. After the passage of SOx earnings management returned to the trend line before the regulation was passed. The results indicate that levels of accrual-based earnings management decline but the levels of real earnings management increase significantly after the passage of SOx. Over the sample period Cohen et al. (2008) find that earnings management increases steadily and all the incentives for earnings management, meeting or beating last year's earnings, meeting or beating the consensus analysts' forecast and avoiding reporting losses continues to be important. They also note that not all earnings management activities can be solely attributed to the passage of SOx. Enforcement actions by the department of justice or increased investor and auditor vigilance are two concurrent events mentioned as possible causes.

3.4 MARGINALLY BEATING OR MISSING ANALYST FORECAST

Bhojraj et al. (2009) examine performance consequences for firms that use real and accrual-based earnings management to meet or beat analyst's earnings forecasts. They focus on two groups. The first group just beats consensus forecasts by one cent, has large income increasing accruals and low discretionary spending (R&D and advertising expenditure). The second group misses consensus forecasts by one cent, has a large amount of income decreasing accruals and high discretionary spending. These two groups represent firms that are most likely and least likely to have manipulated their earnings for a short-term benefit of beating analyst forecasts. Roychowdhury (2006) concludes that firms with small positive forecast errors and income-increasing accruals or cuts in discretionary spending are more likely to have performed earnings management for a short-term gain. Survey by Graham (2005) mentions the most likely choices executives would make to meet an earnings target. The most popular activities mentioned were delaying the start of a new project, providing discounts to customers in order for them to purchase this quarter instead of next quarter, delaying an accounting charge, decreasing discretionary spending, booking revenues this quarter instead of next quarter and decreasing previously established reserves. Bhojraj et al. (2009) also mention that two other groups are most likely also part of his sample and will reduce the power of its results. These groups are firms that missed analyst forecasts but were conservative in their guidance to analysts early in the quarter in order to beat the forecast by one cent and firms that did not have to take any explicit actions in order to beat analyst

forecasts by one cent. I follow the methodology employed by Bhojraj et al. (2009) to isolate the firms which most likely use earnings management strategies to reach an expected credit rating. Bhojraj et al. (2009) also research the short-term and long-term stock price performances of these firms and if the managers understand the short- and long-run performance implications of their actions. My research will not expand on these topics. Bhojraj et al. (2009) elaborate on the stress managers face whether to manage earnings in order to beat analyst forecasts. It shows that a consecutively beating analyst forecasts can increase the firm's valuation premium by a significant margin. On the contrary, missing analyst forecasts by a small margin can lead to a dramatic drop in stock price. However, to apply these activities consecutively increases the likelihood that these manipulated earnings will reverse in the future and therefor will be associated with an underperformance of the firm.

3.5 SUMMARY

This chapter presents several relevant studies which are important to the discussion of credit ratings and the management of earnings. First, the relevant parts of the studies by Alissa et al. (2013), Graham and Harvey (2001) and Kisgen (2006) were discussed. They find that managers indeed base certain operating financing and investing decisions on their current credit rating or on achieving an expected credit rating. Graham et al. (2005) and Bhojraj et al. (2009) provide evidence that managers are willing to sacrifice economic value to meet short-run earnings objectives. I continue by discussing research by Cohen et al. (2008) on the evolvement of real and accrual-based earnings management over time. They find that management's willingness to use earnings management to avoid a negative earnings surprise has risen considerably in the period between 1984 and 1999 right before major corporate accounting scandals occurred that lead to the passage of SOx. I also discuss the theoretical background for the firm characteristics that provide the results of the proxies for the expected credit ratings, accrual-based and real-activity based earnings management. The expected credit rating is based on the firm's operating risk, profitability, size, tangibility and future growth opportunity. The accrual-based earnings management proxy is based on total accruals, cash flow from operations, size and return on assets. The real-activity based earnings management proxy is based on abnormal levels of cash flow from operations, abnormal levels of production expenses and abnormal levels of discretionary expenses. I conclude the chapter by discussing Bhojraj et al. (2009) that examined performance consequences for firms that

use real and accrual-based earnings management to meet or beat analyst's earnings forecasts. It shows that consecutively beating analyst forecasts can increase the firm's valuation premium by a significant margin. On the contrary, missing analyst forecasts by a small margin can lead to a dramatic drop in stock price. However, to apply these activities consecutively increases the likelihood that these manipulated earnings will reverse in the future and therefore will be associated with an underperformance of the firm. The results of the studies on meeting and beating behavior on earnings forecasts might be relevant for meeting or beating expected credit ratings.

CHAPTER 4 HYPOTHESIS DEVELOPMENT

4.1 INTRODUCTION

In this chapter the main hypotheses that will be tested are introduced. These are based on the concepts and prior literature mentioned in chapters 2 and 3, and aim to answer the main research question mentioned in chapter 1 'Do firms manage earnings less in order to reach an expected credit rating after the passage of SOx and Dodd-Frank?'.

4.2 HYPOTHESIS DEVELOPMENT

I first start by investigating the discretionary accruals of firms as measured by the performance matched discretionary accrual model by Kothari et al. (2005), and examine this in a similar way to Alissa et al. (2013) whether firms which deviate from an empirically modeled expected credit rating engage in less earnings management activities after passing legislation specifically aimed at these activities.

Prior research (Graham and Harvey 2001, Kisgen 2006, Kisgen 2009, Hovakimian et al. 2009) indicates that firms pay strong attention to credit ratings when making capital structure decisions because they believe that investors use credit ratings as a key indicator in assessing bankruptcy risk. It also finds that firms act to avoid a credit rating downgrade or to regain their credit rating after a downgrade.

With regards to managing earnings to meet an earning target Graham et al. (2005) suggest that managers would decrease discretionary spending or delay a project even if it means to reduce value in the short term to meet these earnings targets. Bhojraj et al. (2009) suggest that firms that manage earnings to meet or beat an analyst forecast have better short-term stock performance than firms that don't. Zhang (2007) finds that cumulative abnormal returns after the passage of SOx are negative, which is an indicator of less earnings management.

Rather than examining whether earnings management activities are successful to move closer to an expected credit rating as Alissa et al. (2013) I follow by examining if SOx and Dodd-Frank were successful in reducing earnings management activities in order to reach an expected credit rating. This leads me to the first hypothesis which focuses on accrual based earnings management;

H1: The levels of accrual based earnings management of firms that are close to their expected rating decreased after the passage of SOx.

The second hypothesis is based on real activity based earnings management.

H2: The levels of real activity based earnings management of firms that are close to their expected rating decreased after the passage of SOx.

As in Cohen et al. (2008) I expect to find levels of earnings management to have returned to pre-SOx levels, specifically that the amount of accrual based earnings management has decreased and the amount of real-activity based earnings management increased after the passage of SOx. Cohen et al. (2008) concluded that after the passage of SOx accrual-based earnings management was substituted for real-activity based earnings management.

As mentioned in section 2.5.3 the Investor Protection and Securities Reform Act is specifically aimed at increasing the reliability and the confidence of credit ratings in the financial markets. Due to these provisions, I expect rating to be influenced less by earnings management activities after the passage of Dodd-Frank. This leads me to the third and fourth hypothesis, which investigates if the provisions in Dodd-Frank lead to less earnings management in obtaining an expected credit rating.

H3: The levels of accrual based earnings management of firms that are close to their expected rating decreased after the passage of Dodd-Frank

H4: The levels of real activity based earnings management of firms that are close to their expected rating decreased after the passage of Dodd-Frank

Section 6003(c) of the Dodd-Frank act states that the acquirer of a security rated by one of the nationally recognized statistical rating organization has the right to recover damages if there is evidence of gross negligence in the rating process. This increases liability together with the provisions mentioned in section 2.5.3 leads me to expect similar results to Cohen et al. (2008) on SOx. I expect levels of accrual based earnings management to have decreased and the amount of real-activity based earnings management increased after the passage of Dodd-Frank.

4.3 SUMMARY

In this chapter the hypotheses are discussed. The first two hypotheses are related to the passage of SOx and the development of accrual-based and real-activity based earnings management after the passage of the legislation. The first hypothesis, 'the levels of accrual based earnings management of firms that are close to their expected rating decreased after the passage of SOx', and the second hypothesis 'the levels of real activity based earnings management of firms that are close to their expected rating decreased after the passage of SOx' are expected to be confirmed similar to the results presented by Cohen et al. (2008). The third and fourth hypotheses test the development of accrual-based and real-activity based earnings management in relation to the passage of Dodd-Frank. The third hypothesis, 'the levels of accrual based earnings management of firms that are close to their expected rating decreased after the passage of Dodd-Frank', and the fourth hypothesis 'the levels of real activity based earnings management of firms that are close to their expected rating decreased after the passage of Dodd-Frank' are expected to be confirmed similar to the results presented by Cohen et al. (2008) which concluded that accrual-based earnings management is substituted for real-activity based earnings management.

CHAPTER 5 METHODOLOGY AND PRELIMINARY STATISTICAL ANALYSES

5.1 INTRODUCTION

This chapter starts by explaining the main metrics used in this study, then continues with the regressions, sample description and preliminary statistical analysis of the data on potential outliers and assumptions of OLS regression. The main metrics used are an empirically modeled "expected" credit rating, a metric for calculating accrual-based earnings management and three metrics used for calculating real activity based earnings management. First the regressions that is used to test the first and third hypothesis whether the levels of accrual based earnings management of firms that are close to their expected credit rating have decreased after the passage of SOx and Dodd-Frank are presented, then the regressions for second and fourth hypothesis are presented whether the levels of real activity based earnings management of firms that are close to their expected rating have decreased after the passage of SOx and Dodd-Frank. The sample, tests and results performed to ensure that all OLS regression assumptions are met are also discussed.

5.2 EMPIRICALLY MODELED 'EXPECTED' CREDIT RATING

In order to estimate a firm's expected credit rating, I follow the methodology applied by Alissa et al. (2013). As discussed in chapter 3 the characteristics which influence firms' expected credit ratings are *Size, Profitability, Operating risk*, *Asset specialization* and *Future growth options*, where *Size* is calculated as the natural log of sales, *Profitability* as the operating income scaled by lagged assets, *Operating risk* as the standard deviation of operating income scaled by lagged total assets, measured over the previous five years, *Asset specialization* as research and development expenses and selling, general and administrative expenses lagged by total assets. Also, an indicator variable is added which indicates if research and development expenses are reported or not. *Future growth options* is calculated as the market-to-book ratio per firm.

Similar to Alissa et al. (2013) I construct the proxy for expected rating by estimating an ordered probit model with a vector of the above-mentioned control variables.

$$RATING_{it} = \alpha_j + X_{it}\beta + U_{it} \quad (1)$$

where $RATING_{it}$ is an ordinal variable taking on a value from 1 to 16, representing the Standard & Poor's (S&P's) investment grade long-term credit ratings from B- to AAA. Non-investment grade credit ratings are excluded from the study because different factors may influence credit behavior than investment grade firms (Hovakimiam 2009). X_{it} represents the vector of the above-mentioned control variables. The coefficients i refer to each firm within the sample and t refer to the related fiscal year of the firm.

5.3 EARNINGS MANAGEMENT METRICS

5.3.1 Accrual-Based Earnings Management

I continue by calculating discretionary accruals by applying the performance matched discretionary accrual formula as discussed by Kothari et al. (2005). I estimate the model grouped for each two digit SIC-code per fiscal year. SIC-code groups containing less than 8 firms are excluded from the sample as I assume at least 8 firms are needed per two digit SIC-code to obtain a significant result for earnings management per industry sector.

I start by calculating the dependent variable total accruals TA_{it} per firm, per fiscal year.

$$\mathrm{TA}_{it} = (\Delta\mathrm{ACT}_{\mathrm{it}} - \Delta\mathrm{CHE}_{\mathrm{it}} - \Delta\mathrm{LCT}_{\mathrm{it}} + \Delta\mathrm{DLC}_{\mathrm{it}} - \Delta\mathrm{DP}_{\mathrm{it}}) / \mathrm{ASSETS}_{it-1} \quad (2)$$

Which is defined as the change in non-cash current assets $\Delta\mathrm{ACT}_{it}$ minus the change in current liabilities $\Delta\mathrm{CHE}_{it}$ excluding the current portion of long-term debt $\Delta\mathrm{LCT}_{\mathrm{it}} + \Delta\mathrm{DLC}_{\mathrm{it}}$, minus depreciation and amortization $\Delta\mathrm{DP}_{\mathrm{it}}$, scaled by lagged total assets ASSETS_{it-1}.

Thereafter I calculate the various independent variables as shown in equation number 3 as cross-sectional regression applied per industry and fiscal year.

$$\mathrm{TA}_{it} = b_0 + b_1(1/\mathrm{ASSETS}_{it-1}) + b_2(\Delta\mathrm{SALES}_{it} - \Delta\mathrm{AR}_{it}) + b_3\mathrm{PPE}_{it} + b_4\mathrm{ROA}_{it} + \varepsilon_{it} \quad (3)$$

The independent variables are ASSETS_{it-1} which is lagged total assets, $\Delta\mathrm{SALES}_{it}$ is the change in sales scaled by lagged total assets, $\Delta\mathrm{AR}_{it}$ is the change in receivables scaled by lagged total assets, PPE_{it} is net property, plant and equipment scaled by lagged assets, and

ROA_{it} is return on assets for the current year. Most important for the test is the residual ε_{it} which is equal to measures of discretionary accruals.

Since the metric is highly skewed I apply the natural logarithm of the residual ε_{it} as discussed in section 5.5.1.

To further analyze the direction of earnings management I create 4 versions of the residual ε_{it}. First, the actual results for discretionary accruals, second, only positive residuals ε_{it}, third, only negative residuals ε_{it} and lastly the absolute value of the residuals ε_{it}. The absolute value of discretionary accruals is the main value of interest as the hypotheses do not specify a specific direction for earnings management and therefore will also contain the reversal of accruals after earnings management. It is also difficult to hypothesize the event of accrual reversals (obtaining the expected rating proceeded with the reversal of the accrual) in my analysis and therefore is not part of this thesis.

5.3.2 Real activities Earnings Management

For real activities earnings management, following Alissa et al. (2013) and Cohen et al. (2008) I focus on three manipulation metrics, which are abnormal levels of cash flow from operations due to accelerated timing of sales, abnormal levels of production costs by means of an increase in production and abnormal levels of discretionary expenses. As the model for accrual-based earnings management the residuals from the real activities earnings management estimation models are relevant. Negative deviation from normal levels of these models are considered decisions by management to manage earnings upwards.

Abnormal levels of cash flow from operations due to accelerated timing of sales as implemented by Roychowdhury (2006) implies that management will offer significant discounts or be more lenient in credit terms in an attempt to temporarily increase sales. This results in an increase in earnings and a decrease in current period's cash flow from operations.

Equation number 4 is used to calculate the abnormal levels per industry and fiscal year as a cross-sectional regression.

$$\mathrm{CFO}_{it} = b_{1t}(1/\mathrm{ASSETS}_{it-1}) + b\mathrm{SALES}_{it} + b_3\Delta\mathrm{SALES}_{it} + b_4\mathrm{ROA}_{it} + \varepsilon_{it} \quad (4)$$

Where CFO_{it} is cash flow from operations in the current period scaled by lagged total assets, ASSETS_{it-1} is lagged total assets, SALES_{it} is the current month's sale scaled by lagged total assets and $\Delta\mathrm{SALES}_{it}$ is the change in current month's sales scaled by lagged total assets. ε_{it} represents the abnormal levels of cash flow from operations (acfo).

Abnormal levels of production costs through in increase in production implies that management report lower cost of goods sold by increasing production more than is necessary. This will increase earnings because the fixed overhead costs can be spread over a larger number of units. The total cost per unit should decline if the marginal costs per unit does not increase.

Equation number 5 is used to calculate abnormal levels per industry and fiscal year as a cross-sectional regression.

$$Prod_{it} = b_{1t}(1/\mathrm{ASSETS}_{it-1}) + b\mathrm{SALES}_{it} + b\Delta\mathrm{SALES}_{it} + b_4\Delta\mathrm{SALES}_{it-1} + b_4\mathrm{ROA}_{it} + \varepsilon_{it} \quad (5)$$

Where $Prod_{it}$ is the production cost for the current year scaled by lagged total assets, ASSETS_{it-1} is lagged total assets, SALES_{it} is the current month's sale scaled by lagged total assets, $\Delta\mathrm{SALES}_{it}$ is the change in current month's sales scaled by lagged total assets. ε_{it} represents the abnormal levels of production costs (aprod).

Abnormal levels of discretionary expenses imply that management will reduce expenses for advertising, research & development and selling, general and administrative expenses to boost current period earnings. It could also lead to a higher cash flow in the current period.

Equation number 6 is used to calculate abnormal levels per industry and fiscal year as a cross-sectional regression.

$$\mathrm{DiscExp}_{it} = b(1/\mathrm{ASSETS}_{it-1}) + b_2\mathrm{SALES}_{it} + b_4\mathrm{ROA}_{it} + \varepsilon_{it} \quad (6)$$

Where $\mathrm{DiscExp}_{it}$ is the discretionary costs in the current period scaled by lagged assets, ASSETS_{it-1} is lagged total assets, SALES_{it} is the current month's sale scaled by lagged total assets. ε_{it} represents the abnormal levels of discretionary expenses (adiscexp).

In order to obtain the complete effect for real activities earnings management I follow Cohen et al. (2008) and combine the above mentioned three measures into one real activities earnings management variable realaccm. This represents the sum of the standardized variables acfo, aprod and adiscexp.

5.4 REGRESSIONS

As Cohen et al. (2008) I regress the accrual-based and real activity earnings management metrics over the relevant time-periods. For accrual-based earnings management I regress the metric in its original state (aac), positive earnings management (posaac), negative earnings management (negaac) and the absolute value of earnings management (absaac). For real-activity based earnings management I regress the three individual metrics (acfo, aprod, adiscexp) separately and the sum of the three metrics (realaccm) in order to thoroughly analyze the effect of real activity based earnings management.

In order to test if the levels of earnings management of firms that are close to their expected rating has decreased over the periods I create dummy variables for the pre-SOx, Scandal, post-SOx and post-Dodd-Frank periods. I use these variables as an interaction effect between the dependent variable Diff_{it} (the difference between the actual credit rating and the expected credit rating) and independent variable AAC_{it}, CFO_{it}, $\mathrm{Prod}_{\mathrm{it}}$, $\mathrm{DiscExp}_{it}$ and $\mathrm{Realaccm}_{it}$.

To test the first and third hypothesis, I use the following regression equation to analyze if accrual earnings management decreased over the mentioned periods.

$$\begin{aligned}\mathrm{Diff}_{it} = {} & y_0 + x_1\mathrm{AAC}_{it} * \mathrm{preSOX}_{it} + x_2\mathrm{ACC}_{it} * \mathrm{SCA}_{it} + x_3\mathrm{ACC}_{it} * \mathrm{postSOX}_{it} \\ & + x_4\mathrm{ACC}_{it} * \mathrm{postDodd}_{it} + y_5\mathrm{LEV}_{it} + y_6\mathrm{ZSCORE}_{it} \\ & + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} + y_9\mathrm{RETVOL}_{it} + y_{10}\mathrm{GROWTH}_{it} \\ & + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \tag{7}$$

Where Diff_{it} is the dependent variable and defined as the difference between the actual credit rating and the expected credit rating, AAC_{it} is the independent variable and is defined as the discretionary portion of accruals as mentioned in section 5.3.1. I have chosen the control variables following Alissa et al. (2013) as these have shown in prior literature to be associated with earnings management and credit ratings. LEV_{it} is the sum of long- and short-term debt scaled by lagged assets, ZSCORE_{it} is a re-estimated version of Altman's (1968) Z-score developed by Begley et al. (1996). I further elaborate on how this is calculated below,

EXTFIN_{it} is an indicator variable that equals one if the firm's free cash flow is less than -0.1, and 0 otherwise, BM_{it} is the book value to the total market value of the firm, RETVOL_{it} is the standard deviation of stock returns over the 60 months prior to the end of the year, GROWTH_{it} is the percentage change in net sales from year t-2 to year t-1 and SIZE_{it} is the natural log of net sales from year t-1.

The following three equations show how the positive earnings management (posaac), negative earnings management (negaac) and the absolute value of earnings management (absaac) are regressed.

$$\begin{aligned}\mathrm{Diff}_{it} = {} & y_0 + x_1\mathrm{NEGAAC}_{it} * \mathrm{preSOx}_{it} + x_2\mathrm{NEGACC}_{it} * \mathrm{SCA}_{it} + x_3\mathrm{NEGACC}_{it} \\ & * \mathrm{postSOx}_{it} + x_4\mathrm{NEGACC}_{it} * \mathrm{postDodd}_{it} + y_5\mathrm{LEV}_{it} \\ & + y_6\mathrm{ZSCORE}_{it} + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} + y_9\mathrm{RETVOL}_{it} \\ & + y_{10}\mathrm{GROWTH}_{it} + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \tag{8}$$

NEGAAC_{it} is the negative discretionary accruals as measured by regression (7)

$$\begin{aligned}\mathrm{Diff}_{it} = {} & y_0 + x_1\mathrm{POSAAC}_{it} * \mathrm{preSOx}_{it} + x_2\mathrm{POSACC}_{it} * \mathrm{SCA}_{it} + x_3\mathrm{POSACC}_{it} \\ & * \mathrm{postSOx}_{it} + x_4\mathrm{POSACC}_{it} * \mathrm{postDodd}_{it} + y_5\mathrm{LEV}_{it} \\ & + y_6\mathrm{ZSCORE}_{it} + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} + y_9\mathrm{RETVOL}_{it} \\ & + y_{10}\mathrm{GROWTH}_{it} + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \tag{9}$$

POSAAC_{it} is the positive discretionary accruals as measured by regression (7)

$$\begin{aligned}\mathrm{Diff}_{it} = {} & y_0 + x_1\mathrm{ABSAAC}_{it} * \mathrm{preSOx}_{it} + x_2\mathrm{ABSACC}_{it} * \mathrm{SCA}_{it} + x_3\mathrm{ABSACC}_{it} \\ & * \mathrm{postSOx}_{it} + x_4\mathrm{ABSACC}_{it} * \mathrm{postDodd}_{it} + y_5\mathrm{LEV}_{it} \\ & + y_6\mathrm{ZSCORE}_{it} + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} + y_9\mathrm{RETVOL}_{it} \\ & + y_{10}\mathrm{GROWTH}_{it} + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \tag{10}$$

ABSAAC_{it} is the absolute value of the discretionary accruals as measured by regression (7)

To test the second and fourth hypothesis, I use the same regression and apply the real-activity based earnings management metrics to analyze if real activities earnings management decreased over the mentioned periods.

$$\begin{aligned}\mathrm{Diff}_{it} = y_0 + x_1\mathrm{ACFO}_{it} * \mathrm{preSOx}_{it} + x_2\mathrm{ACFO}_{it} * \mathrm{SCA}_{it} + x_3\mathrm{ACFO}_{it} \\ * \mathrm{postSOx}_{it} + x_4\mathrm{ACFO}_{it} * \mathrm{postDodd}_{it} + y_5\mathrm{LEV}_{it} + y_6\mathrm{ZSCORE}_{it} \\ + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} + y_9\mathrm{RETVOL}_{it} + y_{10}\mathrm{GROWTH}_{it} \\ + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \quad (11)$$

ACFO_{it} is the metric for abnormal levels of cash flows from operations.

$$\begin{aligned}\mathrm{Diff}_{it} = y_0 + x_1\mathrm{APROD}_{it} * \mathrm{preSOx}_{it} + x_2\mathrm{APROD}_{it} * \mathrm{SCA}_{it} + x_3\mathrm{APROD}_{it} \\ * \mathrm{postSOx}_{it} + x_4\mathrm{APROD}_{it} * \mathrm{postDodd}_{it} + y_5\mathrm{LEV}_{it} \\ + y_6\mathrm{ZSCORE}_{it} + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} + y_9\mathrm{RETVOL}_{it} \\ + y_{10}\mathrm{GROWTH}_{it} + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \quad (12)$$

APROD_{it} is the metric for abnormal levels of production expenses.

$$\begin{aligned}\mathrm{Diff}_{it} = y_0 + x_1\mathrm{ADiscExp}_{it} * \mathrm{preSOx}_{it} + x_2\mathrm{ADiscExp}_{it} * \mathrm{SCA}_{it} + x_3\mathrm{ADiscExp}_{it} \\ * \mathrm{postSOx}_{it} + x_4\mathrm{ADiscExp}_{it} * \mathrm{postDodd}_{it} + y_5\mathrm{LEV}_{it} \\ + y_6\mathrm{ZSCORE}_{it} + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} + y_9\mathrm{RETVOL}_{it} \\ + y_{10}\mathrm{GROWTH}_{it} + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \quad (13)$$

$\mathrm{ADiscExp}_{it}$ is the metric for abnormal levels of discretionary expenses.

$$\begin{aligned}\mathrm{Diff}_{it} = y_0 + x_1\mathrm{REALACCM}_{it} * \mathrm{preSOx}_{it} + x_2\mathrm{REALACCM}_{it} * \mathrm{SCA}_{it} \\ + x_3\mathrm{REALACCM}_{it} * \mathrm{postSOx}_{it} + x_4\mathrm{REALACCM}_{it} * \mathrm{postDodd}_{it} \\ + y_5\mathrm{LEV}_{it} + y_6\mathrm{ZSCORE}_{it} + y_7\mathrm{EXTFIN}_{it} + y_8\mathrm{BM}_{it} \\ + y_9\mathrm{RETVOL}_{it} + y_{10}\mathrm{GROWTH}_{it} + y_{11}\mathrm{SIZE}_{it} + \varepsilon_{it}\end{aligned} \quad (14)$$

$\mathrm{REALACCM}_{it}$ is the sum variable of the three real activity based earning management metrics.

The re-estimated version of Altman's (1968) Z-score developed by Begley et al. (1996) is used to predict the probability that a firm will go bankrupt within two years and is calculated by the below equation.

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.3X_4 + 1.0X_5 \quad (15)$$

Where X_1 is net working capital divided by total assets, X_2 is retained earnings divided by total assets, X_3 is earnings before interest and taxes divided by total assets, X_4 is the market value of equity divided by the book value of total liabilities and X_5 is the total sales divided by the total assets.

5.5 SAMPLE AND DATA

The credit rating, financial and returns data is obtained through Compustat. The measure of credit rating is the S&P long-term issuer level rating as registered in the Compustat database. I exclude all non-investment grade observations and make sure they have the data necessary to calculate the discretionary accruals and real-activity based earnings management metrics. This creates a selection bias (survivorship bias) toward larger and more successful firms. This is not a problem because excluded firms are expected to increase the variation in earnings management for reasons that are not relevant to this research. Therefore, the exclusion leads to a more conservative measure for earnings management. I transform the letter rating into a numeric equivalent using an ordinal scale ranging from 1 (BBB) to 16 (AAA). I exclude financial firms (SIC codes 6000-6999) same as other studies on capital structure. The four periods examined that are the period before the passage of SOx ranging from 1995 till 1999, the scandal period 2000 and 2001, the period after the passage of SOx ranging 2002 till 2009 and the period after the passage of Dodd-Frank ranging from 2010 till 2015.

Table 1

Selection procedure	**Number of firm-year observations**
Compustat annual fundamentals merged with Credit ratings fiscal years 1994-2015	220,871
Drop SIC 6000-6999 financial firms	185,956
Drop missing and negative sale, total assets & common/ordinary equity - total	123,286
Drop fiscal year 1994	116,764
Drop observations with missing and defaulted credit ratings	28,208
Drop if SIC-group has less than 8 observations	25,656
Drop observations that are further than 4 ratings below expected rating, or does not have an expected rating	1,122

5.5 PRELIMINARY STATISTICAL ANALYSIS

To do the analyses presented in this thesis I use Stata. The main estimation technique that I apply is the ordinary least square (OLS) method in order to estimate the unknown parameters

mentioned in the above regressions. According to Hill, Griffith & Lim (2012) if the underlying assumptions are met the OLS estimators are unbiased. This means that the predicted coefficients are equal to the true coefficients. If the sample does not have a normal distribution, as one of the assumptions indicate results would be in the form of best linear unbiased estimators or BLUE. This means that the regression line is closest to the regression line which would be present if an error term was not present. The assumptions of OLS according to Hill, Griffith & Lim (2012) are (1) linearity, (2) independence of errors, (3) expected value of the residuals is zero, (4) homogeneity of variance (homoscedasticity), and (5) normal distribution of the residuals.

I first discuss the treatment of outliers which is not an OLS assumption but can have significant effects on the results while not having significant meaning.

5.5.1 Treatment of outliers

In order to examine whether there are outliers in the observations that could influence the result I analyze and treat the continuous variables by creating histograms and in some cases deleting, winzorizing and/or applying the natural logarithm of these variables. The main measure I examine is the skewness of the variable. This indicates a lack of asymmetry of the data. A normally distributed variable will have a skewness of zero. When the left tail of the distribution is long compared to the right tail the skewness is negative. When the right tail is long in comparison to the left tail the skewness is positive.

Table 2 provides a summary of the treatment of outliers. For a complete analysis of the treatment of outliers see appendix C.

Table 2
Outlier treatments

Variable	Outlier treatment	Skewness before treatment	Skewness after treatment
acc (total accruals)	Winsorize at 1st and 99th percentiles	-7.43	-0.99
bm (book-to-market)	Winsorize at 1st and 99th percentiles	-195.53	0.8
dsal (delta sales)	Winsorize at 1st and 99th percentiles	-3.69	0.27
Growth	Winsorize at 5st and 95th percentiles	88.42	-1.22

inverse_assets	Winsorize at 5st and 95th percentiles	7.38	1
lev (leverage)	Winsorize at 5st and 95th percentiles	-8.74	-1.27
mtb (market-to-book)	Winsorize at 5st and 95th percentiles	-162.81	-0.76
n1cfo (total cash flows)	Winsorize at 5st and 95th percentiles Transform into log	15.77	2.3
n1dsal (total delta sales)	Winsorize at 5st and 95th percentiles	16.55	1.16
n1sal (total sales)	Winsorize at 5st and 95th percentiles	-3.37	-1.5
n2lag_sales (total lagged sales)	Winsorize at 5st and 95th percentiles	-5.42	-1.51
n3discexp (total discretionary expenses)	Winsorize at 5st and 95th percentiles Transform into log	2.39	2.08
Ppeg	Winsorize at 5st and 95th percentiles	-6.79	-1.08
Profit	Winsorize at 5st and 95th percentiles	-12.88	-1.3
rd (research & development)	Winsorize at 1st and 99th percentiles	-13.36	-0.97
Retvol	Winsorize at 5st and 95th percentiles	217.36	1.59
Roa	Winsorize at 5st and 95th percentiles	-11.94	-0.32
Sga	Winsorize at 1st and 99th percentiles	-172.27	-0.88
sizebysale	Winsorize at 1st and 99th percentiles	-2.58	-1.59
tang (tangibility)	Winsorize at 5st and 95th percentiles	-7.63	-1.29
Zscore	Winsorize at 5st and 95th percentiles	-8.3	-1.03

5.5.2 OLS assumptions

In this section I explain how I test the OLS assumptions. These assumptions are important to the test since not fulfilling the assumptions leads to misleading results.

5.5.2.1 Multicollinearity

Multicollinearity occurs when two or more independent variables in a multiple regression are highly correlated. This means that one variable can be predicted by the other with a high degree of accuracy. Multicollinearity does not violate the OLS assumption, reduce the predictive power or reliability of the model. It leads to an increase in standard errors of the coefficients. A standard error occurs when the calculated mean of the sample varies from the mean of the population. This leads to cases where the null hypothesis is incorrectly rejected.

In order to examine the multicollinearity of the variables I calculate the variance inflation factors (VIF). The variance inflation factor indicates how much larger the standard error of the coefficient is, compared with what it would be if that variable were uncorrelated with the other independent variables in the model. A VIF of 4 or above indicates that there is severe multicollinearity. This means that the standard error is more than twice its minimal size.

I also calculate the variance covariance matrix for the fitted coefficients for the independent variables in the regression models. These results will be negative to the results of the correlation matrix of the raw data. See Appendix E for all relevant results.

5.5.2.2 Linearity

To check for linearity, I apply the augmented component plus residual (ACPR) plot for the dependent variables. Testing for linearity indicates that the relationship between the dependent and the independent variable is linear. In Appendix E, the relevant plots and analyses can be seen where a straight line is fitted to the data to show linearity. If there is no to little linearity the results from the predictions of the regression model could contain errors.

5.5.2.3 Independence of errors

The independence of errors indicates that the error terms are not correlated over time. If this is not the case means that there is room for improvement in the model. This is also called autocorrelation. Autocorrelation can be divided in negative and positive autocorrelation. Positive autocorrelation indicates that consecutive residuals have the same sign. This leads to the OLS estimates of the standard errors to be smaller than the actual standard errors. This can incorrectly suggest that the coefficients are significant. Negative autocorrelation indicates that consecutive residuals have opposite signs. This leads to the OLS estimates of the standard

errors to be larger than the actual standard errors. This makes it more difficult to reject the null hypothesis.

In order to examine this I use the Wooldridge test for autocorrelation in panel data in Stata. This tests for serial correlation in the idiosyncratic errors of a linear panel-data model as discussed by Wooldridge (2002).

5.5.2.4 Expected value of the residuals is zero

I test whether the models used in my research are properly specified and if all relevant variables are chosen. This is called the goodness of fit test. I do this by checking if the expected value of the residuals is zero. This indicates that the error terms on average will balance out. In Stata this can be achieved by applying the linktest. The linktest works by accepting the hypothesis that no additional independent variables are to be found that are statistically significant. It creates two new variables _hat and _hatsq which is the total of the predicted values from the initial regression model and the predicted value squared. Stata recalculates the models with _hat and _hatsq as independent variables. If the p-value of _hatsq is insignificant than the regression model is well specified. In Appendix E the results can be seen.

5.5.2.5 Homogeneity of variance

Homogeneity of variance, also known as homoscedasticity means that the variance of residuals is constant. If this is not the case, the error term is heteroscedastic. In other words, the estimates are unbiased. When there is heteroscedasticity the regression is no longer providing the estimates with the smallest variance. This means that the standard errors of the estimates are biased and the test statistics cannot be used to make reliable inferences.

I use the Breusch-Pagan to test if there is heteroscedasticity in the analysis. The null hypothesis indicates that the variance of the residuals is homogenous, so that there is no heteroscedasticity. All results in Appendix E indicate that there is no heteroscedasticity in the tests (p-value > 0.05).

5.5.2.6 Normality of residuals

The normal distribution of the residuals insures that the p-values of significance are valid. This assumption is not required to obtain an unbiased estimation of the regression coefficients. In order to test the normality of the residuals I create kernel density, standardized normal probability and quintile-quintile plots to judge if the residuals are normally distributed. I opted

for this method as the Shapiro-Wilk test will reject the assumption when there is a slight deviation from normality. For test with larger samples the plots method is the most effective. The kernel density plot includes a normal density function to the plot which enables judgement of the errors against normality. In the P-P plot the theoretical cumulative distribution function is plotted against the empirical cumulative distribution function. If the residuals are normally distributed, then the plot results in a straight line. In the Q-Q plot the quintiles of the standard normal distributed function is plotted against the quintiles of the empirical data. If the residuals are normally distributed, then the plot also results in a straight line.

Table 3 provides a summary of the outcomes of the tests performed with regards to the OLS assumptions. The results show that the primary problem with the analysis is the independence or error. Further investigation needs to be done in order to make the necessary adjustments to correct for this assumption. To correct for this the model specification needs to be adjusted to include (or exclude) independent variables that would provide independent error terms. I have chosen a combination of variables and sample that provide reasonable results that satisfies most OLS assumptions and provide an answer to the hypotheses presented in chapter 4.

Table 3

Summary of OLS assumptions

	Regression (7)	Regression (8)	Regression (9)	Regression (10)	Regression (11)	Regression (12)	Regression (13)	Regression (14)
linearity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
independence of errors	No	No	No	No	No	No	No	No
Expected value of residuals is zero	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
homogeneity of variance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Normal distribution of residuals	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OLS assumptions satisfied?	No	No	No	No	No	No	No	No

5.6 SUMMARY

In this chapter I discussed how the research is performed. I start with explaining the probit model in order to predict the expected credit ratings. This model contains a vector of variables based on firm characteristics which in prior research have proven to provide an indicator of firm bankruptcy risk. These variables are size, profitability, operating risk, asset specialization and future growth options. I then continue by discussing the metrics used to calculate accrual-based and real activity based earnings management, which follows the performance matched discretionary accrual formula discussed by Kothari et al. (2005) and the three real-activity based formulas mentioned by Alissa et al. (2013) and Cohen et al. (2008), which are abnormal levels of cash flow from operations due to accelerated timing of sales, abnormal levels of production costs by means of an increase in production and abnormal levels of discretionary expenses.. These metrics are then used the regress expected ratings with earnings management with the different periods as interaction effects. I also discussed the composition of the sample and the treatment of the outliers. The final sample contains 2017 firm year observations spread over four periods, the period before the passage of SOx ranging from 1995 till 1999, the scandal period 2000 and 2001, the period after the passage of SOx ranging 2002 till 2009 and the period after the passage of Dodd-Frank ranging from 2010 till 2015. I finalize by discussing the OLS assumptions for my test. All OLS assumption are met except for the independence or error. To correct for this the model specification needs to be adjusted to include (or exclude) independent variables that would provide independent error terms. Further investigation needs to be done in order to make the necessary adjustments to correct for this assumption.

CHAPTER 6 RESULTS

6.1 INTRODUCTION

In this chapter I discuss the results of the regression models presented in chapter 5. First the result of the descriptive statistics is presented for the variables most important to the empirically modeled expected credit ratings and thereafter the variables for the earnings management metrics. Thereafter the regression results are presented.

6.2 EMPIRICALLY MODELED 'EXPECTED' CREDIT RATING

I start by providing the descriptive statistics for the variables that are used to predict the expected credit rating per firm per fiscal year. Table 4, 5, 6 and 7 contain the descriptive statistics for the periods before the passage of SOx, the scandal period, after the passage of SOx and after the passage of Dodd-Frank. Variables sizebysale, profit, rdind, oprisk, rd, sga, tang and mtb are used to predict the expected credit rating splticrm2. Where splticrm2 is empirically modeled 'expected' S&P domestic long term issuer credit rating, sizebysale is the natural Log of sales, profit is operating income scaled by lagged assets, rdind equals 1 if R&D is not missing, and zero otherwise, oprisk is standard deviation of operating income scaled by lagged total assets, measured over the previous five years, rd is research & development expenses scaled by lagged assets, sga is selling, general and administrative expenses scaled by lagged assets, tang is net property, plant and equipment scaled by lagged assets and mtb is total assets minus book equity plus market equity over total assets. For a complete overview of the variables and how they are calculated see Appendix B.

The mean and median of sizebysale, which is the natural logarithm of the sales value per firm per fiscal year increased steadily over the 4 periods (preSOx 2.087, 2.097; SCA-period 2.103, 2.094; postSOx 2.165, 2.184; postDodd-Frank 2.204, 2.214).

Table 4

Descriptive statistics
Before the passage of SOx

	N	mean	p50	sd	min	max
splticrm2	377	11.9947	12	2.3812	1	15
sizebysale	377	2.08662	2.09674	0.1761	1.36784	2.37756
profit	364	0.66306	0.68662	0.0956	0.16804	0.7713
rdind	377	0.38196	0	0.4865	0	1
oprisk	206	0.03366	0.01638	0.0512	0	0.42631
rd	144	0.57879	0.5795	0.1399	0.053	0.79905

sga	227	0.79923	0.81897	0.0728	0.57299	0.92029
tang	376	0.98404	0.99787	0.0593	0.686	1.04526
mtb	261	2.4665	2.52504	0.4034	1.36006	2.91426

Where splticrm2 is expected S&P domestic long term issuer credit rating, sizebysale is the natural Log of sales, profit is operating income scaled by lagged assets, rdind equals 1 if R&D is not missing, and zero otherwise, oprisk is standard deviation of operating income scaled by lagged total assets, measured over the previous five years, rd is research & development expenses scaled by lagged assets, sga is selling, general and administrative expenses scaled by lagged assets, tang is net property, plant and equipment scaled by lagged assets and mtb is total assets minus book equity plus market equity over total assets.

The mean and median of profit, which is net income divided by the total of lagged assets per firm per fiscal year declined over the pre-SOx period (0.663, 0.687), scandal period (0.661, 0.680) and post-SOx (0.660, 0.692) to then increase in the post-Dodd-Frank period (0.692, 0.712). Rdind is a dummy variable in case the firm has reported research and development expenditure. The descriptive statistics show a steady increase of relevant firms that report research and development expenditure during the pre-SOx period (0.382, 0.000), scandal period (0.452, 0.000) and post-SOx (0.783, 1.000) to then increase in the post-Dodd-Frank period (0.846, 1.000).

Table 5

Descriptive statistics

Scandal period

	N	mean	p50	sd	min	max
splticrm2	115	10.4348	12	3.1515	1	15
sizebysale	115	2.10316	2.09445	0.1845	1.63767	2.37756
profit	109	0.66082	0.68013	0.1	0.13246	0.7713
rdind	115	0.45217	0	0.4999	0	1
oprisk	115	0.04139	0.02224	0.0545	0	0.34809
rd	53	0.58394	0.60741	0.1811	0.09627	0.81219
sga	81	0.80665	0.83246	0.0753	0.50872	0.92724
tang	114	0.95631	0.97033	0.0899	0.68137	1.04526
mtb	79	2.44432	2.49198	0.447	1.0533	2.91426

Where splticrm2 is expected S&P domestic long term issuer credit rating, sizebysale is the natural Log of sales, profit is operating income scaled by lagged assets, rdind equals 1 if R&D is not missing, and zero otherwise, oprisk is standard deviation of operating income scaled by lagged total assets, measured over the previous five years, rd is research & development expenses scaled by lagged assets, sga is selling, general and administrative expenses scaled by lagged assets, tang is net property, plant and equipment scaled by lagged assets and mtb is total assets minus book equity plus market equity over total assets.

The mean and median of oprisk, which is the standard deviation of operating income divided by the total of lagged assets of the past five years increased over the first three periods pre-SOx period (0.034, 0.016), scandal period (0.041, 0.022) and post-SOx (0.055, 0.040) and declined in the post-Dodd-Frank period (0.044, 0.027).

Table 6

Descriptive statistics
After the passage of SOx

	N	mean	p50	sd	min	max
splticrm2	359	8.59332	8	3.20118	2	15
sizebysale	359	2.16475	2.18378	0.15723	1.63864	2.37756
profit	351	0.66040	0.69228	0.12244	-0.24645	0.77130
rdind	359	0.78273	1	0.41296	0	1
oprisk	359	0.05476	0.03973	0.05067	0.00000	0.28652
rd	294	0.55495	0.58433	0.18314	-0.59901	0.91412
sga	346	0.80835	0.82476	0.07792	0.53402	0.93347
tang	359	0.91735	0.93206	0.07844	0.48850	1.04526
mtb	343	2.38956	2.40782	0.42131	-1.02876	2.91426

Where splticrm2 is expected S&P domestic long term issuer credit rating, sizebysale is the natural Log of sales, profit is operating income scaled by lagged assets, rdind equals 1 if R&D is not missing, and zero otherwise, oprisk is standard deviation of operating income scaled by lagged total assets, measured over the previous five years, rd is research & development expenses scaled by lagged assets, sga is selling, general and administrative expenses scaled by lagged assets, tang is net property, plant and equipment scaled by lagged assets and mtb is total assets minus book equity plus market equity over total assets.

The mean and median of rd, which is the total of research and development expenditure per firm per fiscal year increased in the scandal period (0.584, 0.607) compared to the pre-SOx period (0.579, 0.580), to then decline in the post-SOx period (0.555, 0.584) and increased again in the post-Dodd-Frank period (0.568, 0.566). The mean and median of sga, which is the total of selling, general and administrative expenditure per firm per fiscal year stayed steady through the four periods pre-SOx (0.799, 0.819), scandal period (0.807, 0.832), post-SOx (0.808, 0.825) and post-Dodd-Frank (0.818, 0.829). The mean and median of tang, which is the tangibility of assets calculated by dividing property, plant and equipment by lagged total assets declined over the pre-SOx (0.984, 0.998), scandal (0.956, 0.970) and post-SOx period (0.917, 0.932) and increased in the post-Dodd-Frank period (0.919, 0.925).

Table 7

Descriptive statistics
After the passage of Dodd-Frank

	N	mean	p50	sd	min	max
splticrm2	253	8.63636	9	2.89673	1	15
sizebysale	253	2.20408	2.21402	0.14127	1.65497	2.37756
profit	252	0.69173	0.71216	0.07788	0.29417	0.77130
rdind	253	0.84585	1	0.36181	0	1
oprisk	253	0.04408	0.02722	0.05262	0	0.35663
rd	233	0.56778	0.56614	0.15921	0	0.81883
sga	251	0.81827	0.82884	0.05869	0.64086	0.94308
tang	253	0.91899	0.92517	0.05622	0.76222	1.02210
mtb	253	2.50130	2.55361	0.36300	1.07149	2.91426

Where splticrm2 is expected S&P domestic long term issuer credit rating, sizebysale is the natural Log of sales, profit is operating income scaled by lagged assets, rdind equals 1 if R&D is not missing, and zero otherwise, oprisk is standard

deviation of operating income scaled by lagged total assets, measured over the previous five years, rd is research & development expenses scaled by lagged assets, sga is selling, general and administrative expenses scaled by lagged assets, tang is net property, plant and equipment scaled by lagged assets and mtb is total assets minus book equity plus market equity over total assets.

The mean and median of mtb, which is the market to book ratio per firm per year declined over the first three periods pre-SOx (2.467, 2.525), scandal (2.444, 2.492) and post-SOx period (2.390, 2.408) to then increase in the post-Dodd-Frank period (2.501, 2.554). Overall most of the variables are used to predict the expected ratings stayed steady or declined, or increased marginally during the first three periods but almost all variables increased in the post-Dodd-Frank period.

Table 8 shows the results for the distribution of the actual ratings compared to the expected ratings. 10.02% of the expected rating matched with the actual ratings per firm. 9.84% of the expected ratings were 1 hit from their actual ratings, 8.13% 2 hits from their actual ratings, 6.38% 3 hits from their actual rating and 6.43% 4 hits from their actual rating. In total this is more than 40% of the complete sample of firms that registered credit rating between 1995-2015.

Table 8

Distribution of actual rating variance from expected ratings.

Actual	Expected																
	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	
AAA	1.22%	0.00%	0.44%	0.03%	0.00%	0.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.98%
AA+	0.78%	0.00%	0.16%	0.03%	0.03%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.08%
AA	0.94%	0.00%	0.71%	0.02%	0.21%	0.54%	0.05%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.48%
AA-	1.84%	0.00%	0.14%	0.10%	0.06%	0.71%	0.05%	0.11%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.16%
A+	4.40%	0.00%	0.65%	0.08%	0.06%	1.81%	0.06%	0.05%	0.67%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.79%
A	7.02%	0.00%	0.27%	0.13%	0.21%	3.59%	0.11%	0.05%	1.41%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.81%
A-	5.98%	0.00%	0.03%	0.02%	0.06%	0.84%	0.13%	0.05%	1.35%	0.05%	0.00%	0.00%	0.06%	0.00%	0.00%	0.02%	8.59%
BBB+	7.92%	0.00%	0.02%	0.02%	0.00%	1.24%	0.11%	0.08%	2.46%	0.13%	0.03%	0.00%	0.05%	0.00%	0.00%	0.00%	12.05%
BBB	10.87%	0.00%	0.03%	0.00%	0.05%	0.86%	0.10%	0.10%	2.78%	0.21%	0.00%	0.19%	0.38%	0.00%	0.00%	0.00%	15.56%
BBB-	6.73%	0.00%	0.02%	0.05%	0.00%	0.21%	0.03%	0.06%	1.30%	0.32%	0.02%	0.27%	0.16%	0.00%	0.00%	0.00%	9.16%
BB+	3.60%	0.00%	0.02%	0.00%	0.00%	0.08%	0.00%	0.02%	1.05%	0.38%	0.06%	0.11%	0.38%	0.05%	0.00%	0.00%	5.75%
BB	3.75%	0.00%	0.00%	0.00%	0.00%	0.05%	0.00%	0.00%	0.62%	0.13%	0.03%	0.13%	0.38%	0.03%	0.00%	0.00%	5.11%
BB-	5.05%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.38%	0.08%	0.02%	0.08%	0.81%	0.00%	0.00%	0.00%	6.44%
B+	4.25%	0.00%	0.00%	0.00%	0.00%	0.03%	0.00%	0.00%	0.16%	0.02%	0.00%	0.02%	0.38%	0.02%	0.02%	0.00%	4.89%
B	1.71%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.06%	0.02%	0.00%	0.03%	0.08%	0.02%	0.02%	0.00%	1.94%
B-	1.17%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.03%	0.00%	0.00%	0.00%	1.22%
Total	67.24%	0.00%	2.49%	0.46%	0.68%	10.35%	0.63%	0.51%	12.40%	1.37%	0.16%	0.84%	2.71%	0.11%	0.03%	0.02%	100.00%

Hit ratio	1.22%	0.00%	0.71%	0.10%	0.06%	3.59%	0.13%	0.08%	2.78%	0.32%	0.06%	0.13%	0.81%	0.02%	0.02%	0.00%	10.02%
1 from hit	0.78%	0.16%	0.16%	0.14%	2.02%	0.95%	0.16%	2.56%	1.51%	0.40%	0.14%	0.46%	0.38%	0.03%	0.00%		9.84%
2 from hit	1.38%	0.03%	0.86%	0.84%	0.13%	1.29%	1.44%	0.19%	1.05%	0.40%	0.40%	0.05%	0.08%	0.00%			8.13%
3 from hit	1.87%	0.03%	0.81%	0.06%	0.05%	2.27%	0.08%	0.05%	0.81%	0.24%	0.05%	0.03%	0.03%				6.38%
4 from hit	4.40%	0.08%	0.08%	0.13%	0.71%	0.24%	0.00%	0.00%	0.76%	0.02%	0.00%	0.02%					6.43%
Total hits within 4 steps of actual rating																	40.79%

This table shows the distribution of the variances of the actual ratings from the expected ratings based on annual estimation per firm. Actual ratings are shown per row and expected ratings per column. The values represent the percentages of row and column combination hits. For example, 1.22% of all expected ratings have an actual rating of AAA and expected rating of AAA. Expected ratings are defined as the rating with the highest fitted probability from equation (1).

6.3 DESCRIPTIVE STATISTICS

In tables 10, 11, 12 & 13 I present the descriptive statistics of the independent variable diff, the variables for predicting splticrm2, the various dependent variables and the control variables before the passage of SOx (1995-1999), the period of major corporate scandals (2000 and 2001), after the passage of SOx (2002-2009) and after the passage of Dodd-Frank (2010-2015) respectively.

Table 9

Period	Number of observations where difference between expected and actual credit rating is no larger than 4 rating steps.
preSOx	369
Scandal	118
postSOx	369
postDodd	266
Grand Total	1122

In the pre-SOx period, there are 369 observations which have a difference between expected and actual credit ratings that is no larger than 4 rating steps, compared to 118 in the scandal period, 369 after the passage of SOX and 266 after the passage of Dodd-Frank.

The mean and median of the absolute value of discretionary accruals increased slightly (mean = 0.111, median = 0.077) in the scandal period compared to the period before the passage of SOx (mean = 0.101, median = 0.068), and thereafter decreased in the after the passage of SOx (mean = 0.107, median = 0.078) and Dodd-Frank periods (mean = 0.099, median = 0.066). The positive values of discretionary accruals show an almost straight line behavior over the period before the passage of SOx (mean = 0.101, median = 0.068), in the scandal period (mean = 0.095, median = 0.077), after the passage of SOx (mean = 0.105, median = 0.077) and after the passage of Dodd-Frank (mean = 0.095, median = 0.062).

Table 10

Descriptive statistics
Before the passage of SOx

	N	mean	p50	sd	min	max
diff	377	-2.95491	-3	1.0771	-4	-1
aac	377	0.00245	0.00697	0.1377	-0.328	0.31335
negaac	183	-0.1017	-0.06786	0.096	-0.328	-0.00015

posaac	194	0.10068	0.06778	0.0908	0.00151	0.31335
absaac	377	0.10118	0.06784	0.0933	0.00015	0.32802
acfo	377	-0.08622	-0.37526	1.0828	-1.324	3.66239
aprod	377	0.01934	0.01169	0.1127	-0.5607	0.50391
adiscexp	377	0.06975	0	1.475	-2.6153	5.01382
realaccm	377	0.00287	-0.40684	1.794	-3.1197	6.87071
lev	364	1.39753	1.45842	0.211	0.1415	1.60749
zscore	255	4.15596	4.26575	0.4506	2.42441	4.56818
extfin	377	0.18833	0	0.3915	0	1
bm	262	0.41461	0.3967	0.0912	0.25238	0.73526
retvol	261	1.64455	1.23744	1.3214	0.01414	4.41942
gdp	377	0.11911	0.23529	0.8397	-1.3187	1.07691
growth	294	-0.0084	-0.00663	0.0183	-0.127	0.09174
size	377	2.07737	2.0912	0.1762	1.35587	2.37756

Where diff is the dependent variable and defined as the difference between the actual credit rating and the expected credit rating, aac, negaac, posaac and absaac are the independent variables and are defined as the actual, negative, positive and absolute value of discretionary accruals. lev is the sum of long- and short-term debt scaled by lagged assets, zscore is a re-estimated version of Altman's (1968) Z-score, extfin is an indicator variable that equals one if the firm's free cash flow is less than -0.1, and 0 otherwise, bm is the book value to the total market value of the firm, retvol is the standard deviation of stock returns over the 60 months prior to the end of the year, growth is the percentage change in net sales from year t-2 to year t-1 and size is the natural log of net sales from year t-1.

The actual value of discretionary accruals seems to have decreased in the scandal period (mean = -0.011, median = 0.008) compared to the period before the passage of SOx (mean = 0.002, median = 0.007). Thereafter in increased after the passage of SOx (mean = 0.005, median = 0.007) and remained steady after the passage of Dodd-Frank (mean = 0.005, median = 0.011). The negative values of discretionary accruals increased during the scandal period (mean = -0.128, median = -0.078) compared to the period before the passage of SOx (-mean = 0.102, median = -0.068) to then have decrease after the passage of SOx (mean = -0.110, median = -0.090) and Dodd-Frank (mean = -0.105, median = -0.067). I will discuss what these figures mean in chapter 7 where I discuss the analysis of all the data.

Table 11

Descriptive statistics

Scandal period

	N	mean	p50	sd	min	max
diff	115	-2.98261	-3	1.1846	-4	-1
aac	115	-0.01133	0.00813	0.1491	-0.328	0.31335
negaac	55	-0.1277	-0.07839	0.114	-0.328	-0.00293
posaac	60	0.09534	0.0765	0.0829	0.00133	0.31335
absaac	115	0.11081	0.07694	0.0999	0.00133	0.32802
acfo	115	-0.30266	-0.65189	1.1006	-1.996	3.4577
aprod	115	0.06005	0.0157	0.1489	-0.3972	0.50391
adiscexp	115	0.28024	-0.15256	1.7425	-3.0352	4.52288
realaccm	115	0.03763	-0.6522	1.9313	-3.2894	7.7808

lev	114	1.38881	1.4925	0.2869	0.01379	1.60749
zscore	78	4.19129	4.34167	0.4112	2.36792	4.56818
extfin	115	0.27826	0	0.4501	0	1
bm	81	0.42146	0.40249	0.1139	0.18675	0.9494
retvol	82	2.16569	2.01084	1.5735	0.01414	4.41942
gdp	115	-1.65099	-0.59302	1.3436	-3.1162	0.81015
growth	113	-0.01121	-0.00529	0.0238	-0.0902	0.07495
size	114	2.08976	2.08674	0.19	1.59952	2.37756

Where diff is the dependent variable and defined as the difference between the actual credit rating and the expected credit rating, aac, negaac, posaac and absaac are the independent variables and are defined as the actual, negative, positive and absolute value of discretionary accruals. lev is the sum of long- and short-term debt scaled by lagged assets, zscore is a re-estimated version of Altman's (1968) Z-score, extfin is an indicator variable that equals one if the firm's free cash flow is less than -0.1, and 0 otherwise, bm is the book value to the total market value of the firm, retvol is the standard deviation of stock returns over the 60 months prior to the end of the year, growth is the percentage change in net sales from year t-2 to year t-1 and size is the natural log of net sales from year t-1.

The mean and median of the total value of real activity based earnings management increased in the scandal period (mean = 0.038, median = -0.652) and after the passage of SOx (mean = 0.931, median = 0883) compared to the period before the passage of SOx (mean = 0.003, median = -0.407). After the passage of Dodd-Frank it declined again (mean = 0.599, median = 0.270). The same applies for abnormal amount of production costs and discretionary spending before the passage of SOx (mean = 0.019, median = 0.012), during the scandal period (mean = 0.060, median = 0.016), after the passage of SOx (mean = 0.006, median = -0.000) and after the passage of Dodd-Frank (mean = 0.000, median = 0.001). Abnormal levels of cash flow decreased during the scandal period (mean = -0.303, median = -0.652) compared to the period before the passage of SOx (mean = -0.086, median = -0.375) to then decrease after the passage of SOx (mean = 0.236, median = -0.595) and increase after the passage of Dodd-Frank (mean = 0.324, median = 1.200).

Table 12

Descriptive statistics

After the passage of SOx

	N	**mean**	**p50**	**sd**	**min**	**max**
diff	359	-2.22006	-2	1.15262	-4	-1
aac	359	0.00453	0.00709	0.14182	-0.32802	0.31335
negaac	168	-0.10966	-0.08507	0.09513	-0.32802	-0.00007
posaac	191	0.10497	0.07742	0.09095	0.00079	0.31335
absaac	359	0.10716	0.07835	0.09283	0.00007	0.32802
acfo	359	0.23615	-0.59455	1.77611	-3.09605	3.54192
aprod	359	0.00561	-0.00046	0.11919	-0.50822	0.50391
adiscexp	359	0.68932	-0.24633	2.33501	-2.83471	4.82392
realaccm	359	0.93108	0.88298	2.78315	-4.73155	7.39048
lev	358	1.34793	1.44756	0.29533	-0.28393	1.60749

zscore	333	4.15853	4.28838	0.49736	1.34665	4.56818
extfin	359	0.06128	0	0.24018	0	1
bm	343	0.42441	0.41470	0.11255	-0.68076	1.36407
retvol	342	1.54602	1.13137	1.32539	0.01414	4.41942
gdp	359	-0.26600	-0.44053	1.37931	-2.48391	5.30745
growth	358	-0.00735	-0.00714	0.01990	-0.10739	0.09500
size	358	2.15745	2.17239	0.15984	1.60043	2.37756

Where diff is the dependent variable and defined as the difference between the actual credit rating and the expected credit rating, aac, negaac, posaac and absaac are the independent variables and are defined as the actual, negative, positive and absolute value of discretionary accruals. lev is the sum of long- and short-term debt scaled by lagged assets, zscore is a re-estimated version of Altman's (1968) Z-score, extfin is an indicator variable that equals one if the firm's free cash flow is less than -0.1, and 0 otherwise, bm is the book value to the total market value of the firm, retvol is the standard deviation of stock returns over the 60 months prior to the end of the year, growth is the percentage change in net sales from year t-2 to year t-1 and size is the natural log of net sales from year t-1.

Also, provided in table 10, 11, 12 & 13 is the descriptive statistics for the control variables used in the various regressions. The mean and median of lev, which is the leverage per firm per fiscal year calculated as the sum of long- and short-term debt scaled by total assets declined over the first three period pre-SOx (mean = 1.398, median = 1.458), scandal (mean = 1.389, median = 1.493) and post-SOx period (mean = 1.348, median = 1.448) to then increase in the post-Dodd-Frank period (mean = 1.370, median = 1.458). The mean and median of Z-Score, which is the calculation for the Altman Z-Score explained in chapter 5 increased in the scandal period (mean = 4.191, median = 4.342) compared to the pre-SOx period (mean = 4.156, median = 4.266) and declined in the post-SOx period (mean = 4.159, median = 4.288) to then increase again in the post-Dodd-Frank period (mean = 4.303, median = 4.394).

Table 13

Descriptive statistics
After the passage of Dodd-Frank

	N	mean	p50	sd	min	max
diff	253	-2.23715	-2	1.03082	-4	-1
aac	253	0.00496	0.01082	0.13597	-0.32802	0.31335
negaac	114	-0.10461	-0.06707	0.09671	-0.32802	-0.00057
posaac	139	0.09482	0.06190	0.08973	0.00018	0.31335
absaac	253	0.09923	0.06644	0.09288	0.00018	0.32802
acfo	253	0.32355	1.20046	1.86545	-3.06352	3.18689
aprod	253	-0.00003	0.00105	0.07735	-0.45978	0.37456
adiscexp	253	0.27587	-0.36851	2.35534	-3.78453	4.76275
realaccm	253	0.59939	0.26980	2.92916	-6.22837	6.50084
lev	253	1.36993	1.45801	0.26045	0.00702	1.60749
zscore	249	4.30324	4.39378	0.31984	2.66365	4.56818
extfin	253	0.03953	0	0.19523	0	1
bm	253	0.40572	0.39160	0.08075	0.23858	0.93328
retvol	252	1.85566	1.48386	1.43518	0.01414	4.41942

gdp	253	0.84022	0	2.07992	-0.93047	5.30745
growth	253	-0.00198	-0.00078	0.01873	-0.08801	0.09500
size	253	2.19961	2.20182	0.14375	1.67648	2.37756

Where diff is the dependent variable and defined as the difference between the actual credit rating and the expected credit rating, aac, negaac, posaac and absaac are the independent variables and are defined as the actual, negative, positive and absolute value of discretionary accruals. lev is the sum of long- and short-term debt scaled by lagged assets, zscore is a re-estimated version of Altman's (1968) Z-score, extfin is an indicator variable that equals one if the firm's free cash flow is less than -0.1, and 0 otherwise, bm is the book value to the total market value of the firm, retvol is the standard deviation of stock returns over the 60 months prior to the end of the year, growth is the percentage change in net sales from year t-2 to year t-1 and size is the natural log of net sales from year t-1.

The mean and median of extfin, which is a dummy variable if the firm's free cash flow is less than -0.1 indicates that the number of firms increased in the first two periods pre-SOx (mean = 0.188, median = 0.000) and in the scandal period (mean = 0.278, median = 0.000) and declined in the post-SOx (mean = 0.061, median = 0.000) and post-Dodd-Frank periods (mean = 0.040, median = 0.000). The mean and median of bm, which is the book-to-market ratio increased during the first three periods pre-SOx (mean = 0.415, median = 0.400), scandal (mean = 0.421, median = 0.402) and post-SOx period (mean = 0.424, median = 0.415) and declined in the post-Dodd-Frank period (mean = 0.406, median = 0.392). The mean and median of retvol, which is to control for volatility of the firm's reaction to stock price decline and calculated as the standard deviation of stock returns over the 60 months prior to the end of year -1 has increased in the scandal period (mean = 2.166, median = 2.010) compared to the pre-SOx period (mean = 1.645, median = 1.237) and declined in the post-SOx (mean = 1.546, median = 1.131) and post-Dodd-Frank period (mean = 1.856, median = 1.484). The mean and median of gdp, which the gross domestic product calculated for the United Stated declined in the scandal period (mean = -1.651, median = 0.593) compared to the pre-SOx period (mean = 0.119, median = 0.235) and increased during the post-SOx (mean = -0.266, median = -0.441) and post-Dodd-Frank period (mean = 0.840, median = 0.000). The mean and median of growth, which is the percentage change of net sales from year t-2 to t-1 increased in the scandal period (mean = -0.011, median = -0.005) compared to the pre-SOx period (mean = -0.008, median = -0.007) and declined in the post-SOx (mean = -0.005, median = -0.007) and post-Dodd-Frank period (mean = -0.002, median = -0.001). The mean and median of size, which is the natural logarithm of net sales of the past year increased over the four periods pre-SOx (mean = 2.077, median = 2.097), scandal (mean = 2.090, median = 2.087), post-SOx (mean = 2.157, median = 2.172) and post-Dodd-Frank (mean = 2200, median = 2.214).

6.4 RESULTS

This section the results from OLS regression equations 7 to 14 are presented which examine if the levels of earnings management (aac, negaac, posaac, absaac, acfo, aprod, adiscexp, realaccm) of firms that are close or to their expected rating (splticrm2) decreased after the passage of SOx and Dodd-Frank.

6.4.1 Hypothesis 1 & 3

The results from regressions 7, 8, 9 & 10 in table 14 show the association between deviation from the expected rating, earnings management and the periods before the passage of SOx (0), the scandal period (1), after the passage of SOx (2) and after the passage of Dodd-Frank (3). The results for the actual value of discretionary accruals indicate that before the passage of SOx the amount of discretionary accruals had less of an impact (coefficient = -0.405, p-value = 0.694) to reach an expected rating compared to the scandal period (coefficient = -0.274, p-value = 0.815). After the passage SOx the results indicate that this impact is less (coefficient = -0.430, p-value = 0.662) compared to the scandal period to then have more impact after the passage of Dodd-Frank (coefficient = 0.677, p-value = 0.502). The results for the negative values of discretionary accruals indicate that before the passage of SOx the amount of negative discretionary accruals had less of an impact (coefficient = 0.950, p-value = 0.726) to reach an expected rating compared to the scandal period (coefficient = -0.666, p-value = 0.821). After the passage SOx the results indicate that the impact is less (coefficient = -0.201, p-value = 0.939) compared to the scandal period to then have more impact after the passage of Dodd-Frank (coefficient = 2.221, p-value = 0.390). The results for the amount of positive discretionary accruals indicate that before the passage of SOx the amount of positive discretionary accruals had less of an impact (coefficient=-1.176, p-value = 0.627) to reach an expected rating compared to the scandal period (coefficient = 0.681, p-value = 0.822). After the passage SOx the results indicate that this impact is less (coefficient = 0.023, p-value = 0.992) compared to the scandal period to then have more impact after the passage of Dodd-Frank (coefficient = 3.434, p-value = 0.113). The results for the amount of absolute discretionary accruals indicate that before the passage of SOx the amount of absolute discretionary accruals had less of an impact (coefficient = -0.789, p-value = 0.602) to reach an expected rating compared to the scandal period (coefficient = 0.589, p-value = 0.728). After the passage SOx the results indicate that this impact has decreased (coefficient = -0.018, p-

value = 0.990) compared to the scandal period and the impact has decreased once more after the passage of Dodd-Frank (coefficient = 0.738, p-value = 0.604).

In chapter 7 I will further discuss what this could mean compared to previous literature.

Table 14

VARIABLES	(7) aac diff	(8) negaac diff	(9) posaac diff	(10) absaac diff
(xxx)aac	0.47901	-0.15354	-0.29119	-0.11184
	(0.60847)	(0.95093)	(0.88652)	(0.93383)
preSOx = 1	-0.05268	-0.07400	-0.13237	0.00164
	(0.76278)	(0.85466)	(0.68619)	(0.99428)
scandal = 1	-0.22218	-0.72631	-0.32750	-0.30176
	(0.22597)	(0.11039)	(0.36457)	(0.23326)
postSOx = 1	0.06762	-0.08559	-0.03123	0.07242
	(0.64104)	(0.81765)	(0.91496)	(0.72614)
postDodd = 1	-0.07031	0.23787	-0.48724*	-0.13525
	(0.61136)	(0.51928)	(0.09177)	(0.50669)
1.preSOx#(xxx)aac	-0.40473	0.94962	-1.17566	-0.78895
	(0.69411)	(0.72585)	(0.62687)	(0.60275)
1.scandal#(xxx)aac	-0.27384	-0.66639	0.68101	0.58936
	(0.81472)	(0.82067)	(0.82202)	(0.72795)
1.postSOx#(xxx)aac	-0.42946	-0.20071	0.02251	-0.01782
	(0.66178)	(0.93882)	(0.99164)	(0.99001)
1.postDodd#(xxx)aac	0.67681	2.22068	3.43362	0.73796
	(0.50182)	(0.39049)	(0.11274)	(0.60400)
lev	-0.27011	-0.37886	-0.31001	-0.07594
	(0.18922)	(0.28010)	(0.33928)	(0.69388)
zscore	-0.07489	-0.16540	-0.21542	-0.05805
	(0.54899)	(0.46783)	(0.25829)	(0.64801)
extfin = 1	0.17253	0.43232*	0.03106	0.17443
	(0.21491)	(0.06885)	(0.88075)	(0.21271)
bm	2.48154***	1.51224	3.08046***	2.45073***
	(0.00032)	(0.16491)	(0.00353)	(0.00037)
retvol	0.00377	-0.01279	0.00693	0.00602
	(0.87063)	(0.75246)	(0.83894)	(0.79632)
gdp	-0.02977	-0.10358***	-0.01925	-0.03122*
	(0.11042)	(0.00384)	(0.45974)	(0.09550)
growth	1.42350	2.44705	0.38307	1.62011
	(0.35736)	(0.39217)	(0.86219)	(0.29492)
size	-0.14339	-2.10858	0.34427	-0.23726
	(0.88470)	(0.23772)	(0.80035)	(0.81265)
Constant	-2.43307	2.82231	-2.92167	-2.53662
	(0.28089)	(0.49023)	(0.33350)	(0.26387)
Observations	857	413	444	857
R-squared	0.06062	0.10729	0.11847	0.05351
Number of gvkey	182	150	148	182

P-value in parentheses
***** p<0.01, ** p<0.05, * p<0.1**
This table presents coeffients and p-values of regressions (7), (8), (9) and (10), where diff is regressed on aac, negaac, posaac and absaac and intercepted by dummy variables for pre-SOx, Scandal, post-SOx and post-Dodd-Frank periods. diff proxies for the difference between actual and expected credit ratings and aac, negaac, posaac and abs for the normal, negative, positive and absolute values of discretionary accruals. preSOx, Scandal, postSOx and postDodd take on the value of 1 for the fiscal years spanning from 1995-1999, 200-2001, 2002-2009 and 2010-2015 respectively. *lev* is the sum of long- and short-term debt scaled by lagged assets, *zscore* is a re-estimated version of Altman's (1968) Z-score developed by Begley et al. (1996). *extfin* is an indicator variable that equals one if the firm's free cash flow is less than -0.1, and 0 otherwise, *bm* is the book value to the total market value of the firm, *retvol* is the standard deviation of stock returns over the 60 months prior to the end of the year, *growth* is the percentage change in net sales from year t-2 to year t-1 and *size* is the natural log of net sales from year t-1.

With regards to the control variables for regressions 7 to 10 results presented in table 14 show that there is an insignificant negative association between diff and lev (coefficient = -0.270; -0.379; -0.310; -0.076, p-value = 0.189; 0.280; 0.339; 0.694), zscore (coefficient = -0.075; -0.165; -0.215; -0.058, p-value = 0.549; 0.468; 0.258; 0.648), gdp (coefficient = -0.030; 0.104; -0.019; -0.031, p-value = 0.110; 0.004; 0.460; 0.096) and size (coefficient = -0.144; -2.109; 0.344; -0.237, p-value = 0.885; 0.238; 0.800), there is a significant positive association between diff and bm (coefficient = 2.482; 1.512; 3.080; 2.451, p-value = 0.000; 0.165; 0.004; 0.000) and insignificant positive associations between diff and extfin (coefficient = 0.173; 0.432; 0.031; 0.174, p-value = 0.215; 0.069; 0.881; 0.213), retvol (coefficient = 0.004; -0.013; 0.007; 0.006, p-value = 0.871; 0.752; 0.839; 0.796) and growth (coefficient = 1.424; 2.447; 0.383; 1.620, p-value = 0.357; 0.392; 0.862; 0.295). Take note that for regression 8 there is a negative association between diff and retvol (coefficient = -0.013, p-value = 0.752).

6.4.2 Hypothesis 2 & 4

The results for the amount of abnormal levels of cash flow from operations indicate that before the passage of SOx the amount of abnormal levels of cash flow from operations had more of an impact (coefficient = 0.156, p-value = 0.093) to reach an expected rating compared to the scandal period (coefficient = 0.108, p-value = 0.318). After the passage SOx the results indicate that this impact has increased (coefficient = 0.101, p-value = 0.180) compared to the scandal period and the impact has decreased once more after the passage of Dodd-Frank (coefficient = 0.008, p-value = 0.916). The results for the amount of abnormal levels of production expenses indicate that before the passage of SOx the amount of abnormal levels of production expenses had less of an impact (coefficient = -1.402, p-value = 0.392) to reach an expected rating compared to the scandal period (coefficient = -1.509, p-value = 0.394).

After the passage of SOx, the results indicate that this impact has decreased (coefficient = -2.227, p-value = 0.169) compared to the scandal period and the impact has decreased once more after the passage of Dodd-Frank (coefficient = -2.271, p-value = 0.193). The results for the amount of abnormal levels of discretionary expenses indicate that before the passage of SOx the amount of abnormal levels of discretionary expenses had more of an impact (coefficient = 0.051, p-value = 0.474) to reach an expected rating compared to the scandal period (coefficient = -0.007, p-value = 0.928). After the passage of SOx, the results indicate that this impact has increased (coefficient = 0.200, p-value = 0.001) compared to the scandal period and the impact has decreased once more after the passage of Dodd-Frank (coefficient = 0.119, p-value = 0.046). The results for the total amount of real activity based earnings management indicate that before the passage of SOx the amount of real activity based earnings management indicate had more of an impact (coefficient = 0.094, p-value = 0.113) to reach an expected rating compared to the scandal period (coefficient = 0.011, p-value = 0.877). After the passage of SOx, the results indicate that this impact has increased (coefficient = 0.179, p-value = 0.000) compared to the scandal period and the impact has decreased once more after the passage of Dodd-Frank (coefficient = 0.077, p-value =0.103).

Table 15

VARIABLES	(11) acfo diff	(12) aprod diff	(13) adiscexp diff	(14) realaccm diff
(xxx)real	-0.01400	2.05822	-0.05907	-0.05337
	(0.85368)	(0.23938)	(0.39940)	(0.29017)
preSOx = 1	-0.05068	-0.03983	-0.13428	-0.13803
	(0.77580)	(0.82140)	(0.44691)	(0.44109)
scandal = 1	-0.20322	-0.21451	-0.25661	-0.27022
	(0.27568)	(0.25087)	(0.16826)	(0.14889)
postSOx = 1	0.07382	0.09731	-0.08316	-0.11322
	(0.61612)	(0.50657)	(0.57314)	(0.44707)
postDodd = 1	-0.06015	-0.04377	-0.12994	-0.15767
	(0.67199)	(0.75408)	(0.34620)	(0.26586)
1.preSOx#(xxx)real	0.15551*	-1.40192	0.05140	0.09419
	(0.09291)	(0.39175)	(0.47367)	(0.11253)
1.scandal#(xxx)real	0.10792	-1.50909	-0.00706	0.01066
	(0.31758)	(0.39389)	(0.92805)	(0.87670)
1.postSOx#(xxx)real	0.10087	-2.27105	0.20032***	0.17930***
	(0.18020)	(0.16931)	(0.00101)	(0.00028)
1.postDodd#(xxx)real	-0.00784	-2.27057	0.11897**	0.07889
	(0.91604)	(0.19297)	(0.04587)	(0.10270)
Lev	-0.08638	-0.11365	-0.09646	-0.07000
	(0.64589)	(0.55048)	(0.60256)	(0.70458)

zscore	-0.03866	-0.05131	-0.08563	-0.07553
	(0.75290)	(0.68021)	(0.48196)	(0.53331)
extfin = 1	0.17299	0.18975	0.16575	0.18645
	(0.21126)	(0.17356)	(0.22591)	(0.17044)
bm	2.10541***	2.44223***	2.14664***	2.12801***
	(0.00216)	(0.00039)	(0.00165)	(0.00163)
retvol	0.00299	0.00184	0.00002	0.00208
	(0.89636)	(0.93675)	(0.99923)	(0.92682)
gdp	-0.02616	-0.02966	-0.03349*	-0.02843
	(0.15911)	(0.11346)	(0.06839)	(0.11968)
growth	1.28315	1.55964	1.28079	1.03403
	(0.40451)	(0.31542)	(0.39866)	(0.49395)
size	0.01330	-0.09762	-0.39956	-0.20228
	(0.98925)	(0.92271)	(0.68901)	(0.83799)
Constant	-3.03239	-2.84745	-1.86265	-2.36076
	(0.17836)	(0.21207)	(0.41199)	(0.29459)
Observations	857	857	857	857
R-squared	0.06987	0.05348	0.09005	0.09802
Number of gvkey	182	182	182	182

P-value in parentheses

***** p<0.01, ** p<0.05, * p<0.1**

This table presents coeffients and p-values of regressions (11)(12)(13) and (14), where diff is regressed on acfo, aprod, adiscexp and realaccm and intercepted by dummy variables for pre-SOx, Scandal, post-SOx and post-Dodd-Frank periods. diff proxies for the difference between actual and expected credit ratings and acfo, aprod, adiscexp and realaccm for abnormal cash flow from operations, abnormal productions expenses, abnormal discretionary expenses and the sum of these three variables. preSOx, Scandal, postSOx and postDodd take on the value of 1 for the fiscal years spanning from 1995-1999, 200-2001, 2002-2009 and 2010-2015 respectively. lev is the sum of long- and short-term debt scaled by lagged assets, zscore is a re-estimated version of Altman's (1968) Z-score developed by Begley et al. (1996). extfin is an indicator variable that equals one if the firm's free cash flow is less than -0.1, and 0 otherwise, bm is the book value to the total market value of the firm, retvol is the standard deviation of stock returns over the 60 months prior to the end of the year, growth is the percentage change in net sales from year t-2 to year t-1 and size is the natural log of net sales from year t-1.

The control variables for regressions 10 to 14 results presented in table 15 show that similar to the regressions for accrual based earnings management there is an insignificant negative association between diff and lev (coefficient = -0.086; -0.114; -0.096; -0.070, p-value = 0.646; 0.550; 0.603; 0.705), zscore (coefficient = -0.039; -0.051; -0.086; -0.076, p-value = 0.753; 0.680; 0.482; 0.533), gdp (coefficient = -0.026; -0.030; -0.033; -0.028, p-value = 0.159; 0.113; 0.068; 0.120) and size (coefficient = 0.0133; -0.098; -0.400; -0.202, p-value = 0.989; 0.923; 0.690; 0.838), there is a significant positive association between diff and bm (coefficient = 2.105; 2.442; 2.147; 2.128, p-value = 0.896; 0.937; 0.999; 0.927) and insignificant positive associations between diff and extfin (coefficient = 0.173; 0.190; 0.166; 0.186, p-value = 0.211; 0.174; 0.226; 0.170), retvol (coefficient = 0.003; 0.002; 0.000; 0.002, p-value = 0.896; 0.937;

0.999; 0.927) and growth (coefficient = 1.283; 1.560; 1.281; 1.034, p-value = 0.405; 0.315; 0.400; 0.494).

6.5 SUMMARY

In this chapter the descriptive statistics and main results of the regressions are presented as discussed in chapter 5. The overall results show a decrease of accrual based earnings management after the passage of SOx compared to the scandal period and an increase of accrual base earning management after the passage of Dodd-Frank. The results also show that the real activity based earnings management has increased after the passage of SOx compared to the scandal period and decreased after the passage of Dodd-Frank. In chapter 7 I will further analyze these results.

CHAPTER 7 ANALYSIS

7.1 INTRODUCTION

In this chapter the results presented in chapter 6 are further analyzed. The results are compared to literature presented in chapters 2 and 3, and compared to expectations set in chapters 4 and 5.

7.2 HYPOTHESIS 1 & 3

The results presented in section 6.4.1 indicate that the amount of accrual-based earnings management for firms near an expected credit rating has decreased after the passage of SOx. This implies that less accrual based earnings management is used in order to obtain an expected credit rating after the passage of SOx. Therefore, the first hypothesis could be accepted if all results were statistically significant and all OLS assumptions were accepted. Since this is not the case the first hypothesis cannot be accepted as having a statistically significant result. The results do give an indication that if statistically significant the hypothesis would be accepted. This is consistent with prior research, specifically Alissa et al. (2013) and Cohen et al. (2008). When analyzing the negative, positive and absolute values of discretionary accruals in the scandal period and the post-SOx period this conclusion seems to be enhanced. The results for accrual-based earnings management after the passage of Dodd-Frank indicate that more earnings management has taken place after the legislation. This is not in line with expectations and therefore if all results were statistically significant and all OLS assumptions were accepted the third hypothesis would be rejected. It is difficult to find prior research why such a large deviation in the results has taken place. Possible reasons can be the large amount of adjustments to credit ratings that have taken place after the global financial crisis or bias in the sample that skews the results after the passage of Dodd-Frank. After analyzing the sample indeed more credit rating adjustment have taken place after the passage of Dodd-Frank. I could not find any particular bias in the sample that skew the results after the passage of Dodd-Frank. Most of the results from this test are not statistically significant but do give an indication of the development of the use of accrual-based earnings management in order to obtain an expected credit rating over the periods.

7.3 HYPOTHESIS 2 & 4

The results presented in section 6.4.2 indicate that real activity based earnings management for firms near an expected credit rating has increased after the passage of SOx and therefore if all results were statistically significant and all OLS assumptions were accepted the second hypothesis would be rejected. Real activity based earnings management for firms near an expected credit rating has decreased after the passage of Dodd-Frank according to the results and therefore should accept the fourth hypothesis if all results were statistically significant and all OLS assumptions were accepted. This can be an indication as concluded by Cohen et al. (2008) that real activity based earnings management was used as a substitute for accrual based earnings management after the passage of SOx. When analyzing the specific methods of real activity based earnings management it appears that reducing discretionary expenses is by far the most popular form of real activity based earnings management after the passage of SOx compared to accelerating the timing of sales or reporting lower cost of goods sold by increasing production. This is a reasonable conclusion as it is easier to hold off starting a new research & development project or reduce advertising expenses or selling, general and administrative expenses than it would be to increase production or accelerate sales. The reverse trend after the passage of Dodd-Frank is a bit more difficult to explain. I could not find prior research that explains this occurrence. It can be related to a change in behavior of credit rating agencies which caused a lot of ratings to be adjusted, or it can be related to changes in capital structure due to the financial crisis of 2008-2009 or unknown reasons for returning to accrual-based earnings management after the passage of Dodd-Frank. Further research needs to be done to know what exactly the reason is for this occurrence.

7.6 SUMMARY

If all results were statistically significant and all OLS assumptions accepted the first and fourth hypotheses would be accepted and the second and third rejected. It appears that due to the passage of SOx accrual-based earnings management has been substituted by real activity based earnings management similar to prior research done by Zang (2012). The most popular form of real activity based earnings management is the reduction of discretionary expenses. After the passage of Dodd-Frank this behavior seems to reverse. Prior research does not mention this occurrence. Reasons can be the large amount of ratings changes that took place

after the financial crisis of 2008-2009, changes in capital structure due to the financial crisis. Further research needs to be done to know what exactly is the reason for this occurrence.

CHAPTER 8 CONCLUSIONS

8.1 INTRODUCTION

In addition to meeting and beating analyst forecasts in order to reach earnings benchmarks prior research by Graham and Harvey (2001) indicates that managers apply similar behavior to meeting and beating an expected credit rating. Research to date has examined if indeed earnings management activities is associated with obtaining an expected credit rating (Alissa et al. 2013). This research follows up by examining if regulation has the expected impact in reducing these earning management activities. In this chapter I finalize the thesis by answering the research question 'Did the passage of the Sarbanes-Oxley Act (2002) and the Investor Protection and Securities Reform Act (2010) lead to firms managing their earnings less to obtain an expected credit rating?'.

8.2 MAIN CONCLUSIONS

As expected levels of accrual-based earnings management have decreased after the passage of SOx and levels of real-activity based earnings management have increased. SOx is aimed at improving the accuracy and reliability of corporate disclosure. The reduction of accrual-based earnings management in order to obtain an expected credit rating does indicate that the regulation was successful. The increase of real-activity based earnings management indicates that firms have substituted accrual-based earnings management for real-activity based earnings management as concluded by prior research. This development works counter to the aim of the legislation so minor adjustments need to be made if the aim is also to reduce real-activity based earnings management. If these results were statistically significant it provides evidence that the passage of SOx had some desired effects on the management of earnings with the goal of obtaining an expected credit rating. Not in line with expectations, after the passage of Dodd-Frank levels of accrual based earnings management has increased compared to the SOx period and levels of real activity based earnings management have decreased. Because these results are insignificant and there is no empirical evidence that explain these results after the passage of Dodd-Frank I conclude that results are inconclusive. Change in behavior of rating agencies after the financial crisis in 2008-2009 can be the reason for the deviation in the results compared to the SOx period. Further research needs to be done to conclude if Dodd-Frank has the desired results on the management of earnings in order to obtain an expected credit rating. As these results are not statistically significant I determine

that the answer to the main research question if the passage of the Sarbanes-Oxley Act (2002) and the Investor Protection and Securities Reform Act also known as Dodd-Frank (2010) has led to firms managing their earnings less in order to obtain an expected credit rating is inconclusive. If the results were statistically significant and all OLS assumptions accepted then the research question can be answered as the passage of the Sarbanes-Oxley Act (2002) leading to less accrual based earnings management to obtain an expected credit rating, in the case of real-activity based earnings management the regulation did not manage to reduce the activity in order to obtain an expected credit rating. Dodd-Frank (2010) also did not manage to lessen accrual-based earnings management compared to the SOx period but this could be due to alternative reasons.

8.3 LIMITATIONS

A limitation on this research is that an empirically modeled expected credit rating is used as a proxy for an expected credit rating for firms. In practice, management would apply qualitative measures as well as quantitative measures to come to an expected credit rating. Changes in behavior of credit rating agencies as a result of regulation like Dodd-Frank is not part of this research and therefore also a limitation on the results. Changes in practices, like unsolicited ratings are also not part of this thesis. These changes in behavior and practices might skew results after the passage of that regulation. The impact of the reversal of accruals is not part of this thesis as this is difficult to predict. The thesis also excludes the impact of equity based compensation as an incentive for earnings management which is an important part of similar research done by Cohen et al. (2008).

8.4 SUMMARY

Regarding the main research question ‘Did the passage of the Sarbanes-Oxley Act (2002) and the Investor Protection and Securities Reform Act also known as Dodd-Frank (2010) lead to firms managing their earnings less in order to obtain an expected credit rating?’, this thesis provides results that indicate that indeed firms manage earnings less after the passage of the Sarbanes-Oxley Act (2002) to obtain an expected credit rating. Results indicate that firms manage earnings more after the passage of the Investor Protection and Securities Reform Act in 2010. As these results are not statistically significant I determine that the answer to the main research question if the passage of the Sarbanes-Oxley Act (2002) and the Investor

Protection and Securities Reform Act also known as Dodd-Frank (2010) has led to firms managing their earnings less in order to obtain an expected credit rating is inconclusive. If the results were statistically significant and all OLS assumptions accepted then the research question can be answered as the passage of the Sarbanes-Oxley Act (2002) leading to less accrual based earnings management to obtain an expected credit rating, in the case of real-activity based earnings management the regulation did not manage to reduce the activity in order to obtain an expected credit rating. Dodd-Frank (2010) also did not manage to lessen accrual-based earnings management compared to the SOx period but this could be due to alternative reasons. Further research needs to be done to confirm this result as this test did not control for changes in credit rating agency behavior after the passage of Dodd-Frank. Most results are not statistically significant to provide robust evidence of the impact of regulations on earnings management to obtain an expected credit rating.

REFERENCES

Alessi, C., (2012). The Credit Rating Controversy. Campaign 2012. *Council on Foreign Relations*.

Ali, A., & Zhang, W., (2008) *Proximity to Broad Credit Rating Change and Earnings Management*. Available at SSRN: https://ssrn.com/abstract=1163003.

Alissa, W., Bonsall, S. B., Koharki, K., & Penn, M. W. (2013). Firms' use of accounting discretion to influence their credit ratings. *Journal of Accounting and Economics, 55*(2-3), pp. 129-147.

Altman, E. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance, 23*(4), pp. 589-609.

Ball, R., & Shivakumar, L. (2006). The role of accruals in asymmetrically timely gain and loss recognition. *Journal of Accounting Research, 44*(2), pp. 207-242.

Bargeron, L. L., Lehn, K. M., & Zutter, C. J. (2010). Sarbanes-Oxley and corporate risk-taking. *Journal of Accounting and Economics*, 49(1), pp. 34-52.

Begley, J., Ming, J., & Watts, S. (1996). Bankruptcy Classification Errors in the 1980s: An Empirical Analysis of Altaian's and Ohlson's Models. *Review of Accounting Studies, 1*(4), pp. 267-284.

Bhojraj, S., Hribar, P., Picconi, M., & McInnis, J. (2009). Making Sense of Cents: An Examination of Firms That Marginally Miss or Beat Analyst Forecasts. *The Journal of Finance, 64*(5), pp. 2361-2388.

Boot, A.W.A., Milbourn, T. T., & Schmeits, A. (2006). Credit Ratings as Coordination Mechanisms. *The Review of Financial Studies, 19*(1), pp. 81-118.

Brown, L. (2001). A Temporal Analysis of Earnings Surprises: Profits versus Losses. *Journal of Accounting Research, 39*(2), pp. 221-241.

Brown, P. J. (2006). *An introduction to the bond markets.* Wiley finance (Wiley finance series). Chichester, England: John Wiley & Sons.

Brown, L., & Caylor, M.L. (2005). A Temporal Analysis of Quarterly Earnings Thresholds: Propensities and Valuation Consequences. *The Accounting Review, 80*(2), pp. 423-440.

Burnie, D. A., & Langsam, S. A. (2004). How SOX affects investing through credit rating agencies. *Journal of Corporate Accounting & Finance, 15*(6), pp. 49-56.

Coffee, J.C. (2009). *Ratings Reform: The Good, The Bad, and the Ugly*. Columbia Law and Economics Working Paper No. 375; ECGI - Law Working Paper No. 162/2010. Retrieved from: https://ssrn.com/abstract=1650802

Cohen A., Dey A. & Lys, T. (2008). Real and Accrual-Based Earnings Management in the Pre- and Post-Sarbanes-Oxley Periods. *The Accounting Review May 2008, Vol. 83, No. 3* (May 2008) pp. 757-787

Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1995). Detecting earnings management. *The Accounting Review, 70*(2), pp. 193-225.

Engel, E., Hayes, R. M., & Wang, X. (2007). The Sarbanes–Oxley Act and firms' going-private decisions. *Journal of Accounting & Economics*, 44(1/2).

Farrel, G. (2005). *America Robbed Blind.* Wizard Academy Press. Austin, Texas.

Gordon, G (2013). *Industry wrote provision that undercuts credit-rating overhaul.* McClatchy DC. Retrieved from: http://www.mcclatchydc.com/news/nation-world/national/economy /article24751870.html

Government Finance Officers Association (2015). *Government Finance Officers Association Best Practice 2015.* Retrieved from: http://www.gfoa.org/best-practices.

Graham, J. R., & Harvey, C. R. (2001). The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics, 60*(2-3), pp. 187-243.

Graham, J. R., Harvey, C. R., & Rajgopal, S. (2005). The economic implications of corporate financial reporting. *Journal of Accounting and Economics, 40*(1-3), pp. 3-73.

Gunny, K. A., (2005). *What are the consequences of real earnings management?* University of California, Berkeley. Retrieved from: http://w4.stern.nyu.edu/accounting/docs/ speaker_papers/spring2005/Gunny_paper.pdf

Harper, S. (2011). Credit Rating Agencies Deserve Credit for the 2007-2008 Financial Crisis: An Analysis of CRA Liability Following the Enactment of the Dodd-Frank Act. *Washington And Lee Law Review, 68*(4), pp. 1925-1972.

Healy, P. M., & Wahlen, J. M. (1999). A review of the earnings management literature and its implications for standard setting. *Accounting Horizons, 13*(4), pp. 365-383.

Hovakimian, A., Kayhan, A., and Titman A. (2009). *Credit Ratings Targets*. Retrieved from: SSRN: https://ssrn.com/abstract=1098351 or http://dx.doi.org/10.2139/ssrn.1098351

International Accounting Standards Board. (2012). *The conceptual framework for financial reporting 2011.*

Hill, R. C., Griffiths, W. E., & Lim, G. C. (2012). *Principles of econometrics* (4th ed., International student version.). Hoboken, NJ: Wiley.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), pp. 305-360.

Jensen, M. C. (2005). Agency Costs of Overvalued Equity. *Financial Management*, 34(1), pp. 5-19.

Kisgen, D. J. (2006). Credit ratings and capital structure. *Journal of Finance 61*(3), pp. 1035-1072.

Kisgen, D. J. (2009). Do Firms Target Credit Ratings or Leverage Levels? *Journal Of Financial And Quantitative Analysis, 44*(6), pp. 1323-1344.

Kreps, D. M. (1990). A course in microeconomic theory. New York etc.: *Harvester Wheatsheaf*.

Linsley, C., & Linsley, C. (2008). Impact of the Sarbanes-Oxley Act upon management: a behavioural discussion. *Managerial Auditing Journal*, 23(4), pp. 313-327.

Lucas, N. (2004). An Interview with United States Senator Paul S. Sarbanes. *Journal Of Leadership & Organizational Studies, 11*(1), 3-8.

Obama's Financial Reform Plan: The Condensed Version. (2009) *Wall Street Journal*. Retrieved from: http://blogs.wsj.com/washwire/2009/06/17/obamas-financial-reform-plan-the-condensed-version/

Rhee, R. J. (2015). Why Credit Rating Agencies Exist. *Economic Notes, 44*: pp. 161–176.

Ronen, J., & Yaari, V. (2008). *Earnings management: Emerging insights in theory, practice, and research* (1. Aufl. ed.). New York, NY: Springer.

Roychowdhury, S. (2006). Earnings management through real activities manipulation. *Journal of Accounting & Economics, 42*(3), pp. 335-370.

Securities and Exchange Commission. (2015). *Annual Report on Nationally Recognized Statistical Rating Organizations.* Retrieved from: https://www.sec.gov/ocr/reportspubs/annual-reports/2015-annual-report-on-nrsros.pdf

Securities and Exchange Commission. (2003). *Report on the Role and Function of Credit Rating Agencies in the Operation of the Securities Markets.* Retrieved from: https://www.sec.gov/about/laws/soa2002.pdf

Sinclair, T.J. (2005). *The New Masters of Capital: American Bond Rating Agencies and the Politics of Creditworthiness.* Ithaca, New York: Cornell University Press. ISBN 978-0801474910.

Sprengers, M. (2006). *Bond rating classification. A probabilistic Fuzzy approach.* Master's thesis, Erasmus University Rotterdam.

Torres, D. L. (2012). Dodd-Frank Theoretically Unplugged. *SAM Advanced Management Journal (07497075), 77*(4), pp. 19.

Zang, A. Y. (2012). Evidence on the Trade-Off between Real Activities Manipulation and Accrual-Based Earnings Management. *The Accounting Review, 87(*2), pp. 675-703.

Zhang, I. X. (2007). Economic consequences of the Sarbanes–Oxley Act of 2002. *Journal of Accounting & Economics, 44*(1/2).

APPENDIX A LITERATURE TABLE

Authors	Object of study	Sample (period, size, country)	Methodology	Results
Alissa, Bonsall, Koharki and Penn (2013)	Examines whether firms that deviate from an empirically modeled (‘‘expected’’) credit rating engage in earnings management activities, as measured by abnormal accruals and real activities earnings management.	Period: 1985 - 2010 Size: 23909 firm-year observations with firm-level credit ratings from Compustat.	- Calculate expected credit ratings using a model developed by Hovakimian et al. (2009). - Identify firms that deviate from expected credit rating. - identify rating deviations that exhibit mean reversion using the standard time-series Dickey-Fuller tests.	- statistically significant negative relation between rating deviations and income-increasing earnings management activities. - statistically significant positive relation between rating deviations and income-decreasing earnings management activities. - earnings management activities enhance the mean reversion of rating deviation
Hovakimian (2009)	Examine how firms target their credit rating and how their ratings targets influence their decision making.	Period: 1985 - 2006 Size: 64705 firm-year observations including 14364 observations with credit ratings	- examine the determinants of target debt ratios using regressions of observed debt ratios.	- achieving a high credit rating requires a large amount of equity to be added to the capital structure.

		from Compustat.	- estimate regressions of the firm's credit ratings based on the same characteristics.	- only firms that have low bankruptcy risk target high credit ratings because of the cost of having a large amount of equity in the capital structure. Firms with higher market-to-book rations tend to have higher ratings - firms make corporate financial choices that offset shocks that move them away from their target capital structure.
Graham & Harvey (2001)	A comprehensive survey on current practices in capital budgeting, cost of capital and capital structure.	- approximately 4440 firms and 392 chief financial officers of companies in the U.S. and Canada.	- review of existing literature. - circulate draft survey to prominent academics for feedback. - sought advice from marketing research experts on survey design and execution.	- small firms are less sophisticated when it comes to evaluating risky projects. - financial flexibility and credit ratings are the most important debt policy factors.

			- beta test at FEI and Duke University. - Duke University and FEI sent out final surveys.	- relatively weak support for many capital structure theories.
Cohen, Dey and Lys (2008)	- Examine whether the period immediately preceding the passage of SOx had widespread increases in earnings management activities or if it was isolated to a few high-profile cases. - Examine if the passage of SOx led to a reduction in earnings management activities.	Period: 1987 - 2005 Size: 87217 firm-year observations from Compustat. - nonfinancial firms with at least 8 observations per two-digit SIC grouping per year. -compensation hypothesis is tested from 1992 - 2005 with 31668 firm-year observations.	- Calculate the modified Jones model (Jones 1991) cross-sectionally as described in Dechow et al. (1995) - repeat using the performance-matched discretionary accruals from Kothari et al. (2005). - Calculate proxies for real-activity based earnings management following Roychowdhury (2006)	- accrual-based earnings management increased steadily from 1987 until the passage of SOx in 2002 followed by a significant decline after the passage of SOx - levels of real-activity based earnings management declined prior to the passage of SOx and increased significantly after the passage of SOx - earnings management activities were significantly higher in the period immediately preceding SOx

Kothari, Leone and Wasley (2005)	To examine the specification and power of performance-based discretionary accrual measures across a wide variety of settings found in accounting research.	Period: 1962 - 1999 Size: 23909 firm-year observations with firm-level credit ratings from Compustat.	- estimate the difference between the Jones Model discretionary accrual and corresponding discretionary accrual for a performance matched firm.	- discretionary accruals estimated using the Jones or the modified-Jones model adjusted for a performance-matched firm's discretionary accrual is the best measures of discretionary accruals across a wide variety of settings found in accounting research.

APPENDIX B SUMMARY OF TITLES OF SOX AND DODD-FRANK

United States Congress. (2002). H.R.3763 - Sarbanes-Oxley Act of 2002.	Title I: establishes the Public Firm Accounting Oversight Board to oversee the audit of public companies in order to protect the interests of investors and further the public interest in the preparation of accurate and independent audit reports. Duties of the board consist of registering public accounting firms, establishing or adopting standards related to the preparation of audit reports, define processes and procedures and enforce compliance with regards to SOx. Title II: limits conflicts of interest. This title establishes standards for external auditor independence. It also entails sections on new auditor approval requirements, audit partner rotation and audit reporting requirements. It also restricts audit companies from providing non-audit services to the same client. Title III: mandates senior executives to take individual responsibility for the accuracy and completeness of corporate financial reporting. Title IV: enhances the reporting requirements for financial transactions. It introduces requirements for off-balance sheet transactions, pro-forma figures and stock transactions of corporate officers. This provision also requires the audit and reporting of internal controls for assuring the accuracy of financial reports and disclosures. Title V: introduces a code of conduct for securities analysts and requires disclosure of any conflicts of interest. Title VI: defines condition under which an analyst can be barred from practicing as a broker, advisor or dealer. Title VII: requires the comptroller general and the SEC to perform various studies and report their findings. Title VIII: describes specific criminal penalties for manipulating, destruction or alteration of financial records or other interference with investigations. It also provides protection to whistle-blowers.

	Title IX: increases criminal penalties associated with white-collar crimes and conspiracies. It specifically adds failure to certify corporate financial reports as a criminal offense. Title X: states that the chief financial officer should sign the firm's tax return. Title XI: identifies corporate fraud and records them as criminal offenses.
United States Congress. (2010). H.R.4173 - Dodd-Frank Wall Street Reform and Consumer Protection Act.	Title I: The Financial Stability Act of 2010 aims at monitoring systematic risk and researching the state of the economy. The Financial Stability Oversight Council (FSOC) and the Office of Financial Research (OFR) were created to carry out this task. Title II: The Orderly Liquidation Authority expanded laws on liquidation of federally regulated banks. Title III: The Enhancing Financial Institution Safety and Soundness Act of 2010 is aimed at streamlining banking regulation. Title IV: The Private Fund Investment Advisers Registration Act of 2010 expands laws on the registry of investment advisors. Title V: The Federal Insurance Office Act of 2010 aims at monitoring all aspects of the insurance industry. Title VI: The Bank and Savings Association Holding Company and Depository Institution Regulatory Improvements Act of 2010 aims at reducing the amount of speculative investments on the balance sheets of large firms. Title VII: The Wall Street Transparency and Accountability Act of 2010 aims at regulating the over-the-counter swaps market. Title VIII: The Payment, Clearing, and Settlement Supervision Act of 2010 aims at reducing systematic risk for systemically important financial organizations and institutions. Title IX: The Investor Protection and Securities Reform Act of 2010 aims at revising the power and structure of the SEC, credit rating agencies and relationships between customers and broker-dealers. Title X: The Consumer Financial Protection Act of 2010 aims at regulating consumer financial products and services.

	Title XI: The Federal Reserve System Provisions is aimed at raising standard for institutions that the FED supervises. Title XII: The Improving Access to Mainstream Financial Institutions Act of 2010 is aimed at encouraging people with lower to medium income to participate in the financial system. Title XIII: The Pay It Back Act aims at reducing the deficit. Title XIV: Mortgage Reform and Anti-Predatory Lending Act aims at improving data collection for mortgage lenders to provide mortgages that are likely to be paid. Title XV: Contains various provisions on restrictions on loans issued by the International Monetary Fund. Title XVI: Section 1256 Contracts aims at tax treatment for regulated futures contracts.

APPENDIX C VARIABLE LIST

Variable name	**Name**	**Description**
Panel A: Expected credit rating		
mtb	Proxy for Market valuation	Total assets minus book equity plus market equity over total assets. Calculation: mtb=prcc_f*csho/ceq
oprisk	Operating risk	Standard deviation of operating income scaled by lagged total assets, measured over the previous five years. Calculation: oprisk = rowsd(L(1/5).profit)
profit	Proxy for Profitability	Operating income scaled by lagged assets. Calculation: profit=ni/lag_at
rd	Proxy for Growth and investment opportinity	Research & development expenses scaled by lagged assets. Calculation: rd=xrd/sale
rdind	Proxy for R&D indicator	Equals 1 if RD is not missing, and zero otherwise. Calculation: rdind
sga	Proxy for Selling, general and administrative expenses	Selling, general and administrative expenses scaled by lagged assets. Calculation: sga=xsga/sale
sizebysale	Proxy for Size	Natural Log of sales. Calculation: sizebysale=ln(sale)
tang	Proxy for Asset tangibility	Net property, plant and equipment scaled by lagged assets. Calculation: tang=ppegt/at
Panel B: Accrual-based earnings management		
acc	Proxy for total accruals	Delta of non-cash current assets minus the delta of current liabilities minus the current portion of long-term debt, minus depreciation and amortization, scaled by lagged total assets. Calculation: acc=((d.act)-(d.che)-(d.lct)+(d.dlc)-(d.dp))/lag_at
dsal	Delta sales	Delta sales minus delta receivables scaled by lagged assets. Calculation: dsal=((d.sale)-(d.rect))/lag_at
inverse_assets	Inverse of lagged assets	Inverse of lagged assets. Calculation: inverse_assets=1/lag_at
ppeg	Lagged property plant and equipment	Net property, plant and equipment scaled by lagged assets. Calculation: ppeg=ppegt/lag_at
roa	Return on assets	Net income (loss) scaled by lagged assets. Calculation: roa=ni/lag_at

Panel C: Real-activity based earnings management		
n1cfo	Proxy for total cash flow out from operations	Net cash flow minus extraordinary Items and discontinued Operations divided by lagged assets. Calculation: n1cfo=(oancf-xidoc)/lag_at
n1dsal	Delta sales scaled by lagged assets	Delta sales divided by lagged assets. Calculation: n1dsal=(d.sale)/lag_at
n1sal	Sales scaled by lagged total assets	Sales divided by lagged total assets. Calculation: n1sal=sale/lag_at
n2lag_sales	Lagged sales scaled by lagged total assets	Lagged sales divided by lagged total assets. Calculation: n2lag_sales=l.sale/lag_at
n2prod	Proxy for total production expenses	Cost of goods sold plus delta sales divided by lagged assets. Calculation: n2prod=(cogs+d.invt)/lag_at
n3discexp	Proxy for total discretionary expenses	Administrative cost plus research & development costs plus selling, general & administrative expenses divided by lagged assets. Calculation: n3discexp=(xad+xrd+xsga)/lag_at
Panel D: Control variables		
bm	Book-to-market ratio	book equity divided by market equity. Calculation: bm=ceq/(prcc_f*csho)
extfin	External financing	Indicator variable that equals one if firm free cash flow is less than -0.1, 0 otherwise. Calculation: fcf=ib+dp-dv-capx
growth	Growth	Percentage change in net sales from year t-2 to year t-1. Calculation: growth=(l2.sale-l1.sale)/l1.sale
lev	Leverage	Sum of long- and short-term debt scaled by year-end total assets. Calculation: lev=(dlc+dltt)/lag_at
retvol	Volatility on return	The standard deviation of stock returns over 60 months prior to the end of year t-1. Calculation: retvol = rowsd(L(12/71).prccm)
size	Size	Natural Log of the market value of equity. Calculation: size=log(prcc_f*csho)
zscore	Altman Z-score	Possibility of violating debt covenants. Calculation: See section 5.4
Panel E: Global variables		
aco	Current Assets – Other – Total	
act	Current Assets - Total	
at	Assets - Total	
capx	Capital Expenditures	

ceq	Common/Ordinary Equity - Total	
che	Cash and Short-Term Investments	
cogs	Cost of Goods Sold	
conm	Company Name	
csho	Common Shares Outstanding	
dlc	Debt in Current Liabilities - Total	
dltt	Long-Term Debt - Total	
dp	Depreciation and Amortization	
dv	Cash Dividends (Cash Flow)	
fyear	Data Year - Fiscal	
gvkey	Global Company Key	
ib	Income Before Extraordinary Items	
invt	Inventories - Total	
lag_at	Lagged assets	
lco	Current Liabilities – Other – Total	
lct	Current Liabilities - Total	
ni	Net Income (Loss)	
oancf	Operating Activities – Net Cash Flow	
ppegt	Property Plant and Equipment - Total (Gross)	
prcc_f	Price Close - Annual - Fiscal Year	
re	Retained Earnings	
rect	Receivables – Total	
sale	Sales/Turnover (Net)	
sich	Standard Industrial Classification - Historical	

splticrm	S&P Domestic Long Term Issuer Credit Rating	
xad	Advertising Expense	
xidoc	Extraordinary Items and Discontinued Operations (Cash Flow)	
xrd	Research and Development Expense	
xsga	Selling General and Administrative Expense	

APPENDIX D ANALYSIS OF OUTLIERS AND TREATMENT

Figure B.1
Histogram Total Accruals

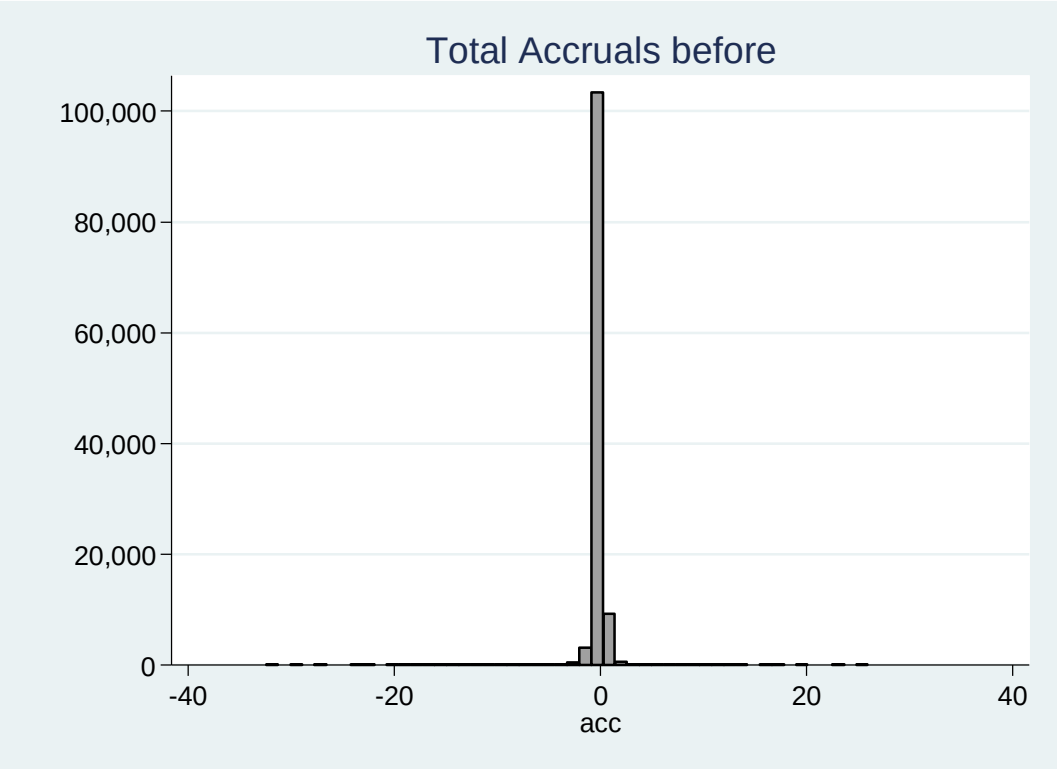


Table B.1
Total Accruals

acc

Percentiles		Smallest		
1%	-1.768372	-32.43224		
5%	-.6818794	-28.97933		
10%	-.4077584	-26.95228	Obs	117,607
25%	-.1229201	-26.71269	Sum of Wgt.	117,607
50%	.01		Mean	-.0577419
		Largest	Std. Dev.	.7172467
75%	.0410543	17.66809		
90%	.2494288	19.41459	Variance	.5144429
95%	.4790652	22.63536	Skewness	-7.433564
99%	1.256487	26.01209	Kurtosis	325.3951

Figure B.2
Histogram Total Accruals after winsorizing

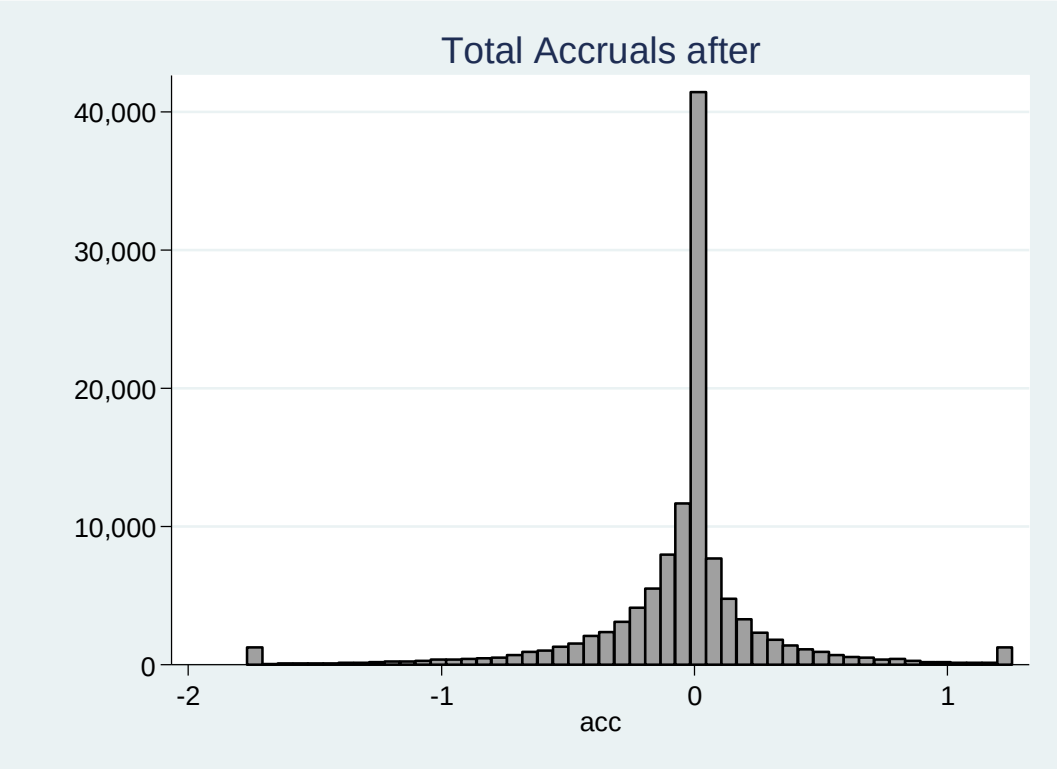


Table B.2
Total Accruals after winsorizing

acc

	Percentiles	Smallest		
1%	-1.768372	-1.768372		
5%	-.6818794	-1.768372		
10%	-.4077584	-1.768372	Obs	117,607
25%	-.1229201	-1.768372	Sum of Wgt.	117,607
50%	.01		Mean	-.0487545
		Largest	Std. Dev.	.3817447
75%	.0410543	1.256487		
90%	.2494288	1.256487	Variance	.145729
95%	.4790652	1.256487	Skewness	-.9937866
99%	1.256487	1.256487	Kurtosis	9.432513

Figure B.3
Histogram Book-to-market ratio

Table B.3
Book-to-market ratio

bm

	Percentiles	Smallest		
1%	-6.311918	-2.04e+07		
5%	-.7135116	-1.77e+07		
10%	.0835485	-7974501	Obs	106,230
25%	.4238965	-7757740	Sum of Wgt.	106,230
50%	.5673397		Mean	-521.6504
		Largest	Std. Dev.	89805.04
75%	.8520277	582.5568		
90%	1.493308	661.1866	Variance	8.06e+09
95%	2.422909	1071.12	Skewness	-195.5273
99%	8.640922	2315.216	Kurtosis	40505.43

Figure B.4
Histogram Book-to-market ratio after winsorizing

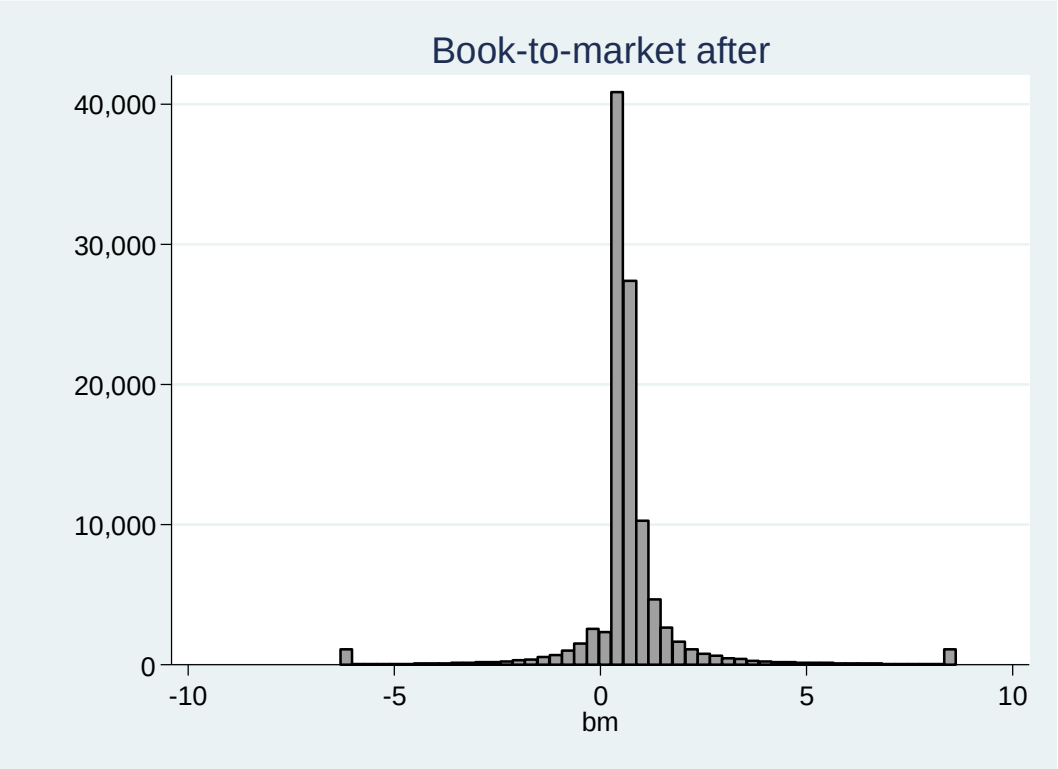


Table B.4
Book-to-market ratio after winsorizing

bm

	Percentiles	Smallest		
1%	-6.311918	-6.311918		
5%	-.7135116	-6.311918		
10%	.0835485	-6.311918	Obs	106,230
25%	.4238965	-6.311918	Sum of Wgt.	106,230
50%	.5673397		Mean	.691991
		Largest	Std. Dev.	1.50375
75%	.8520277	8.640922		
90%	1.493308	8.640922	Variance	2.261263
95%	2.422909	8.640922	Skewness	.8002374
99%	8.640922	8.640922	Kurtosis	17.13489

Figure B.5
Histogram Delta Sales minus Receivables

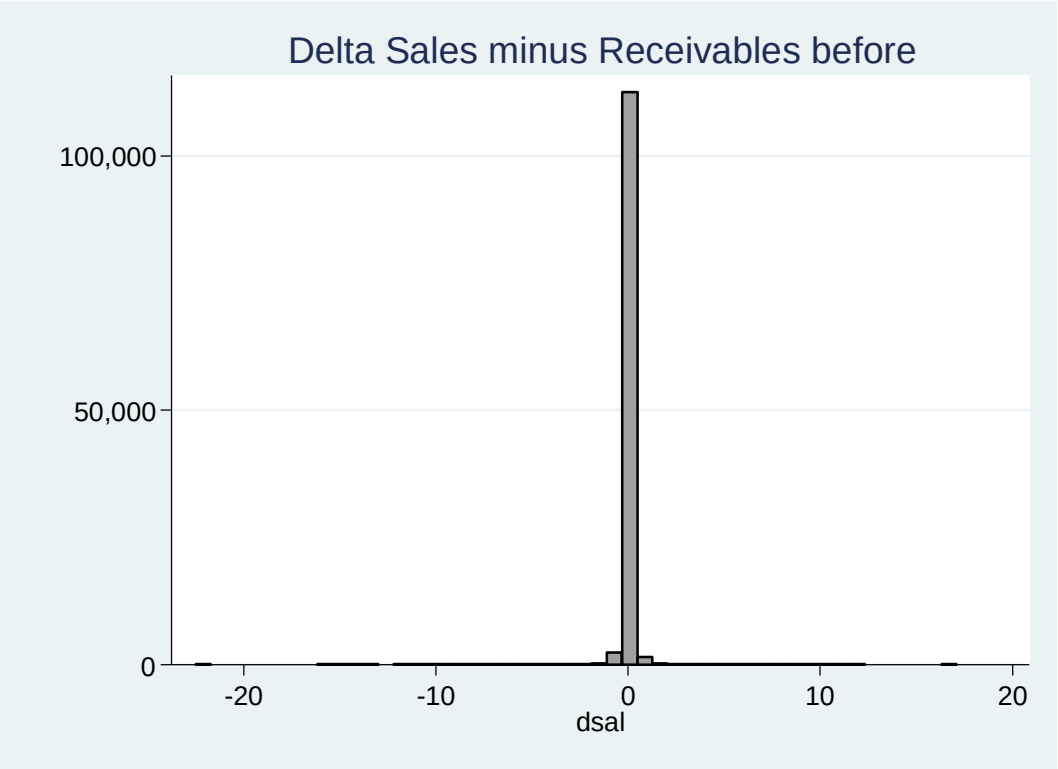


Table B.5
Delta Sales minus Receivables

dsal

Percentiles		Smallest		
1%	-.6981192	-22.48002		
5%	-.163977	-15.74177		
10%	-.0796014	-15.35168	Obs	117,607
25%	-.0199063	-14.78304	Sum of Wgt.	117,607
50%	.0059134		Mean	.0034934
		Largest	Std. Dev.	.3699055
75%	.0245628	11.47422		
90%	.090538	11.64576	Variance	.1368301
95%	.1856664	12.31598	Skewness	-3.687549
99%	.742967	17.11274	Kurtosis	509.0046

Figure B.6
Histogram Delta Sales minus Receivables after winsorizing

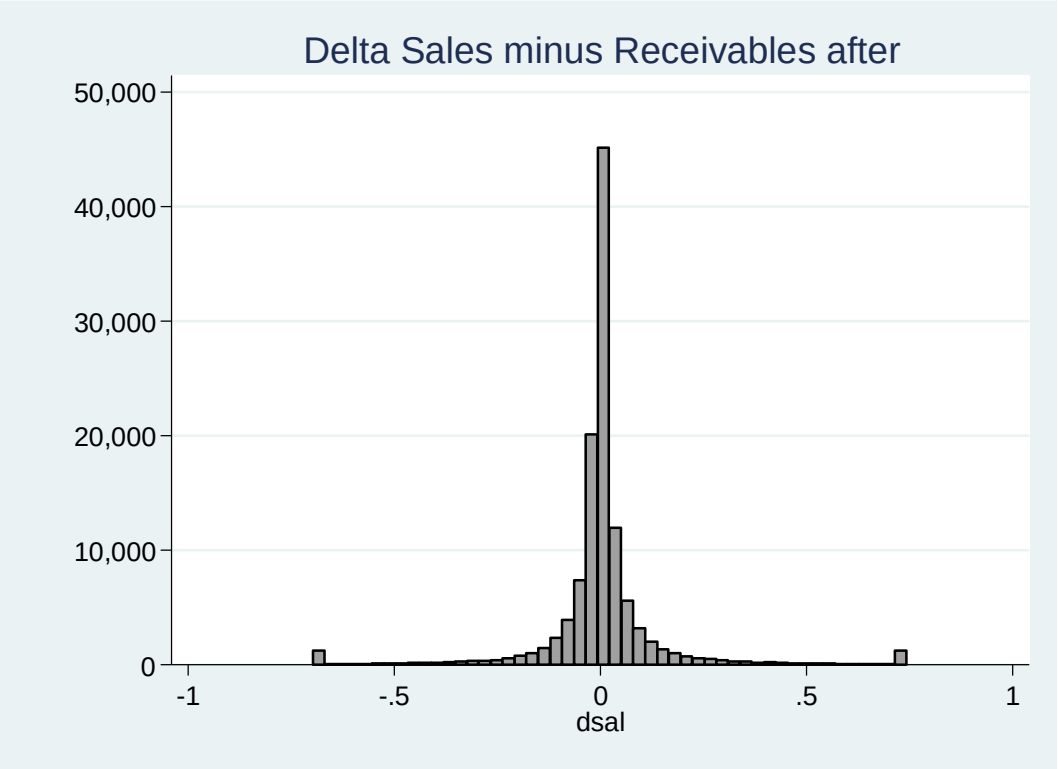


Table B.6
Delta Sales minus Receivables after winsorizing

dsal

Percentiles		Smallest		
1%	-.6981192	-.6981192		
5%	-.163977	-.6981192		
10%	-.0796014	-.6981192	Obs	117,607
25%	-.0199063	-.6981192	Sum of Wgt.	117,607
50%	.0059134		Mean	.0053047
		Largest	Std. Dev.	.1510267
75%	.0245628	.742967		
90%	.090538	.742967	Variance	.0228091
95%	.1856664	.742967	Skewness	.2734134
99%	.742967	.742967	Kurtosis	14.81728

Figure B.7
Histogram Growth

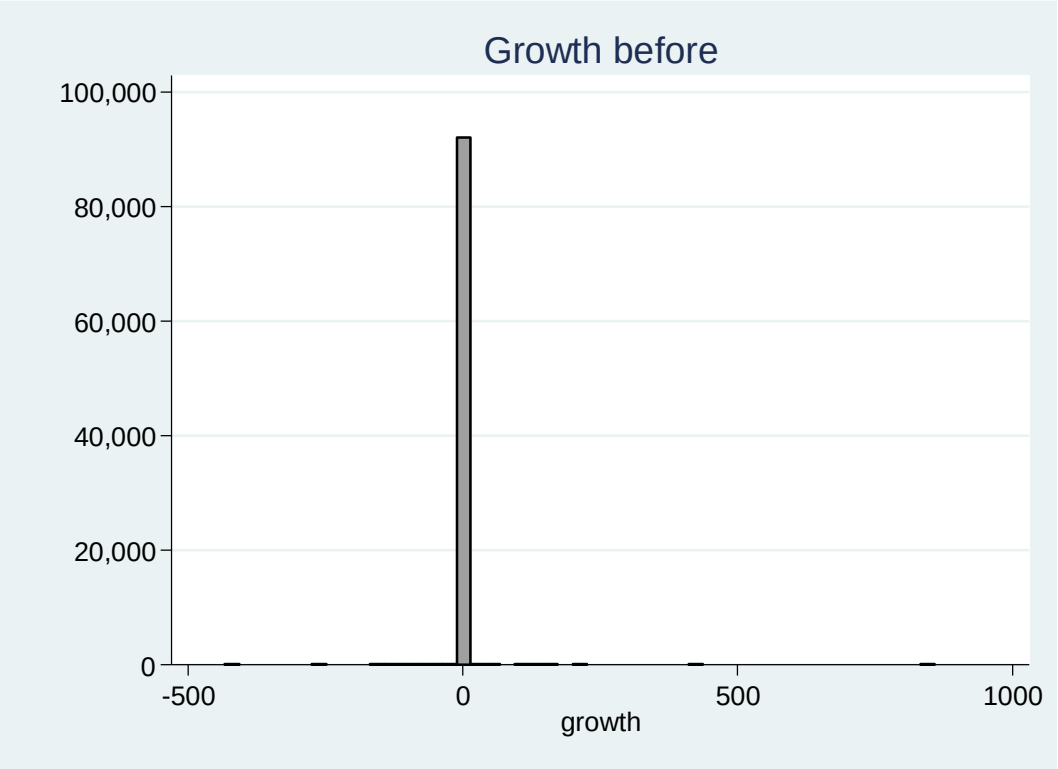


Table B.7
Growth

growth

Percentiles		Smallest		
1%	-1.194803	-433.3553		
5%	-.230063	-273.1784		
10%	-.1179321	-152.9237	Obs	92,213
25%	-.0446066	-148.4221	Sum of Wgt.	92,213
50%	-.0133463		Mean	-.0393293
		Largest	Std. Dev.	4.247771
75%	.0028766	206.9855		
90%	.0387796	223.822	Variance	18.04356
95%	.0949953	432.6476	Skewness	88.42152
99%	.6517742	858.9528	Kurtosis	20956.85

Figure B.8
Histogram Growth after winsorizing

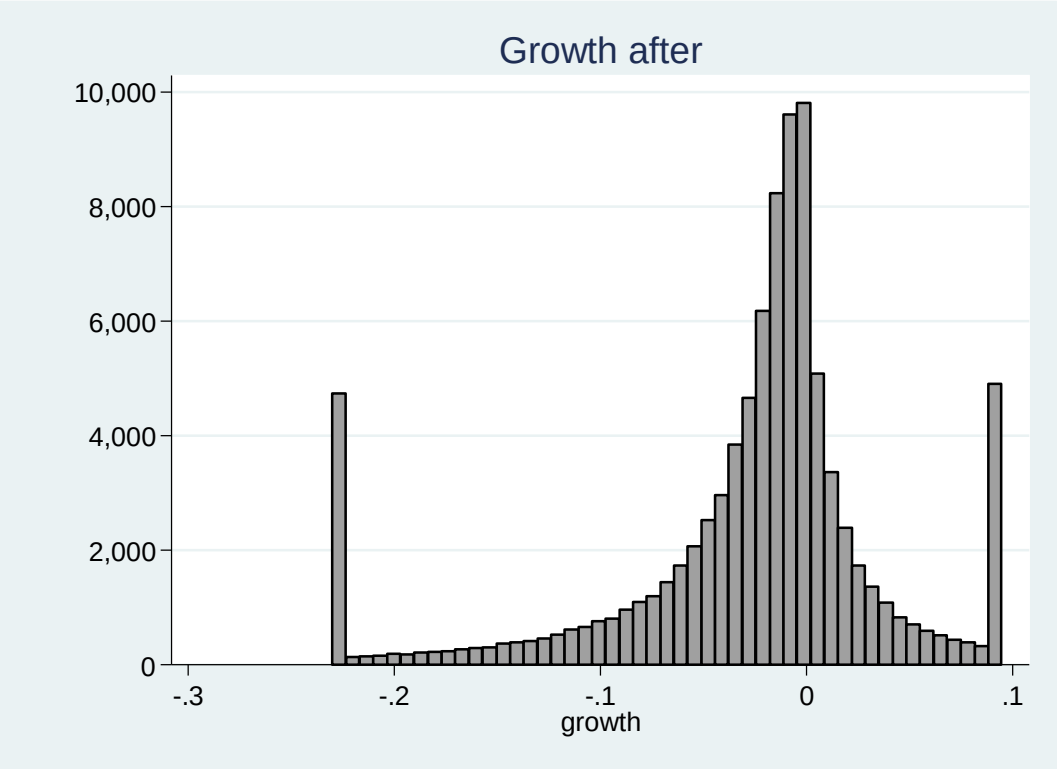


Table B.8
Growth after winsorizing

growth

Percentiles		Smallest		
1%	-.230063	-.230063		
5%	-.230063	-.230063		
10%	-.1179321	-.230063	Obs	92,213
25%	-.0446066	-.230063	Sum of Wgt.	92,213
50%	-.0133463		Mean	-.0279327
		Largest	Std. Dev.	.0702437
75%	.0028766	.0949953		
90%	.0387796	.0949953	Variance	.0049342
95%	.0949953	.0949953	Skewness	-1.216129
99%	.0949953	.0949953	Kurtosis	5.003268

Figure B.9
Histogram Inverse Assets

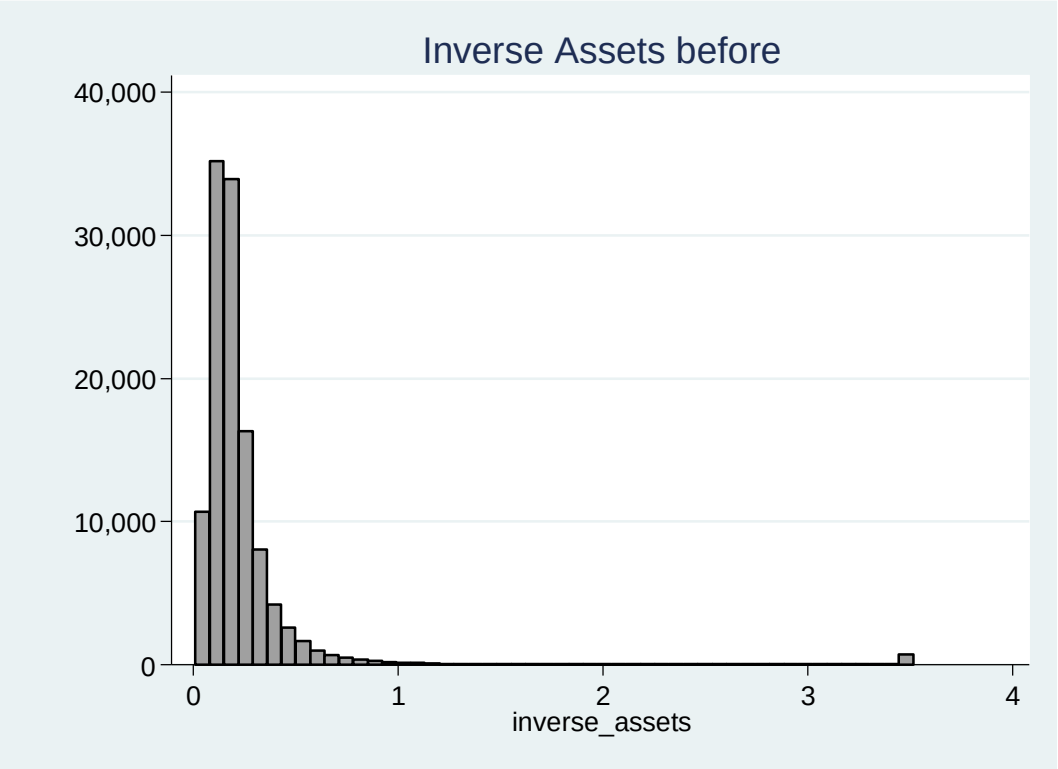


Table B.9
Inverse Assets

inverse_assets

Percentiles		Smallest		
1%	.01	.01		
5%	.01	.01		
10%	.0905641	.01	Obs	117,607
25%	.1257785	.01	Sum of Wgt.	117,607
50%	.1717503		Mean	.23489
		Largest	Std. Dev.	.3283138
75%	.2500139	3.515843		
90%	.3845247	3.515843	Variance	.1077899
95%	.5284832	3.515843	Skewness	7.381089
99%	1.570902	3.515843	Kurtosis	69.19148

Figure B.10
Histogram Inverse Assets after winsorizing

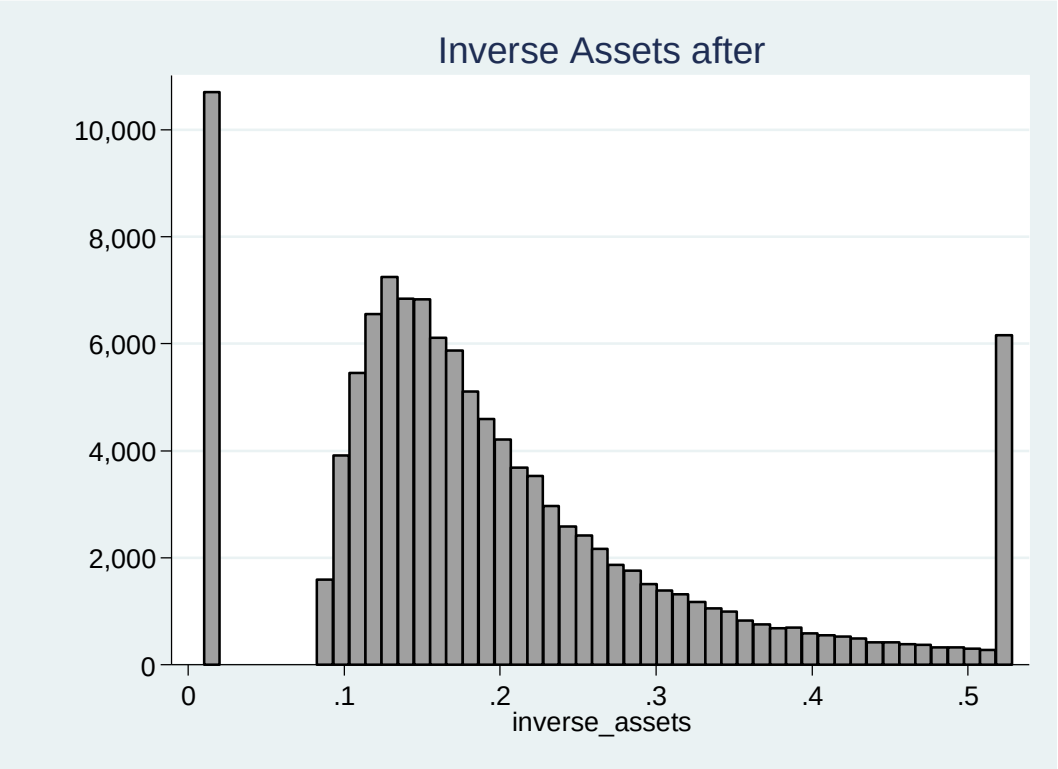


Table B.10
Inverse Assets after winsorizing

inverse_assets

Percentiles		Smallest		
1%	.01	.01		
5%	.01	.01		
10%	.0905641	.01	Obs	117,607
25%	.1257785	.01	Sum of Wgt.	117,607
50%	.1717503		Mean	.2007906
		Largest	Std. Dev.	.1254264
75%	.2500139	.5284832		
90%	.3845247	.5284832	Variance	.0157318
95%	.5284832	.5284832	Skewness	1.003243
99%	.5284832	.5284832	Kurtosis	3.849894

Figure B.11
Histogram Lagged Assets

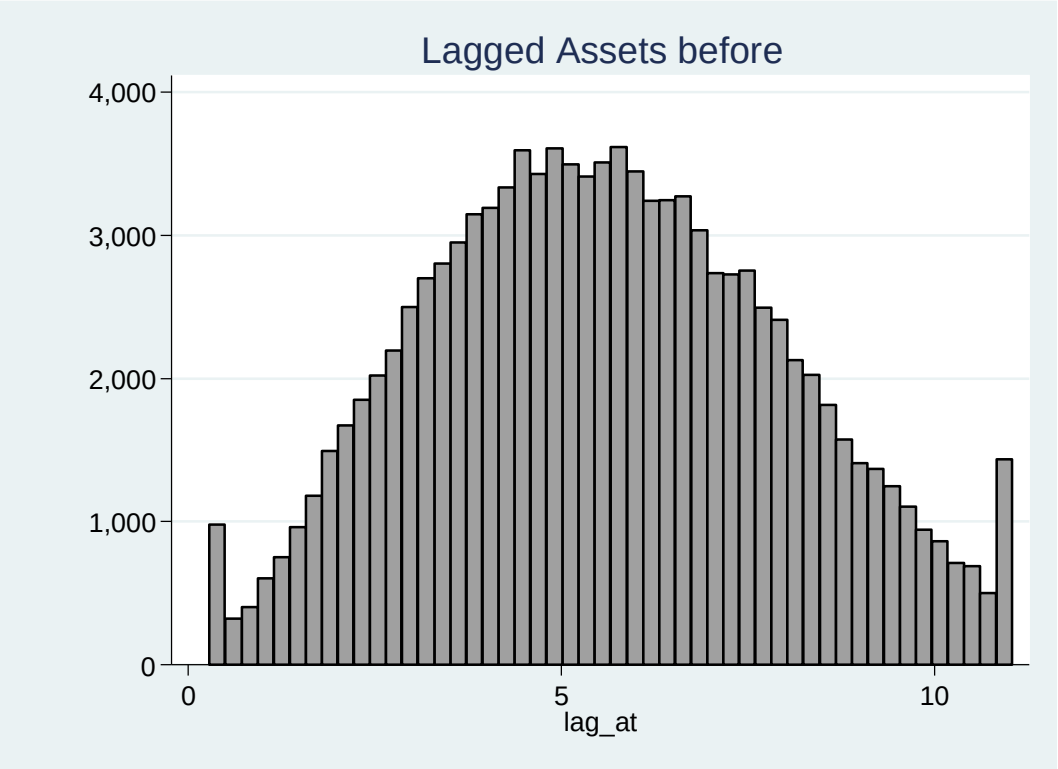


Table B.11
Lagged Assets

lag_at

Percentiles		Smallest		
1%	.5613286	.2844268		
5%	1.811889	.2844268		
10%	2.488567	.2844268	Obs	106,903
25%	3.8178	.2844268	Sum of Wgt.	106,903
50%	5.500658		Mean	5.582402
		Largest	Std. Dev.	2.383507
75%	7.282537	11.0419		
90%	8.832909	11.0419	Variance	5.681106
95%	9.709599	11.0419	Skewness	.1299523
99%	11.0419	11.0419	Kurtosis	2.431904

Figure B.12
Histogram Leverage

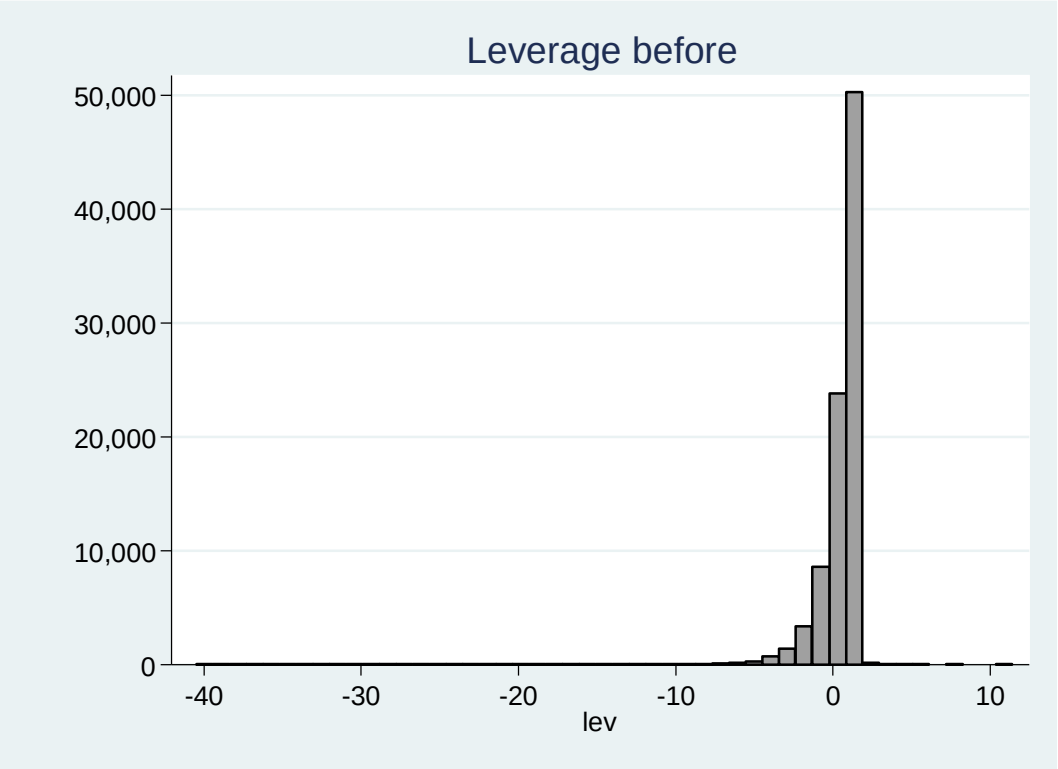


Table B.12
Leverage

lev

Percentiles		Smallest		
1%	-5.663889	-40.47764		
5%	-1.889007	-40.47764		
10%	-.898748	-40.47764	Obs	89,703
25%	.2167094	-40.47764	Sum of Wgt.	89,703
50%	.9637031		Mean	.4716576
		Largest	Std. Dev.	1.972841
75%	1.345205	5.883489		
90%	1.534971	7.655754	Variance	3.892101
95%	1.607494	8.121119	Skewness	-8.741135
99%	1.709464	11.42305	Kurtosis	121.6416

Figure B.13
Histogram Leverage after winsorizing

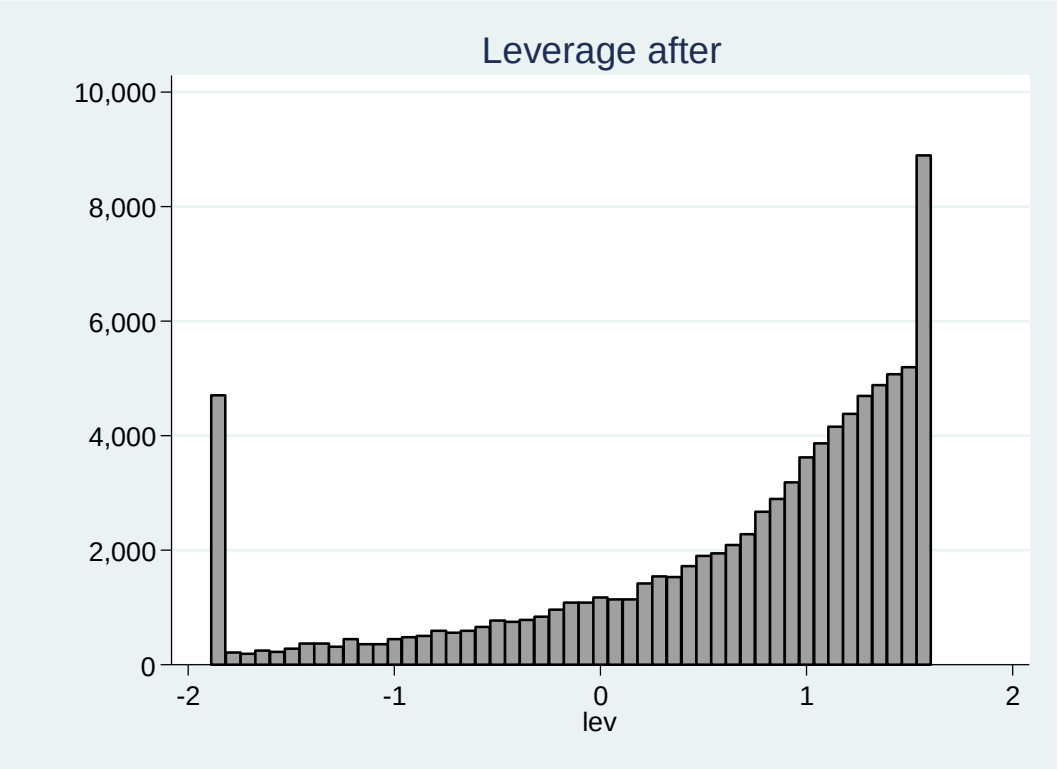


Table B.13
Leverage after winsorizing

lev

	Percentiles	Smallest		
1%	-1.889007	-1.889007		
5%	-1.889007	-1.889007		
10%	-.898748	-1.889007	Obs	89,703
25%	.2167094	-1.889007	Sum of Wgt.	89,703
50%	.9637031		Mean	.6292314
		Largest	Std. Dev.	.9594008
75%	1.345205	1.607494		
90%	1.534971	1.607494	Variance	.9204499
95%	1.607494	1.607494	Skewness	-1.271225
99%	1.607494	1.607494	Kurtosis	3.744807

Figure B.14
Histogram Market-to-Book ratio

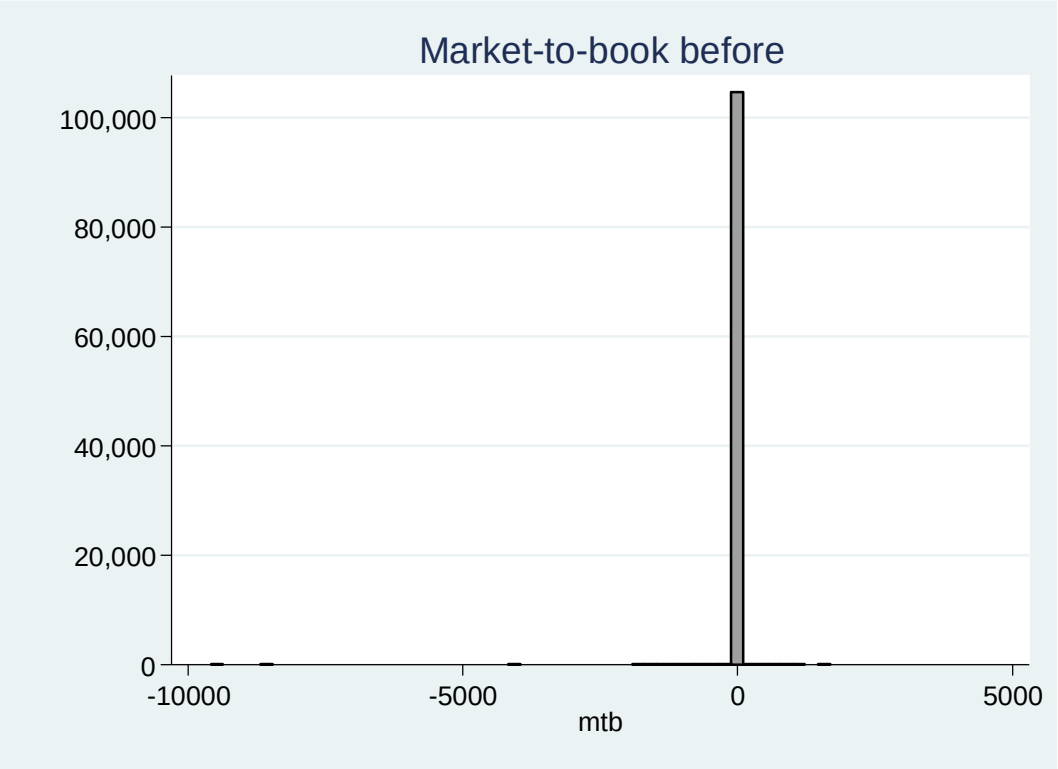


Table B.14
Market-to-Book ratio

mtb

	Percentiles	Smallest		
1%	-8.234802	-9583.177		
5%	-1.028761	-8492.984		
10%	.065118	-4021.426	Obs	104,871
25%	.8876736	-1802.994	Sum of Wgt.	104,871
50%	1.555503		Mean	1.02666
		Largest	Std. Dev.	45.07248
75%	2.104601	958.1324		
90%	2.571038	1156.283	Variance	2031.528
95%	2.914262	1661.533	Skewness	-162.809
99%	6.948254	1684.041	Kurtosis	32230.52

Figure B.15
Histogram Market-to-Book ratio after winsorizing

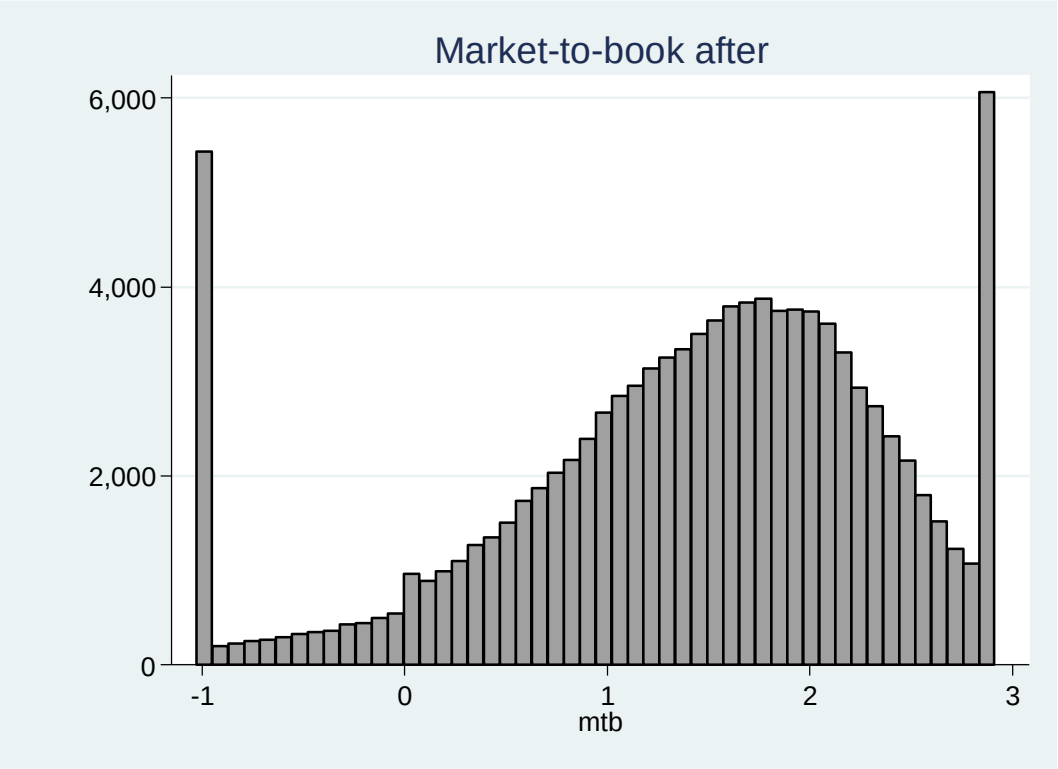


Table B.15
Market-to-Book ratio after winsorizing

mtb

	Percentiles	Smallest		
1%	-1.028761	-1.028761		
5%	-1.028761	-1.028761		
10%	.065118	-1.028761	Obs	104,871
25%	.8876736	-1.028761	Sum of Wgt.	104,871
50%	1.555503		Mean	1.409893
		Largest	Std. Dev.	.9828284
75%	2.104601	2.914262		
90%	2.571038	2.914262	Variance	.9659517
95%	2.914262	2.914262	Skewness	-.7560682
99%	2.914262	2.914262	Kurtosis	3.213399

Figure B.16
Histogram Total Cash Flows

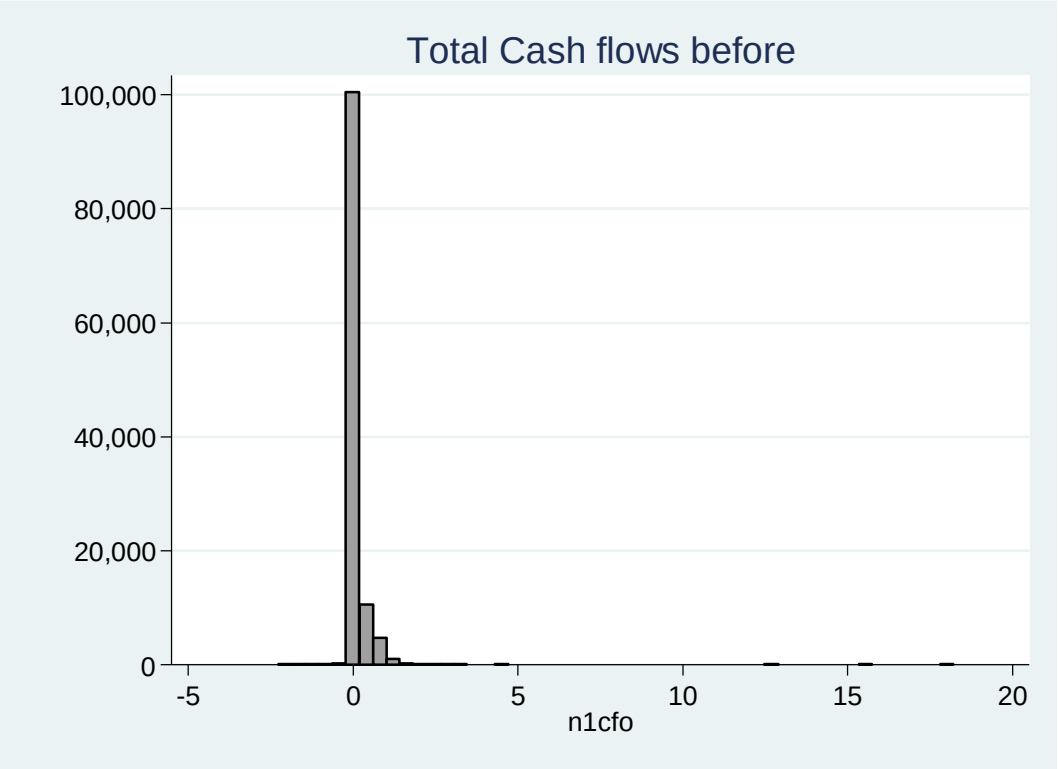


Table B.16
Total Cash Flows

n1cfo

Percentiles		Smallest		
1%	.01	-2.266023		
5%	.01	-1.681453		
10%	.01	-1.417429	Obs	117,607
25%	.01	-1.417429	Sum of Wgt.	117,607
50%	.01		Mean	.0943181
		Largest	Std. Dev.	.2803237
75%	.01	15.40652		
90%	.4142721	15.40652	Variance	.0785814
95%	.6132236	18.21834	Skewness	15.76867
99%	1.08598	18.21834	Kurtosis	765.7576

Figure B.17
Histogram Total Cash Flows after winsorizing and natural logarithm

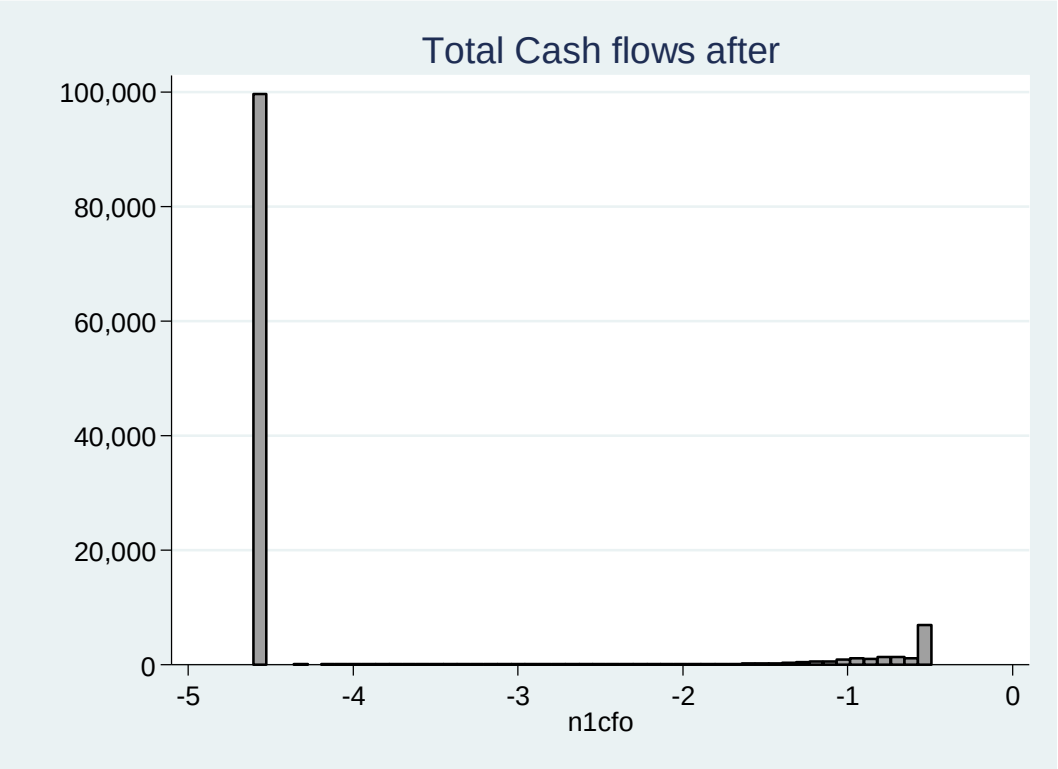


Table B.17
Total Cash Flows after winsorizing and natural logarithm

n1cfo

Percentiles		Smallest		
1%	.01	.01		
5%	.01	.01		
10%	.01	.01	Obs	117,607
25%	.01	.01	Sum of Wgt.	117,607
50%	.01		Mean	.0793414
		Largest	Std. Dev.	.174157
75%	.01	.6132236		
90%	.4142721	.6132236	Variance	.0303307
95%	.6132236	.6132236	Skewness	2.300765
99%	.6132236	.6132236	Kurtosis	6.656166

Figure B.18
Histogram Delta Sales

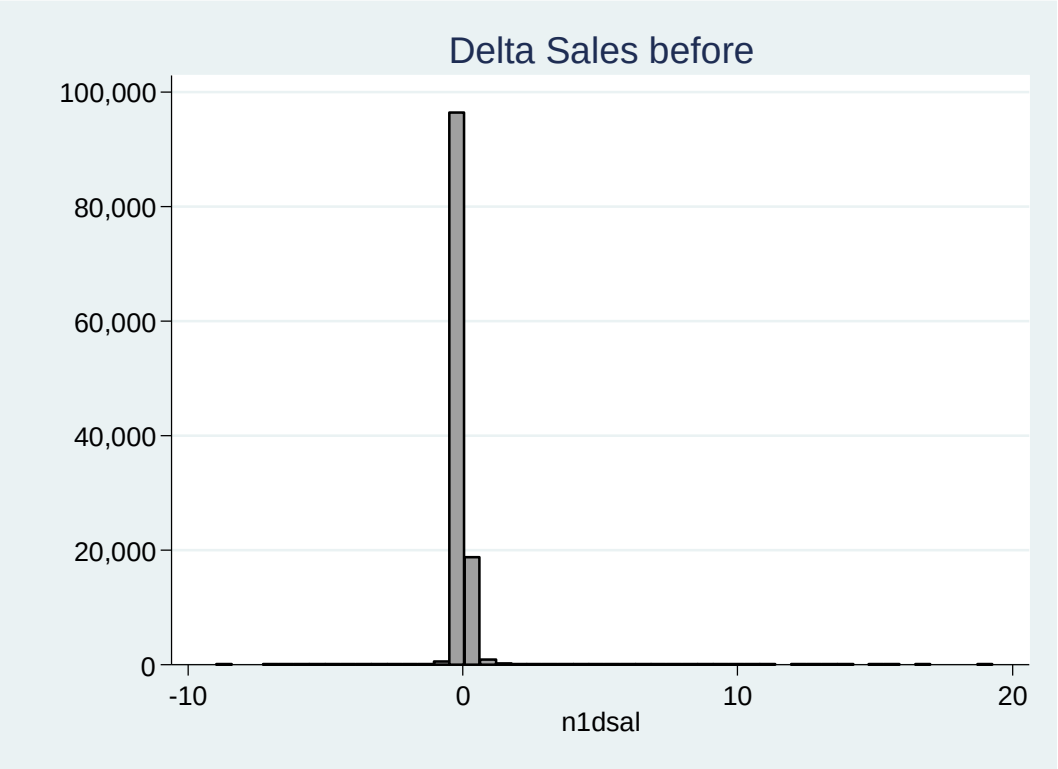


Table B.18
Delta Sales

n1dsal

Percentiles		Smallest		
1%	-.4125803	-8.98455		
5%	-.0904696	-7.008364		
10%	-.037712	-6.707242	Obs	117,607
25%	-.0019767	-6.698678	Sum of Wgt.	117,607
50%	.01		Mean	.0358813
		Largest	Std. Dev.	.3256971
75%	.0393433	15.12255		
90%	.1101325	15.66179	Variance	.1060786
95%	.2075246	17.0132	Skewness	16.54678
99%	.7537448	19.28823	Kurtosis	670.2072

Figure B.19
Histogram Delta Sales after winsorizing

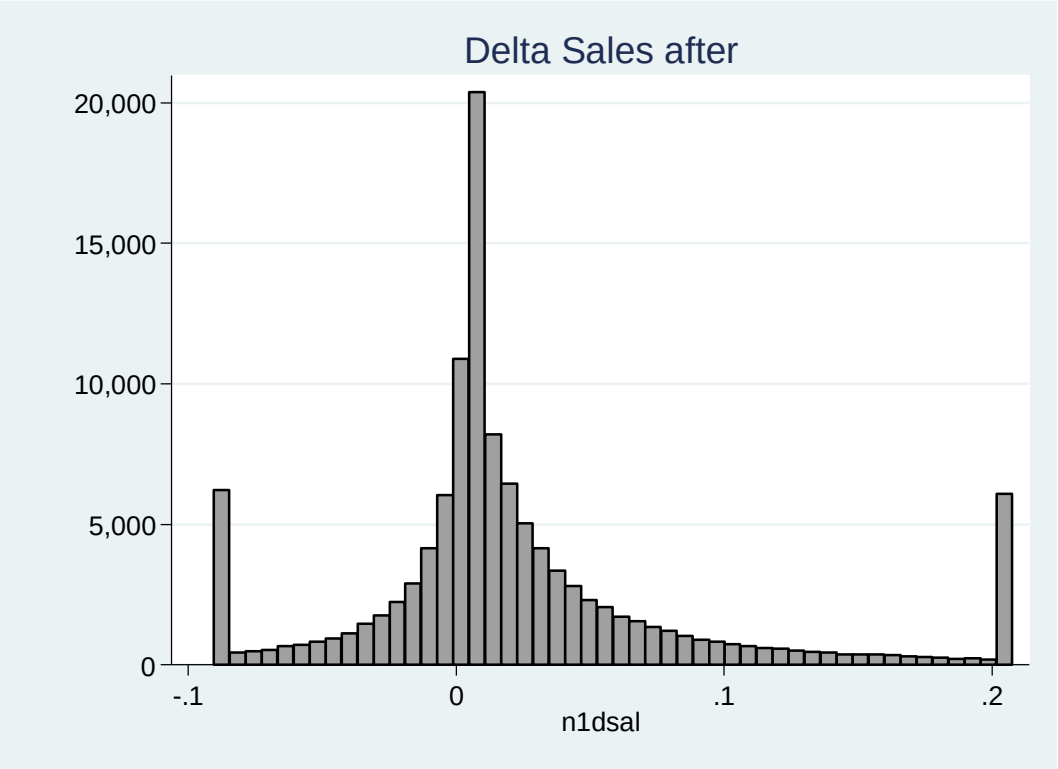


Table B.19
Delta Sales after winsorizing

n1dsal

	Percentiles	Smallest		
1%	-.0904696	-.0904696		
5%	-.0904696	-.0904696		
10%	-.037712	-.0904696	Obs	117,607
25%	-.0019767	-.0904696	Sum of Wgt.	117,607
50%	.01		Mean	.0247667
		Largest	Std. Dev.	.0646235
75%	.0393433	.2075246		
90%	.1101325	.2075246	Variance	.0041762
95%	.2075246	.2075246	Skewness	1.155476
99%	.2075246	.2075246	Kurtosis	4.867056

Figure B.20
Histogram Sales

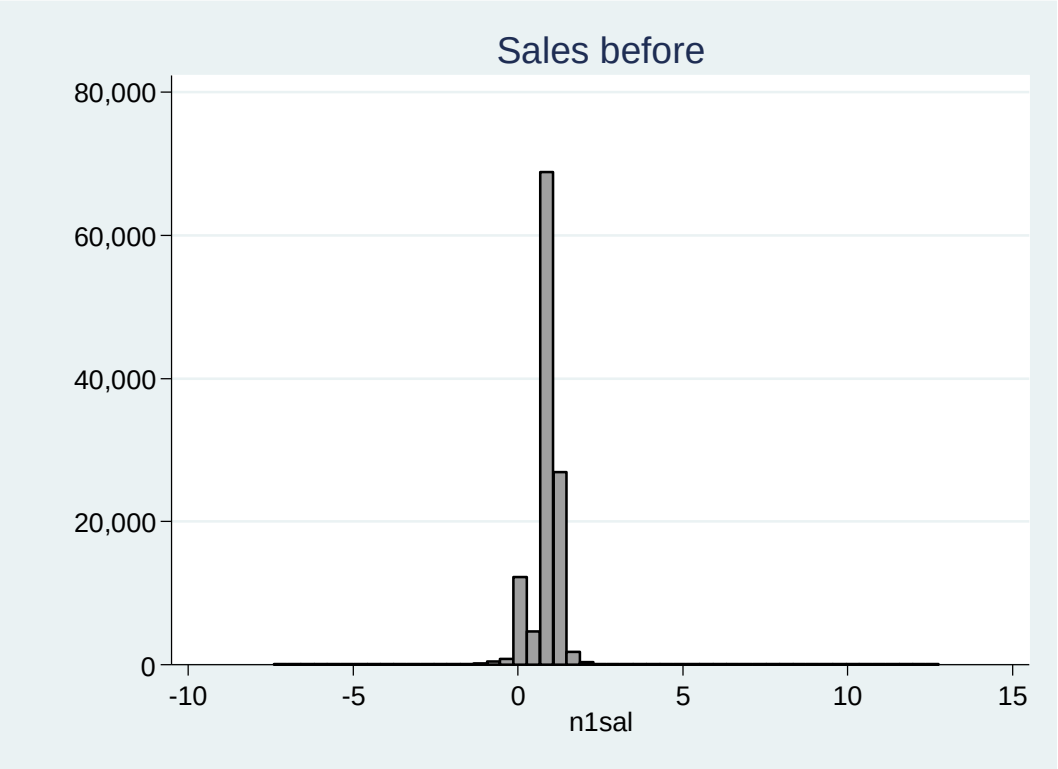


Table B.20
Sales

n1sal

Percentiles		Smallest		
1%	-.6492044	-7.3964		
5%	.01	-7.3964		
10%	.01	-7.3964	Obs	117,607
25%	.847332	-7.3964	Sum of Wgt.	117,607
50%	.976151		Mean	.8674123
		Largest	Std. Dev.	.6051127
75%	1.077458	11.69953		
90%	1.196552	11.89183	Variance	.3661614
95%	1.31012	11.98435	Skewness	-3.370731
99%	1.791921	12.77658	Kurtosis	76.37925

Figure B.21
Histogram Sales after winsorizing

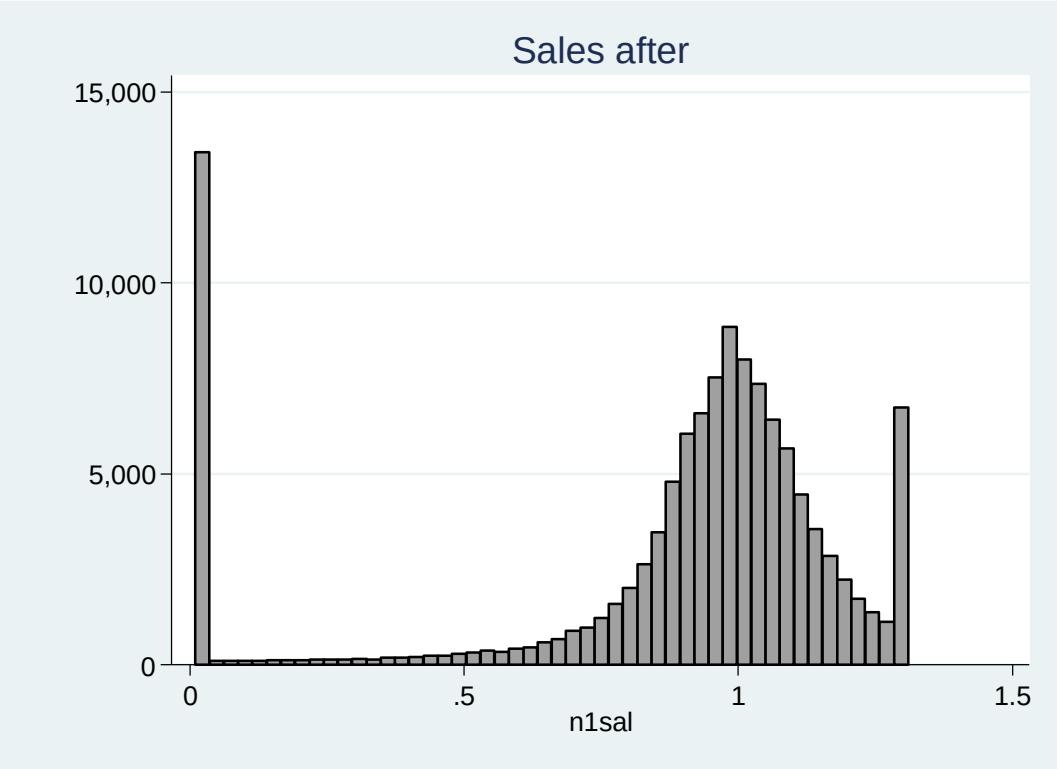


Table B.21
Sales after winsorizing

n1sal

Percentiles		Smallest		
1%	.01	.01		
5%	.01	.01		
10%	.01	.01	Obs	117,607
25%	.847332	.01	Sum of Wgt.	117,607
50%	.976151		Mean	.8745856
		Largest	Std. Dev.	.3588757
75%	1.077458	1.31012		
90%	1.196552	1.31012	Variance	.1287917
95%	1.31012	1.31012	Skewness	-1.497281
99%	1.31012	1.31012	Kurtosis	4.269133

Figure B.22
Histogram Lagged Sales

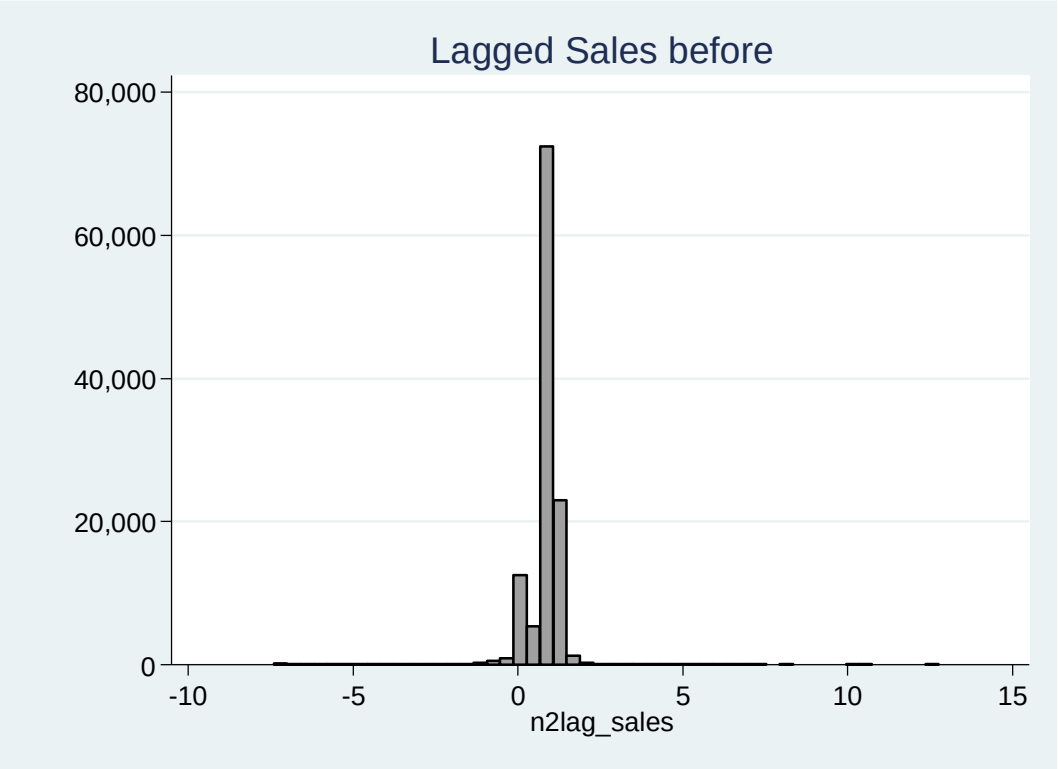


Table B.22
Lagged Sales

n2lag_sales

	Percentiles	Smallest		
1%	-.7791958	-7.3964		
5%	.01	-7.3964		
10%	.01	-7.3964	Obs	117,607
25%	.8263307	-7.3964	Sum of Wgt.	117,607
50%	.9611951		Mean	.8324411
		Largest	Std. Dev.	.5954581
75%	1.056727	8.298909		
90%	1.161759	10.30141	Variance	.3545704
95%	1.253172	10.39979	Skewness	-5.421361
99%	1.599197	12.77658	Kurtosis	76.53439

Figure B.23
Histogram Lagged Sales after winsorizing

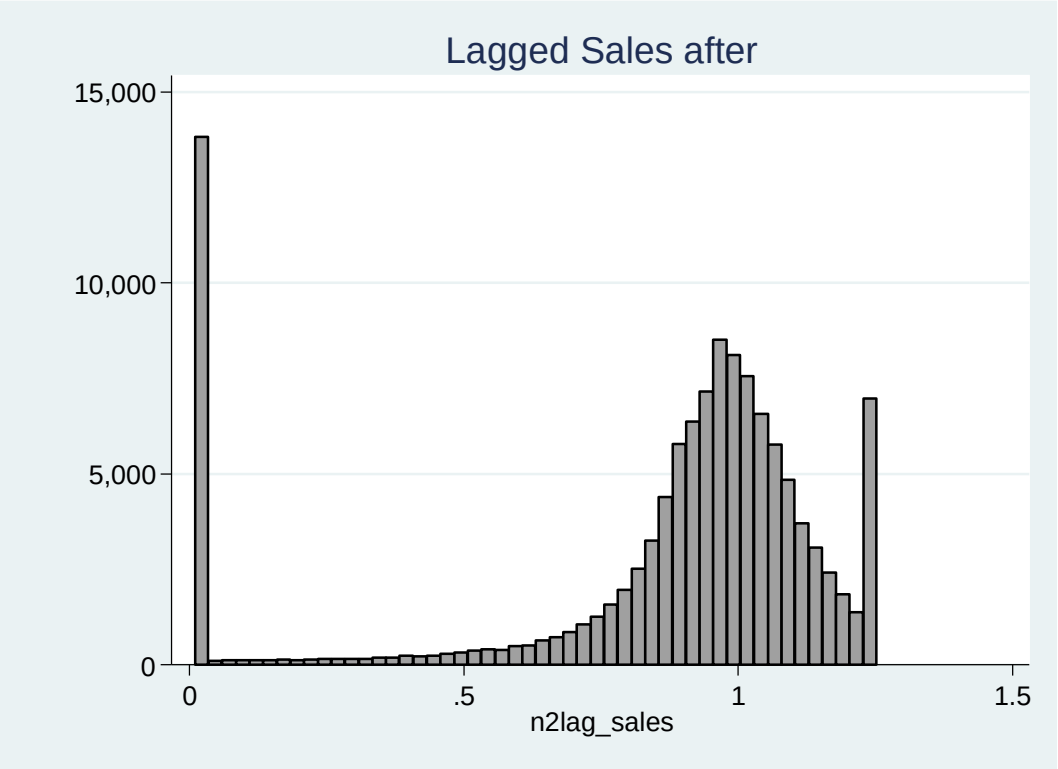


Table B.23
Lagged Sales after winsorizing

n2lag_sales

	Percentiles	Smallest		
1%	.01	.01		
5%	.01	.01		
10%	.01	.01	Obs	117,607
25%	.8263307	.01	Sum of Wgt.	117,607
50%	.9611951		Mean	.8509496
		Largest	Std. Dev.	.3537785
75%	1.056727	1.253172		
90%	1.161759	1.253172	Variance	.1251592
95%	1.253172	1.253172	Skewness	-1.505218
99%	1.253172	1.253172	Kurtosis	4.155128

Figure B.24
Histogram Production costs

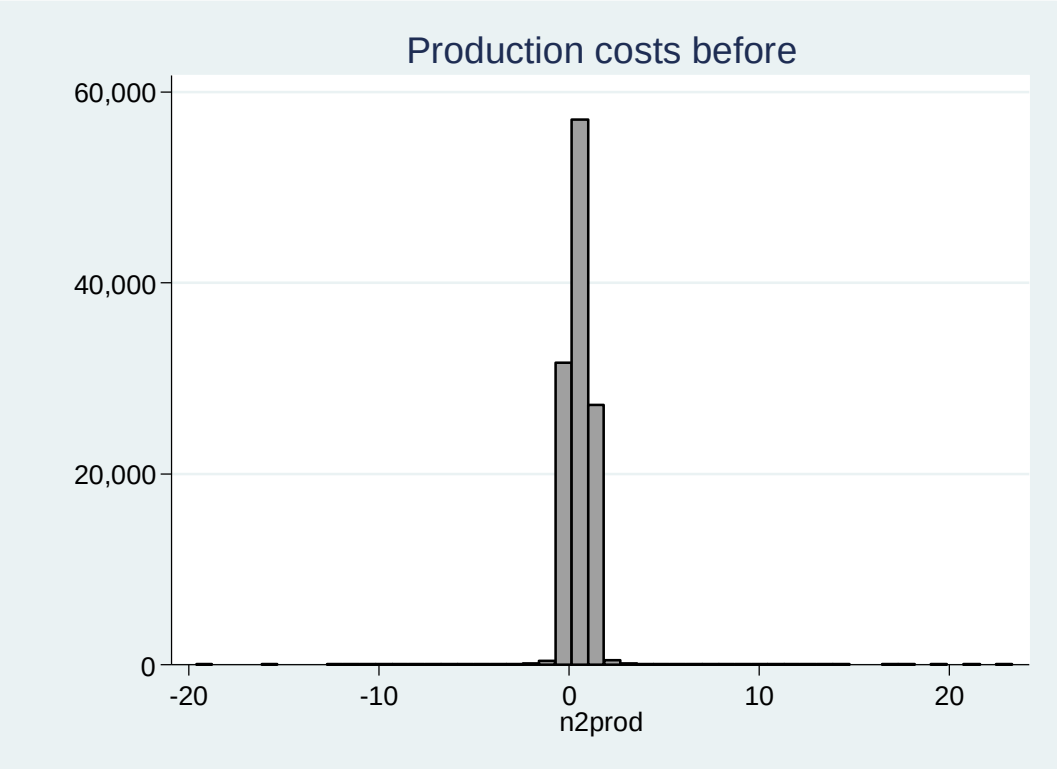


Table B.24
Production costs

n2prod

Percentiles		Smallest		
1%	-.3536401	-19.60529		
5%	.01	-15.50546		
10%	.01	-12.15077	Obs	117,607
25%	.01	-11.26719	Sum of Wgt.	117,607
50%	.853825		Mean	.6699541
		Largest	Std. Dev.	.6245437
75%	.9953522	19.65312		
90%	1.125942	21.09213	Variance	.3900548
95%	1.235168	21.16224	Skewness	.6569639
99%	1.671435	23.3278	Kurtosis	123.8701

Figure B.25
Histogram Discretionary Expenses

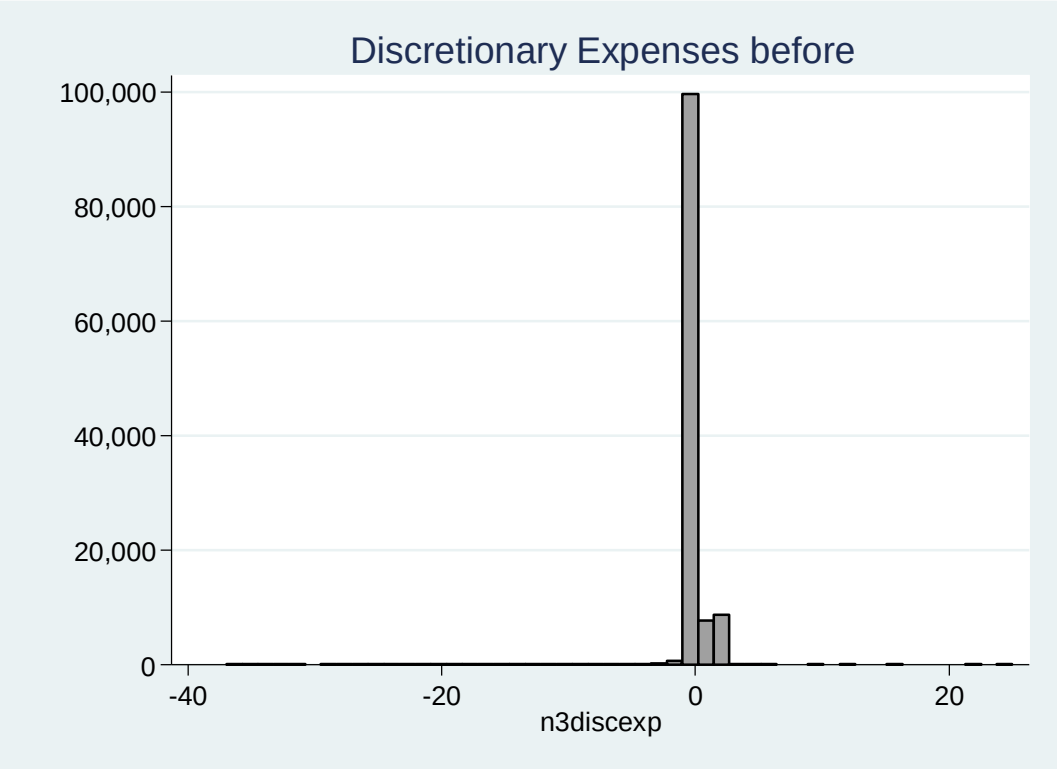


Table B.25
Discretionary Expenses

n3discexp

Percentiles		Smallest		
1%	.01	.01		
5%	.01	.01		
10%	.01	.01	Obs	117,607
25%	.01	.01	Sum of Wgt.	117,607
50%	.01		Mean	.1972546
		Largest	Std. Dev.	.4872419
75%	.01	1.696721		
90%	1.15383	1.696721	Variance	.2374047
95%	1.696721	1.696721	Skewness	2.387676
99%	1.696721	1.696721	Kurtosis	7.004632

Figure B.26
Histogram Discretionary Expenses after winsorizing and natural logarithm

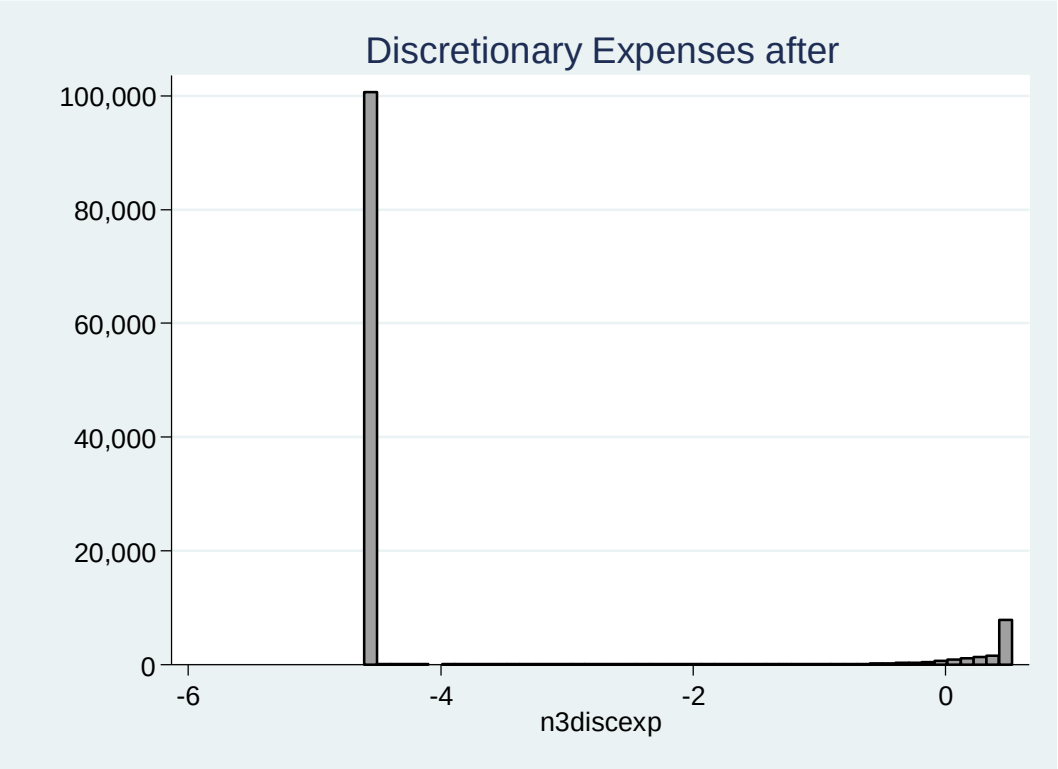


Table B.26
Discretionary Expenses after winsorizing and natural logarithm

n3discexp

	Percentiles	Smallest		
1%	-4.60517	-4.60517		
5%	-4.60517	-4.60517		
10%	-4.60517	-4.60517	Obs	117,607
25%	-4.60517	-4.60517	Sum of Wgt.	117,607
50%	-4.60517		Mean	-3.918231
		Largest	Std. Dev.	1.687528
75%	-4.60517	.5286977		
90%	.1430867	.5286977	Variance	2.847751
95%	.5286977	.5286977	Skewness	2.081946
99%	.5286977	.5286977	Kurtosis	5.401535

Figure B.27
Histogram Property, plant & Equipment

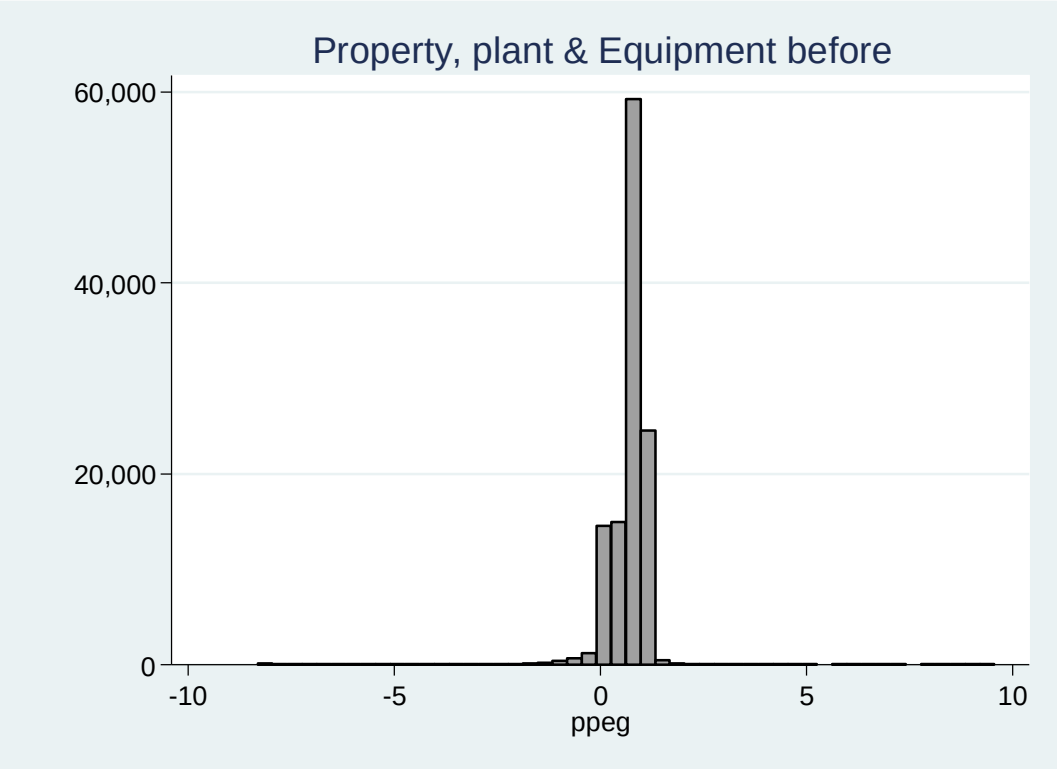


Table B.27
Property, plant & Equipment

ppeg

Percentiles		Smallest		
1%	-1.117416	-8.313073		
5%	.01	-8.313073		
10%	.01	-8.313073	Obs	117,607
25%	.5759207	-8.313073	Sum of Wgt.	117,607
50%	.8317703		Mean	.6756761
		Largest	Std. Dev.	.6291854
75%	.970332	8.74035		
90%	1.031382	9.045707	Variance	.3958742
95%	1.068092	9.209788	Skewness	-6.786554
99%	1.247246	9.564872	Kurtosis	88.16479

Figure B.28
Histogram Property, plant & Equipment after winsorizing

Table B.28
Property, plant & Equipment after winsorizing

ppeg

	Percentiles	Smallest		
1%	.01	.01		
5%	.01	.01		
10%	.01	.01	Obs	117,607
25%	.5759207	.01	Sum of Wgt.	117,607
50%	.8317703		Mean	.7123144
		Largest	Std. Dev.	.337182
75%	.970332	1.068092		
90%	1.031382	1.068092	Variance	.1136917
95%	1.068092	1.068092	Skewness	-1.082482
99%	1.068092	1.068092	Kurtosis	2.912517

Figure B.29
Histogram Profit

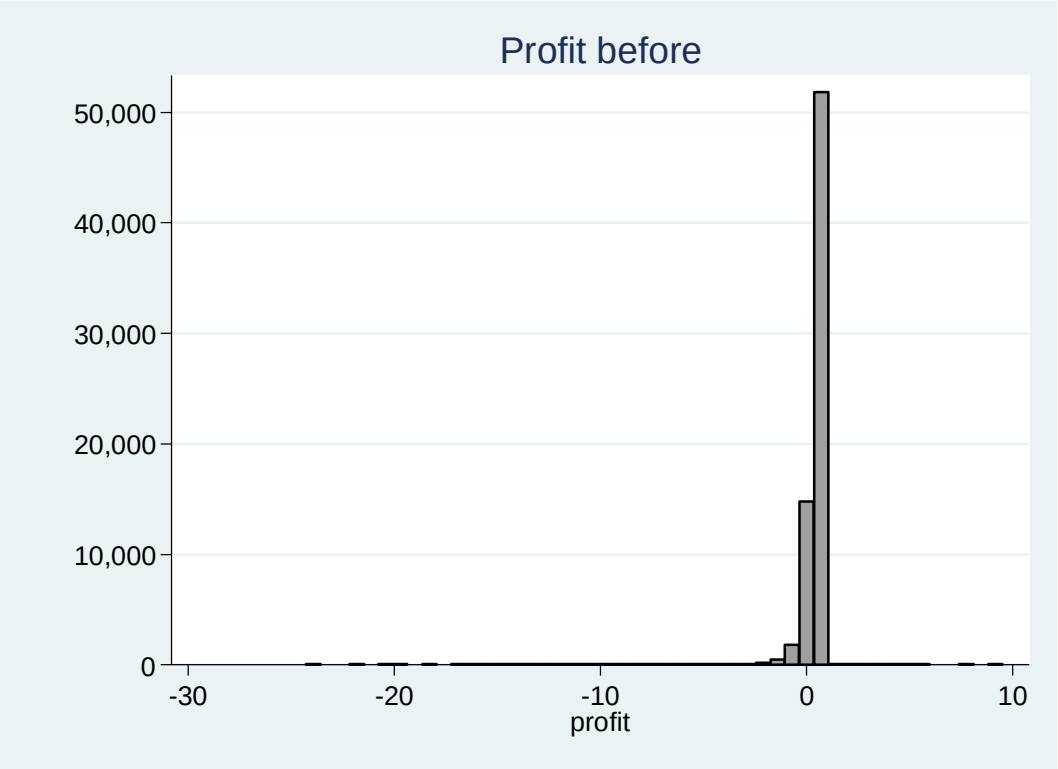


Table B.29
Profit

profit

Percentiles		Smallest		
1%	-1.512528	-24.28658		
5%	-.2464474	-21.84959		
10%	.0500999	-21.84959	Obs	69,621
25%	.3682197	-20.42404	Sum of Wgt.	69,621
50%	.5531718		Mean	.4159264
		Largest	Std. Dev.	.7224588
75%	.6613616	5.091274		
90%	.7394291	5.313014	Variance	.5219468
95%	.771302	8.099566	Skewness	-12.88287
99%	.8536608	9.531846	Kurtosis	257.0344

Figure B.30
Histogram Profit after winsorizing

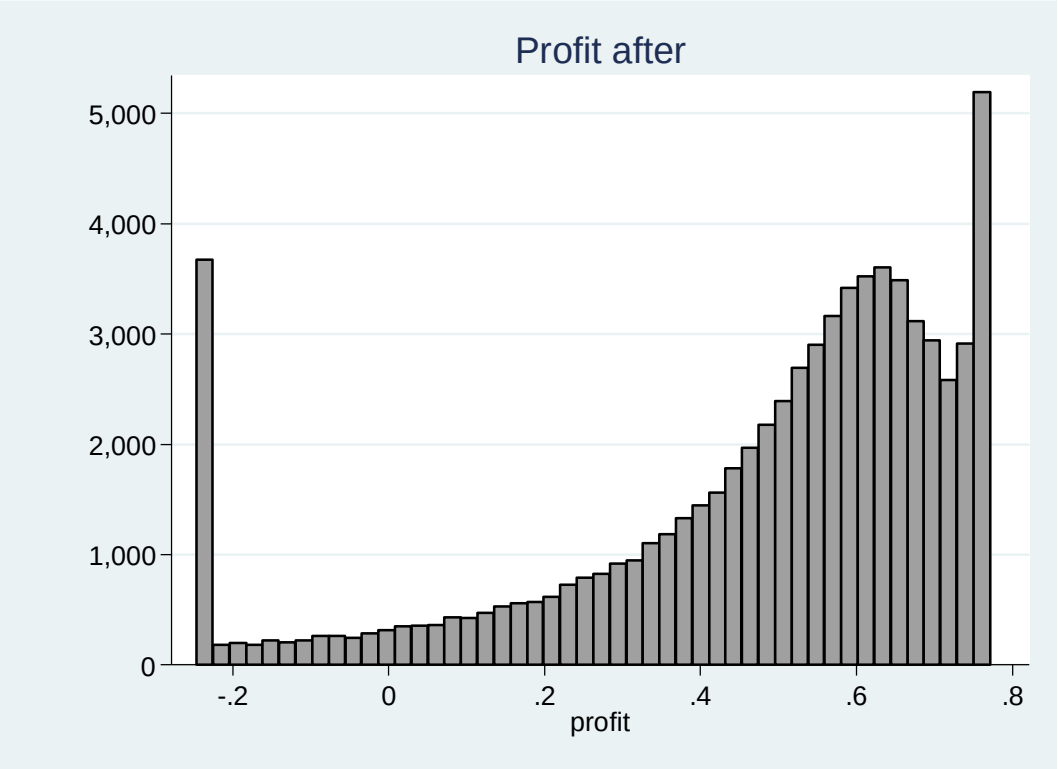


Table B.30
Profit after winsorizing

profit

Percentiles		Smallest		
1%	-.2464474	-.2464474		
5%	-.2464474	-.2464474		
10%	.0500999	-.2464474	Obs	69,621
25%	.3682197	-.2464474	Sum of Wgt.	69,621
50%	.5531718		Mean	.4714518
		Largest	Std. Dev.	.2688118
75%	.6613616	.771302		
90%	.7394291	.771302	Variance	.0722598
95%	.771302	.771302	Skewness	-1.296066
99%	.771302	.771302	Kurtosis	3.961594

Figure B.31
Histogram Research & Development costs

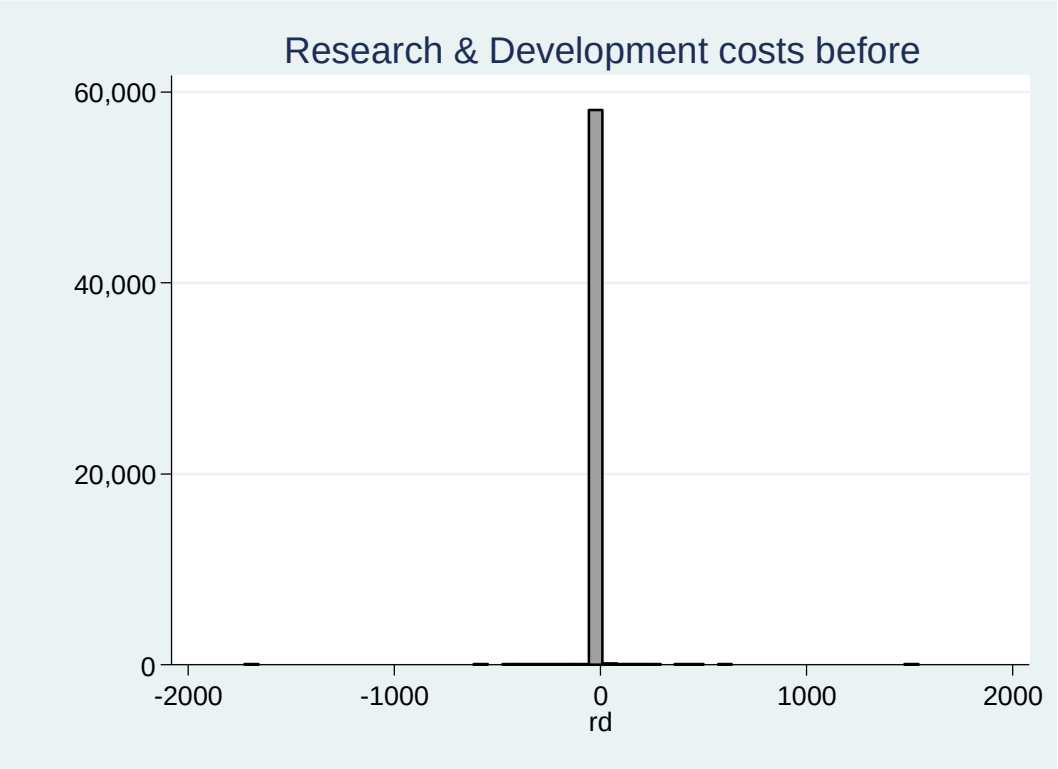


Table B.31
Research & Development costs

rd

Percentiles		Smallest		
1%	-4.418266	-1727.955		
5%	-.9999488	-581.4813		
10%	-.3732811	-459.0184	Obs	58,360
25%	.1534562	-431.5657	Sum of Wgt.	58,360
50%	.45687		Mean	.3611518
		Largest	Std. Dev.	12.38215
75%	.6562345	380.6701		
90%	.8121808	460.6979	Variance	153.3175
95%	1.186553	617.3649	Skewness	-13.36214
99%	4.425619	1545.69	Kurtosis	11040.31

Figure B.32
Histogram Research & Development costs after winsorizing

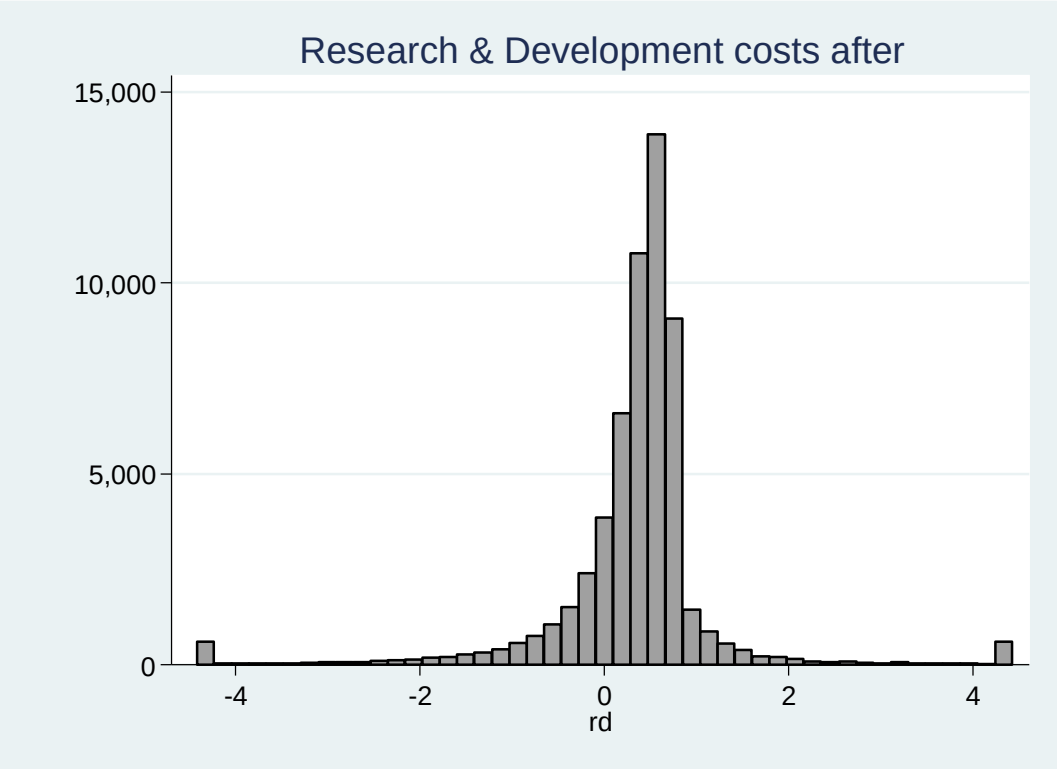


Table B.32
Research & Development costs after winsorizing

rd

	Percentiles	Smallest		
1%	-4.418266	-4.418266		
5%	-.9999488	-4.418266		
10%	-.3732811	-4.418266	Obs	58,360
25%	.1534562	-4.418266	Sum of Wgt.	58,360
50%	.45687		Mean	.33744
		Largest	Std. Dev.	.9388065
75%	.6562345	4.425619		
90%	.8121808	4.425619	Variance	.8813576
95%	1.186553	4.425619	Skewness	-.9743048
99%	4.425619	4.425619	Kurtosis	14.15089

Figure B.33
Histogram Retvol

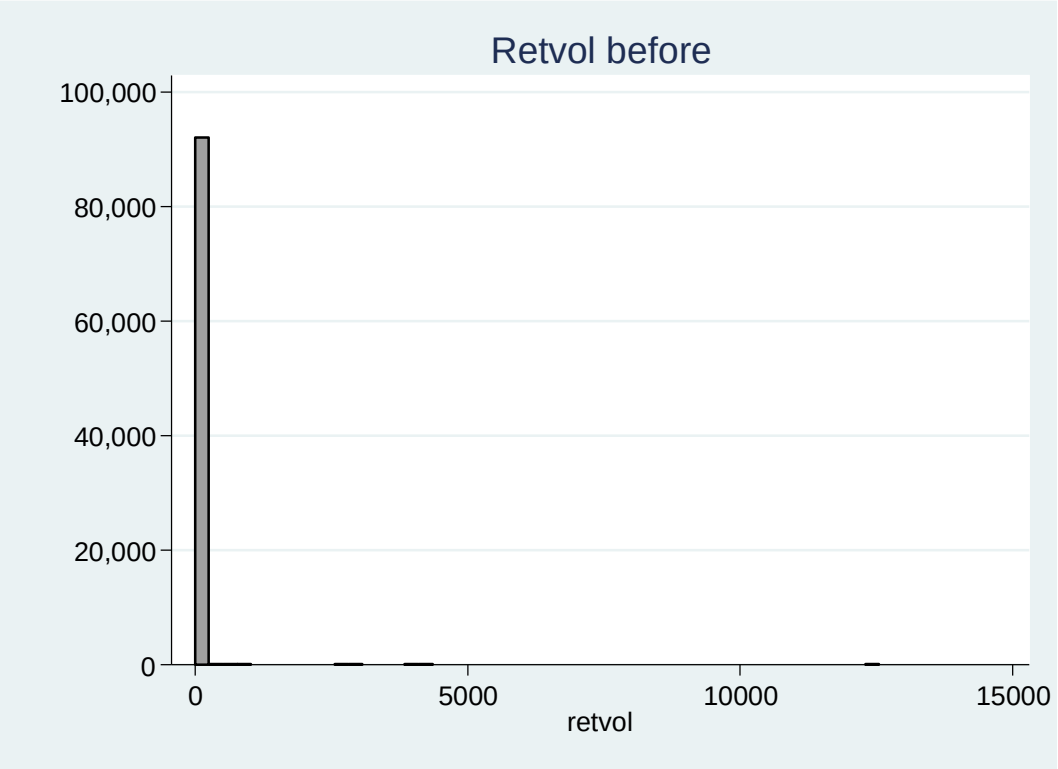


Table B.33
Retvol

retvol

Percentiles		Smallest		
1%	0	0		
5%	.0141421	0		
10%	.0424264	0	Obs	92,103
25%	.1555635	0	Sum of Wgt.	92,103
50%	.5303301		Mean	1.601479
		Largest	Std. Dev.	47.56469
75%	1.414214	2899.138		
90%	2.955706	3959.798	Variance	2262.4
95%	4.490128	4118.897	Skewness	217.3579
99%	11.04501	12555.39	Kurtosis	54071.5

Figure B.34
Histogram Retvol after winsorizing

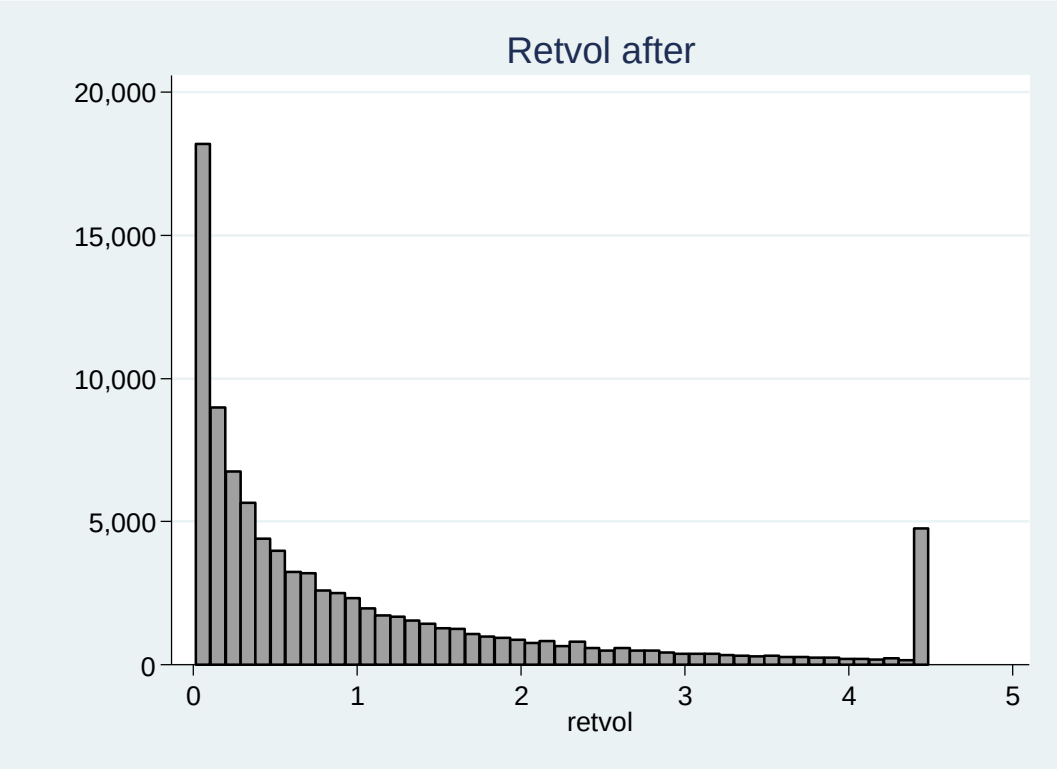


Table B.34
Retvol after winsorizing

retvol

Percentiles		Smallest		
1%	.0141421	.0141421		
5%	.0141421	.0141421		
10%	.0424264	.0141421	Obs	92,103
25%	.1555635	.0141421	Sum of Wgt.	92,103
50%	.5303301		Mean	1.023362
		Largest	Std. Dev.	1.225623
75%	1.414214	4.490128		
90%	2.955706	4.490128	Variance	1.502152
95%	4.490128	4.490128	Skewness	1.592076
99%	4.490128	4.490128	Kurtosis	4.64002

Figure B.35
Histogram Return on Assets

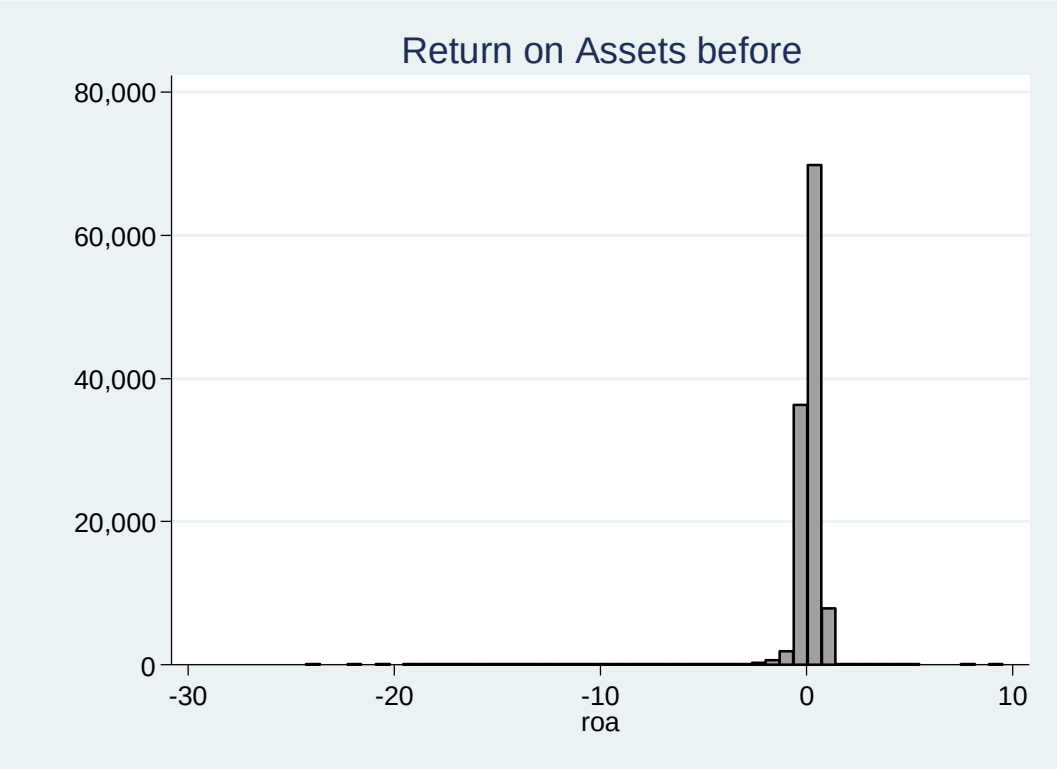


Table B.35
Return on Assets

roa

	Percentiles	Smallest		
1%	-1.642726	-24.28658		
5%	-.2813355	-24.28658		
10%	.01	-24.28658	Obs	117,607
25%	.01	-24.28658	Sum of Wgt.	117,607
50%	.4101793		Mean	.2732272
		Largest	Std. Dev.	.7414452
75%	.6110443	5.313014		
90%	.7099956	8.099566	Variance	.549741
95%	.7519789	9.531846	Skewness	-11.93872
99%	.844291	9.531846	Kurtosis	238.2964

Figure B.36
Histogram Return on Assets after winsorizing

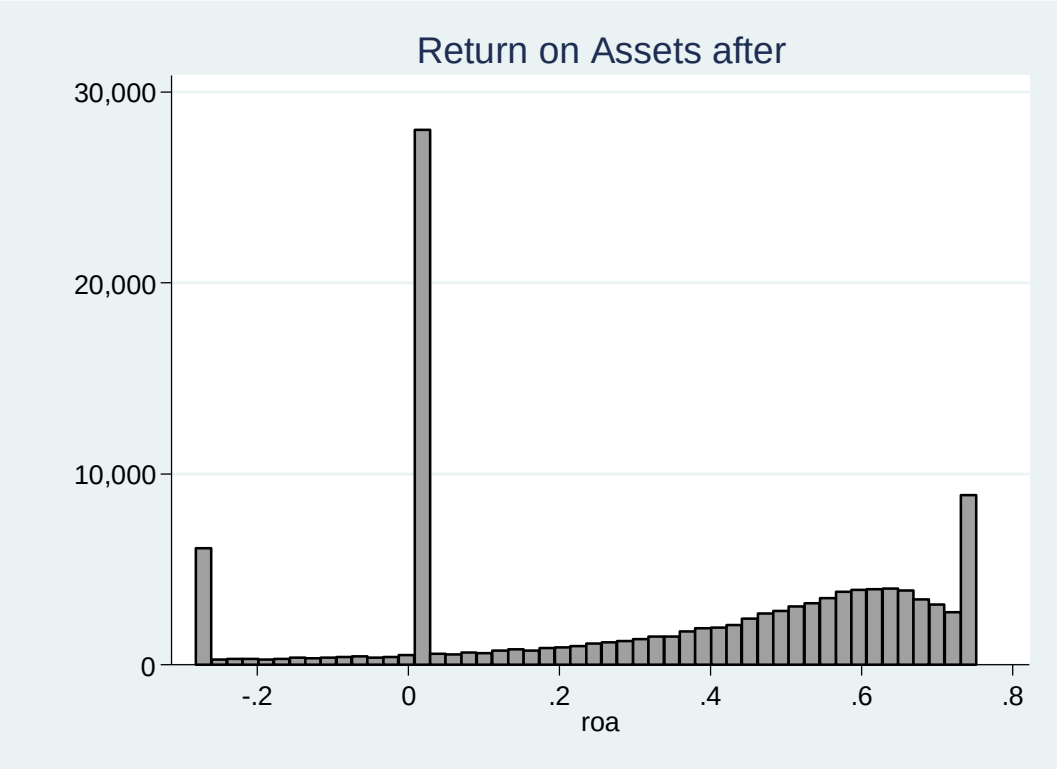


Table B.36
Return on Assets after winsorizing

roa

	Percentiles	Smallest		
1%	-.2813355	-.2813355		
5%	-.2813355	-.2813355		
10%	.01	-.2813355	Obs	117,607
25%	.01	-.2813355	Sum of Wgt.	117,607
50%	.4101793		Mean	.3309943
		Largest	Std. Dev.	.3129715
75%	.6110443	.7519789		
90%	.7099956	.7519789	Variance	.0979512
95%	.7519789	.7519789	Skewness	-.3153082
99%	.7519789	.7519789	Kurtosis	1.769187

Figure B.37
Histogram Selling, general and administrative expenses

Table B.37
Selling, general and administrative expenses

sga

	Percentiles	Smallest		
1%	-1.331413	-2797.892		
5%	.2618746	-1033.093		
10%	.4382305	-670.1754	Obs	102,848
25%	.6076562	-332.0112	Sum of Wgt.	102,848
50%	.7415428		Mean	.6559739
		Largest	Std. Dev.	10.90172
75%	.8410738	395.9901		
90%	.9259849	413.377	Variance	118.8475
95%	1.050246	448.3799	Skewness	-172.2671
99%	2.442962	598.0373	Kurtosis	43377.68

Figure B.38
Histogram Selling, general and administrative expenses after winsorizing

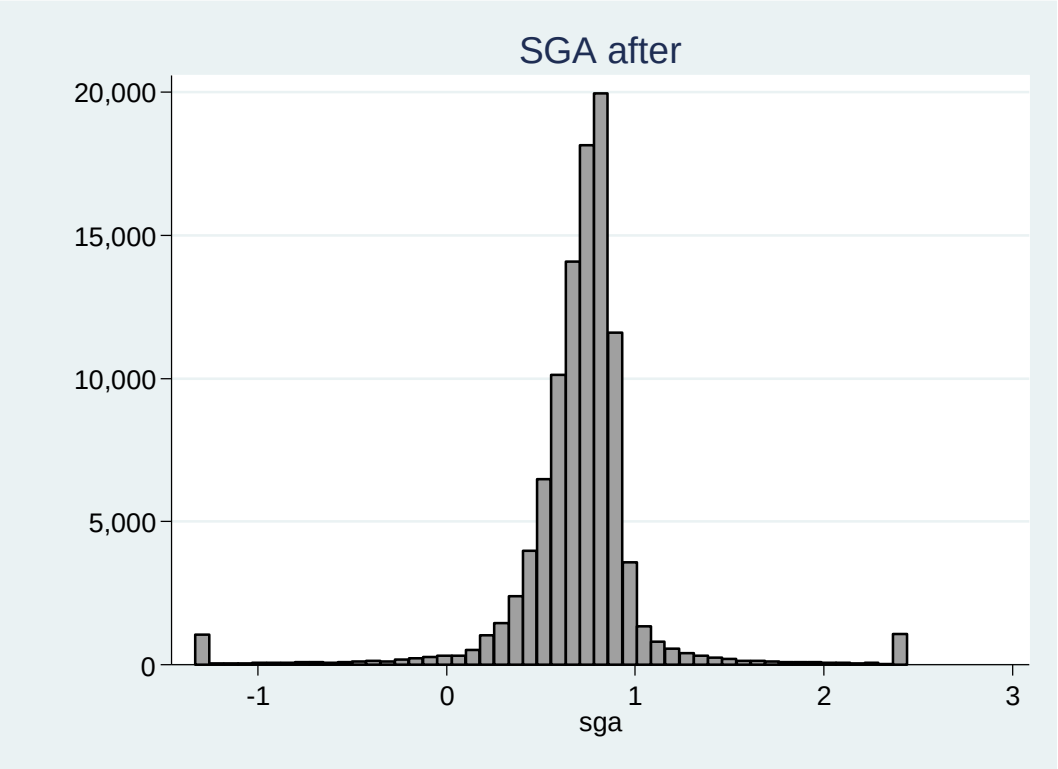


Table B.38
Selling, general and administrative expenses after winsorizing

sga

	Percentiles	Smallest		
1%	-1.331413	-1.331413		
5%	.2618746	-1.331413		
10%	.4382305	-1.331413	Obs	102,848
25%	.6076562	-1.331413	Sum of Wgt.	102,848
50%	.7415428		Mean	.7082042
		Largest	Std. Dev.	.3884744
75%	.8410738	2.442962		
90%	.9259849	2.442962	Variance	.1509123
95%	1.050246	2.442962	Skewness	-.8845051
99%	2.442962	2.442962	Kurtosis	15.63697

Figure B.39
Histogram Size

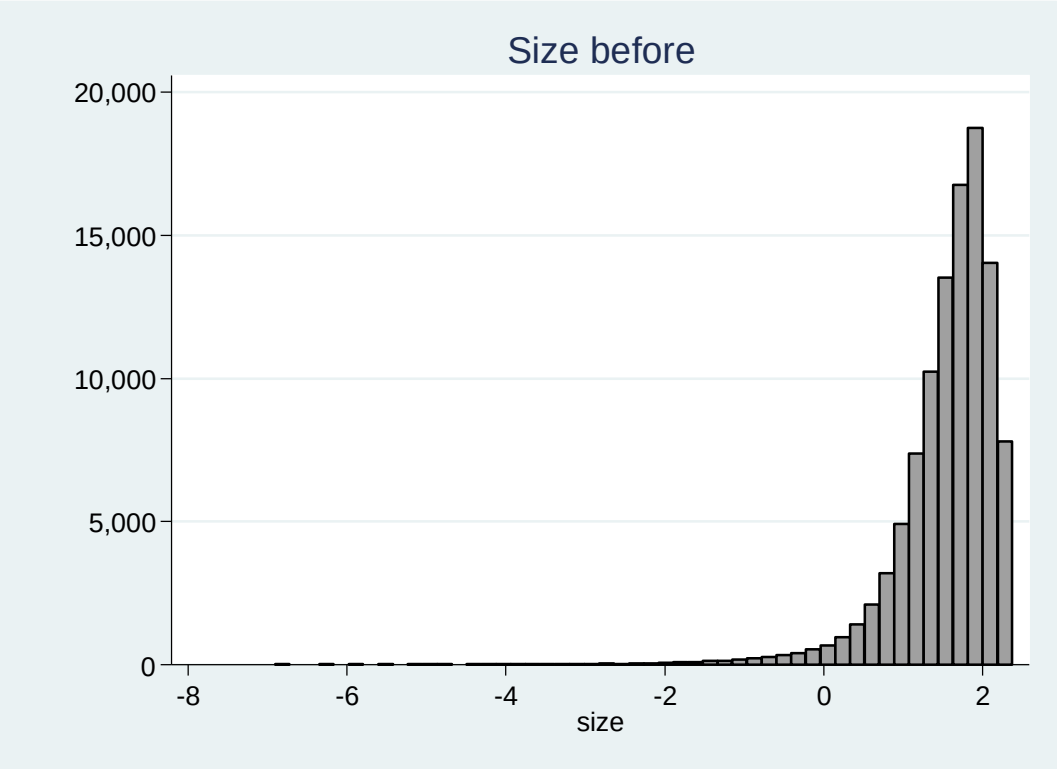


Table B.39
Size

size

	Percentiles	Smallest		
1%	-.9974977	-6.908255		
5%	.4410561	-6.908255		
10%	.8520902	-6.908255	Obs	104,670
25%	1.317005	-6.215607	Sum of Wgt.	104,670
50%	1.694048		Mean	1.55077
		Largest	Std. Dev.	.6499828
75%	1.961267	2.377559		
90%	2.147211	2.377559	Variance	.4224777
95%	2.242224	2.377559	Skewness	-2.648509
99%	2.377559	2.377559	Kurtosis	16.09751

Figure B.40
Histogram Size after winsorizing

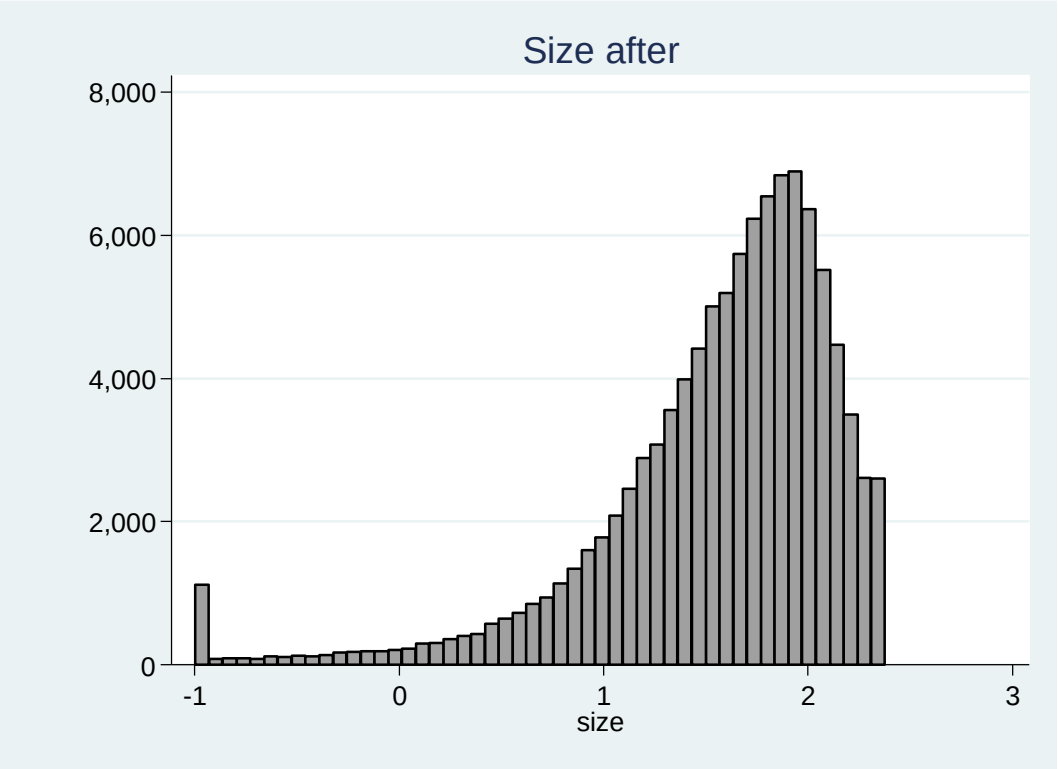


Table B.40
Size after winsorizing

size

	Percentiles	Smallest		
1%	-.9974977	-.9974977		
5%	.4410561	-.9974977		
10%	.8520902	-.9974977	Obs	104,670
25%	1.317005	-.9974977	Sum of Wgt.	104,670
50%	1.694048		Mean	1.560547
		Largest	Std. Dev.	.5953301
75%	1.961267	2.377559		
90%	2.147211	2.377559	Variance	.3544179
95%	2.242224	2.377559	Skewness	-1.709421
99%	2.377559	2.377559	Kurtosis	7.039256

Figure B.41
Histogram Size by Sales

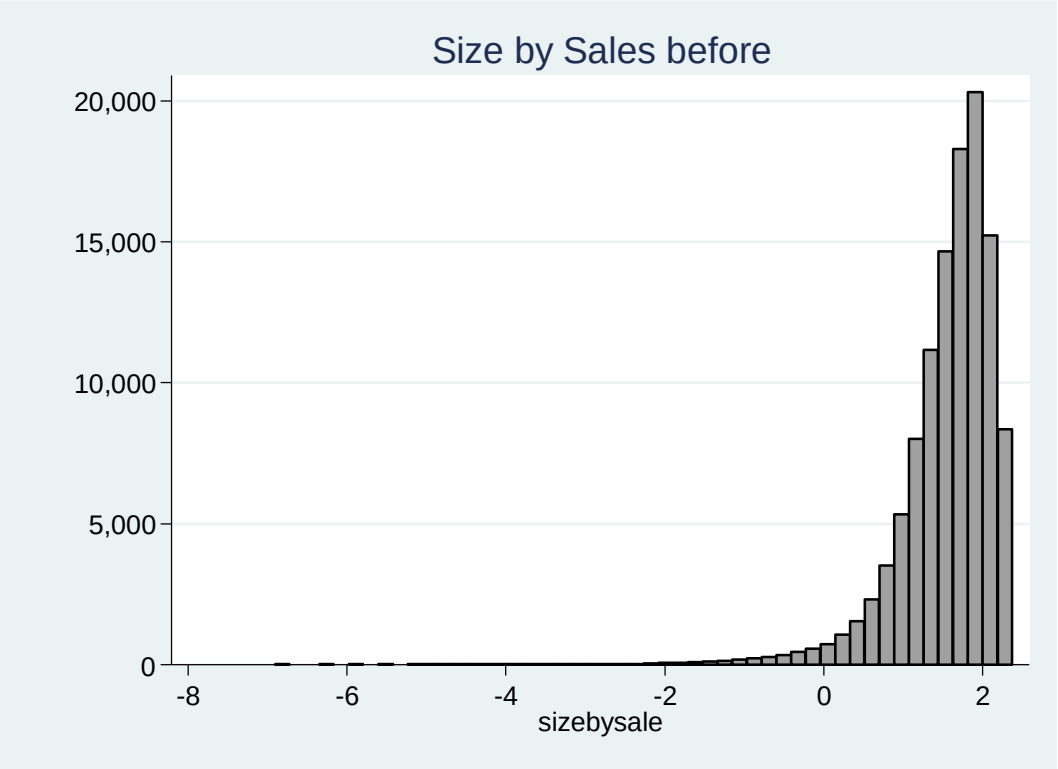


Table B.41
Size by Sales

sizebysale

Percentiles		Smallest		
1%	-.8428478	-6.908255		
5%	.4623529	-6.908255		
10%	.8583433	-6.908255	Obs	113,447
25%	1.319022	-6.908255	Sum of Wgt.	113,447
50%	1.694134		Mean	1.555772
		Largest	Std. Dev.	.632941
75%	1.960326	2.377559		
90%	2.145558	2.377559	Variance	.4006143
95%	2.241364	2.377559	Skewness	-2.582744
99%	2.377559	2.377559	Kurtosis	16.24811

Figure B.42
Histogram Size by Sales after winsorizing

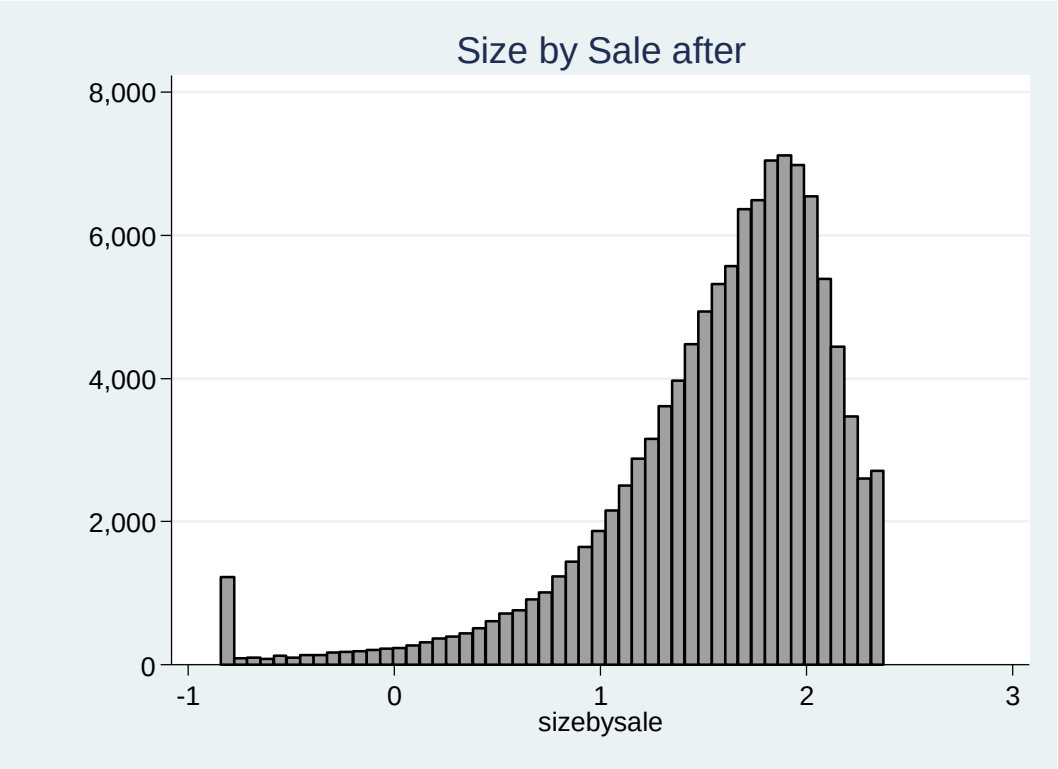


Table B.42
Size by Sales after winsorizing

sizebysale

	Percentiles	Smallest		
1%	-.8428478	-.8428478		
5%	.4623529	-.8428478		
10%	.8583433	-.8428478	Obs	113,447
25%	1.319022	-.8428478	Sum of Wgt.	113,447
50%	1.694134		Mean	1.565423
		Largest	Std. Dev.	.5792134
75%	1.960326	2.377559		
90%	2.145558	2.377559	Variance	.3354882
95%	2.241364	2.377559	Skewness	-1.592397
99%	2.377559	2.377559	Kurtosis	6.447817

Figure B.43
Histogram Asset tangibility

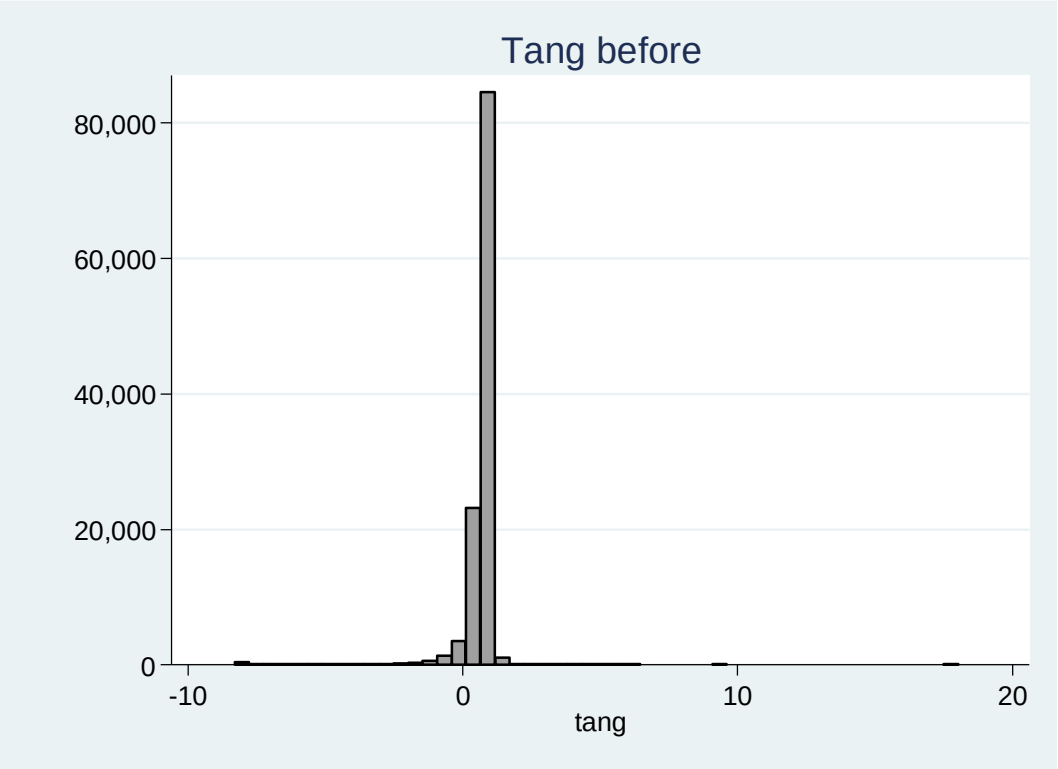


Table B.43
Asset tangibility

tang

Percentiles		Smallest		
1%	-2.343249	-8.313073		
5%	-.0037532	-8.313073		
10%	.3404624	-8.313073	Obs	116,155
25%	.630236	-8.313073	Sum of Wgt.	116,155
50%	.8350899		Mean	.6750141
		Largest	Std. Dev.	.7877216
75%	.9629328	6.223102		
90%	1.016334	6.308502	Variance	.6205053
95%	1.045262	9.254538	Skewness	-7.633505
99%	1.181744	18.02734	Kurtosis	81.41803

Figure B.44
Histogram Asset tangibility after winsorizing

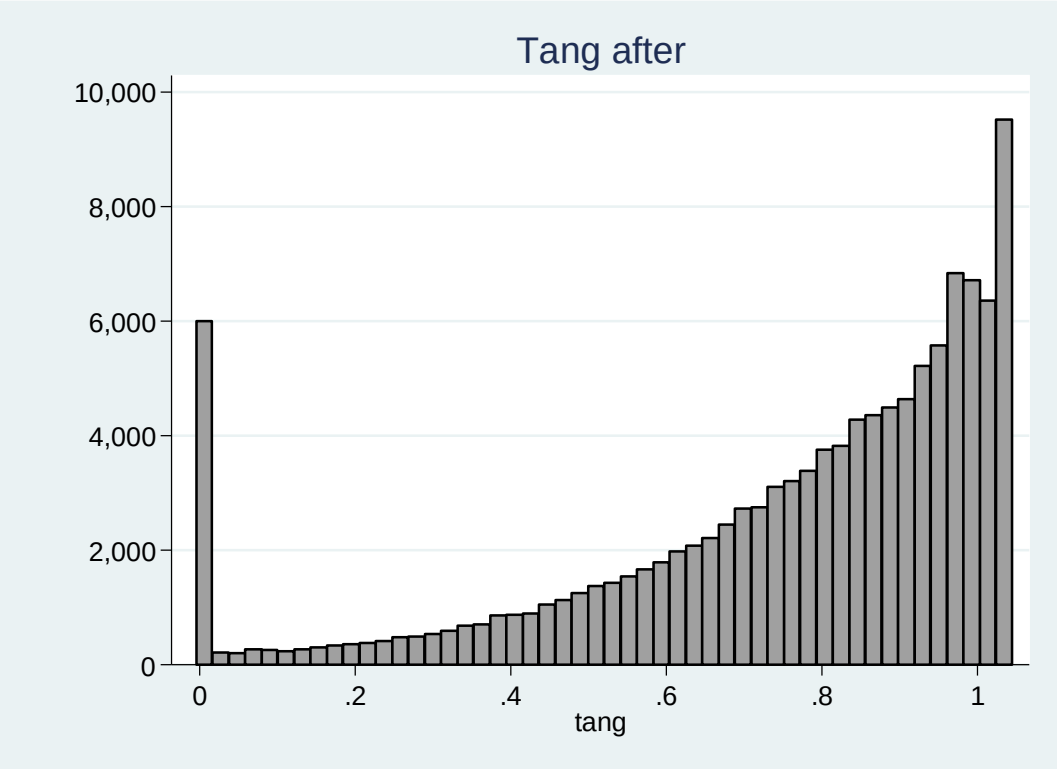


Table B.44
Asset tangibility after winsorizing

tang

Percentiles		Smallest		
1%	-.0037532	-.0037532		
5%	-.0037532	-.0037532		
10%	.3404624	-.0037532	Obs	116,155
25%	.630236	-.0037532	Sum of Wgt.	116,155
50%	.8350899		Mean	.7503873
		Largest	Std. Dev.	.2779479
75%	.9629328	1.045262		
90%	1.016334	1.045262	Variance	.077255
95%	1.045262	1.045262	Skewness	-1.292292
99%	1.045262	1.045262	Kurtosis	3.983594

Figure B.45
Histogram Z-score

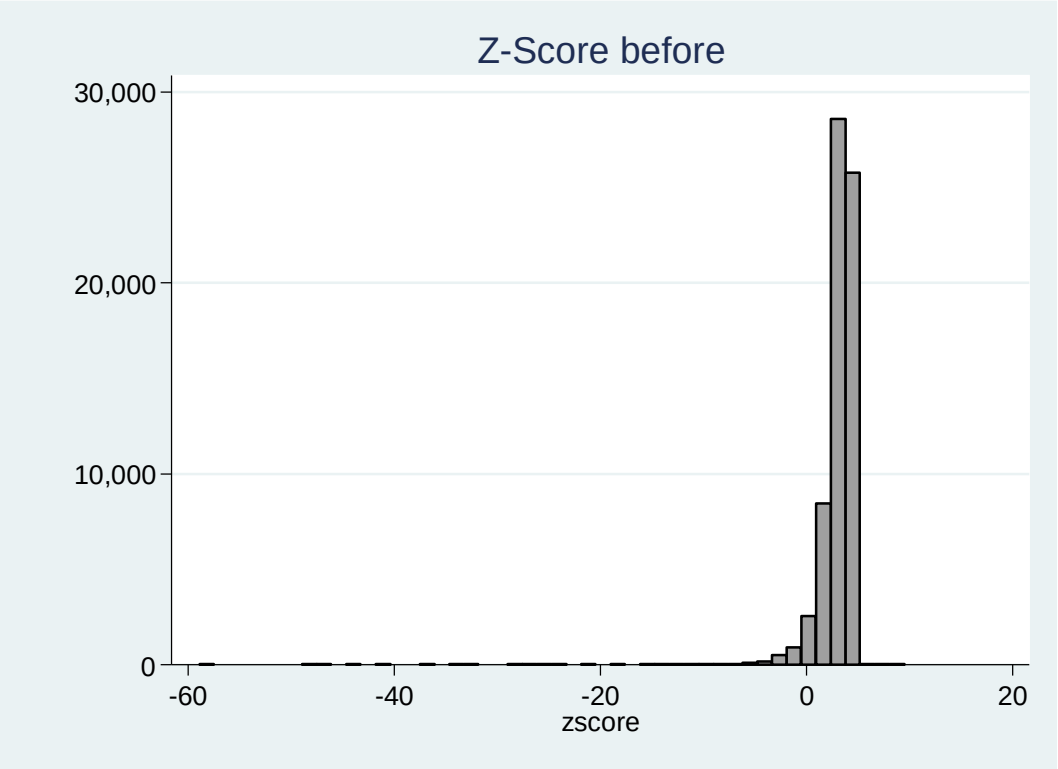


Table B.45
Z-score

zscore

	Percentiles	Smallest		
1%	-2.436474	-58.90845		
5%	.512755	-48.22226		
10%	1.549869	-46.28756	Obs	67,301
25%	2.707395	-46.28756	Sum of Wgt.	67,301
50%	3.541458		Mean	3.151572
		Largest	Std. Dev.	1.694593
75%	4.077511	6.388912		
90%	4.423766	6.415918	Variance	2.871644
95%	4.56818	7.047546	Skewness	-8.303954
99%	4.822152	9.508759	Kurtosis	181.7158

Figure B.46
Histogram Z-score after winsorizing

Table B.46
Z-score after winsorizing

zscore

	Percentiles	Smallest		
1%	.512755	.512755		
5%	.512755	.512755		
10%	1.549869	.512755	Obs	67,301
25%	2.707395	.512755	Sum of Wgt.	67,301
50%	3.541458		Mean	3.254044
		Largest	Std. Dev.	1.093281
75%	4.077511	4.56818		
90%	4.423766	4.56818	Variance	1.195263
95%	4.56818	4.56818	Skewness	-1.03029
99%	4.56818	4.56818	Kurtosis	3.303477

APPENDIX E TEST RESULTS OLS ASSUMPTIONS

Multicollinearity

All results with regards to multicollinearity provided by the variance inflation factors and the variance covariance matrix for the fitted coefficients as represented by tables C.1 till C.16 indicate that there is low degree of multicollinearity between the independent variables in the regression models. Therefore, multicollinearity is not a factor that will affect the results of the OLS regressions.

Table C.1

Variable	VIF	1/VIF
bm	2.19	0.456074
size	2.08	0.481326
zscore	2.02	0.494583
lev	1.40	0.716706
growth	1.17	0.853644
period	1.10	0.911374
extfin	1.09	0.916238
gdp	1.09	0.921602
aac	1.05	0.948030
retvol	1.05	0.952084
Mean VIF	1.42	

Table C.2

e(V)	aac	period	period	period	lev	zscore	extfin	bm	retvol	gdp	growth	size	_cons
aac	1.0000												
1.period	0.0115	1.0000											
2.period	-0.0321	0.4850	1.0000										
3.period	-0.0148	0.3415	0.7675	1.0000									
lev	-0.3206	0.0111	0.0944	0.0693	1.0000								
zscore	-0.0670	0.0004	-0.0735	-0.0947	0.1690	1.0000							
1.extfin	-0.0242	0.0341	0.0322	0.0320	0.0507	0.2970	1.0000						
bm	-0.0027	-0.0883	-0.1755	-0.1131	0.0139	0.3183	0.1296	1.0000					
retvol	0.0281	-0.0840	0.0826	0.0542	-0.0122	-0.0883	-0.1104	0.0632	1.0000				
gdp	-0.0010	0.2937	0.0398	-0.2036	-0.0270	0.0437	0.0285	0.0473	-0.0099	1.0000			
growth	-0.0469	-0.0181	-0.1158	-0.1965	0.0619	0.0581	-0.0043	-0.0329	0.0295	-0.1406	1.0000		
size	0.0367	-0.0514	-0.4027	-0.5766	-0.1545	-0.1109	-0.0884	0.0755	0.0088	0.2266	0.1649	1.0000	
_cons	0.0191	0.0407	0.3896	0.5633	-0.0146	-0.2086	-0.0171	-0.2935	-0.0148	-0.2385	-0.1689	-0.9325	1.0000

Table C.3

Variable	VIF	1/VIF
bm	2.46	0.406418
size	2.26	0.441639
zscore	2.24	0.446201
lev	1.71	0.585915
negaac	1.28	0.784071
growth	1.24	0.805902
extfin	1.11	0.898326
period	1.11	0.898713
gdp	1.09	0.920666
retvol	1.06	0.947559
Mean VIF	1.56	

Table C.4

e(V)	negaac	period	period	period	lev	zscore	extfin	bm	retvol	gdp	growth	size	_cons
negaac	1.0000												
1.period	0.0500	1.0000											
2.period	0.0319	0.4960	1.0000										
3.period	0.0046	0.3628	0.7756	1.0000									
lev	-0.3804	0.0300	0.1219	0.0836	1.0000								
zscore	-0.0780	-0.0139	-0.1024	-0.1305	0.1427	1.0000							
1.extfin	-0.0215	0.0431	0.0156	-0.0011	0.0406	0.3559	1.0000						
bm	0.0064	-0.0942	-0.1627	-0.1706	-0.0106	0.2868	0.1075	1.0000					
retvol	-0.0015	-0.0653	0.1328	0.0774	0.0328	-0.1170	-0.1273	0.1115	1.0000				
gdp	-0.0082	0.2940	0.0388	-0.2002	-0.0014	0.0737	0.0317	0.0705	-0.0080	1.0000			
growth	0.0091	-0.0190	-0.1587	-0.2323	0.0669	0.1292	0.0620	0.0366	0.0396	-0.1454	1.0000		
size	0.0416	-0.0666	-0.4325	-0.5847	-0.1029	-0.0553	-0.0596	0.1355	-0.0088	0.2326	0.1586	1.0000	
_cons	0.0347	0.0576	0.4118	0.5727	-0.0558	-0.2666	-0.0604	-0.3439	-0.0021	-0.2526	-0.1859	-0.9308	1.0000

Table C.5

Variable	VIF	1/VIF
bm	2.03	0.492606
size	1.98	0.505695
zscore	1.88	0.530693
lev	1.31	0.765693
growth	1.15	0.871143
posaac	1.13	0.887256
period	1.10	0.909888
gdp	1.09	0.919449
extfin	1.09	0.920874
retvol	1.07	0.932547
Mean VIF	1.38	

Table C.6

e(V)	posaac	period	period	period	lev	zscore	extfin	bm	retvol	gdp	growth	size	_cons
posaac	1.0000												
1.period	0.0354	1.0000											
2.period	-0.0284	0.5055	1.0000										
3.period	0.0137	0.3532	0.7595	1.0000									
lev	0.0390	0.0207	0.0761	0.0590	1.0000								
zscore	-0.0321	0.0025	-0.0842	-0.0914	0.1954	1.0000							
1.extfin	-0.0597	-0.0053	0.0152	0.0356	0.0638	0.2898	1.0000						
bm	-0.0245	-0.0981	-0.1973	-0.0861	0.0202	0.3440	0.1563	1.0000					
retvol	0.0296	-0.0661	0.0731	0.0585	-0.0396	-0.0840	-0.1447	0.0241	1.0000				
gdp	0.0007	0.2984	0.0762	-0.1785	-0.0266	0.0095	0.0063	0.0063	-0.0197	1.0000			
growth	-0.0745	-0.0373	-0.0750	-0.1419	0.0351	0.0325	0.0053	-0.0689	0.0265	-0.1658	1.0000		
size	-0.0002	-0.0541	-0.3815	-0.5743	-0.2135	-0.1455	-0.1253	0.0272	0.0290	0.2114	0.1092	1.0000	
_cons	-0.0087	0.0413	0.3834	0.5691	0.0228	-0.1807	0.0201	-0.2477	-0.0276	-0.2147	-0.1033	-0.9298	1.0000

Table C.7

Variable	VIF	1/VIF
bm	2.19	0.455871
size	2.07	0.482747
zscore	2.02	0.495745
lev	1.42	0.704418
growth	1.18	0.850454
absaac	1.15	0.865938
period	1.10	0.912754
extfin	1.09	0.916353
gdp	1.09	0.921475
retvol	1.05	0.950578
Mean VIF	1.44	

Table C.8

e(V)	absaac	period	period	period	lev	zscore	extfin	bm	retvol	gdp	growth	size	_cons
absaac	1.0000												
1.period	-0.0111	1.0000											
2.period	-0.0519	0.4855	1.0000										
3.period	-0.0107	0.3418	0.7670	1.0000									
lev	0.1572	0.0137	0.0795	0.0657	1.0000								
zscore	0.0278	0.0008	-0.0772	-0.0962	0.1585	1.0000							
1.extfin	-0.0098	0.0345	0.0319	0.0317	0.0433	0.2958	1.0000						
bm	-0.0037	-0.0882	-0.1753	-0.1131	0.0130	0.3186	0.1296	1.0000					
retvol	-0.0083	-0.0843	0.0839	0.0547	-0.0046	-0.0868	-0.1097	0.0634	1.0000				
gdp	0.0023	0.2937	0.0396	-0.2037	-0.0282	0.0438	0.0284	0.0473	-0.0099	1.0000			
growth	-0.0614	-0.0169	-0.1140	-0.1964	0.0392	0.0533	-0.0048	-0.0328	0.0313	-0.1407	1.0000		
size	-0.0187	-0.0516	-0.4004	-0.5761	-0.1519	-0.1092	-0.0874	0.0757	0.0079	0.2267	0.1678	1.0000	
cons	-0.0191	0.0407	0.3909	0.5638	-0.0118	-0.2083	-0.0165	-0.2934	-0.0152	-0.2385	-0.1667	-0.9333	1.0000

Table C.9

Variable	VIF	1/VIF
bm	2.19	0.455866
size	2.10	0.476190
zscore	2.02	0.495735
lev	1.35	0.742037
growth	1.19	0.842941
period	1.10	0.910955
extfin	1.09	0.916281
gdp	1.09	0.921345
retvol	1.05	0.952099
acfo	1.05	0.956731
Mean VIF	1.42	

Table C.10

e(V)	acfo	period	period	period	lev	zscore	extfin	bm	retvol	gdp	growth	size	_cons
acfo	1.0000												
1.period	-0.0149	1.0000											
2.period	-0.1170	0.4840	1.0000										
3.period	-0.1465	0.3402	0.7712	1.0000									
lev	0.0203	0.0153	0.0859	0.0645	1.0000								
zscore	-0.0275	0.0015	-0.0721	-0.0908	0.1554	1.0000							
1.extfin	-0.0091	0.0345	0.0323	0.0326	0.0452	0.2963	1.0000						
bm	0.0059	-0.0884	-0.1752	-0.1128	0.0139	0.3185	0.1295	1.0000					
retvol	0.0132	-0.0846	0.0814	0.0521	-0.0031	-0.0869	-0.1099	0.0634	1.0000				
gdp	0.0925	0.2911	0.0286	-0.2142	-0.0269	0.0410	0.0275	0.0476	-0.0086	1.0000			
growth	-0.0846	-0.0163	-0.1064	-0.1822	0.0476	0.0573	-0.0046	-0.0335	0.0297	-0.1475	1.0000		
size	0.1043	-0.0531	-0.4093	-0.5824	-0.1478	-0.1110	-0.0881	0.0758	0.0091	0.2342	0.1566	1.0000	
_cons	-0.0997	0.0418	0.3975	0.5695	-0.0109	-0.2040	-0.0157	-0.2927	-0.0166	-0.2456	-0.1583	-0.9347	1.0000

Table C.11

Variable	VIF	1/VIF
bm	2.20	0.453877
size	2.08	0.481207
zscore	2.04	0.491320
lev	1.33	0.749525
growth	1.17	0.853524
period	1.10	0.906081
extfin	1.09	0.916404
gdp	1.09	0.921287
retvol	1.05	0.952337
aprod	1.05	0.953681
Mean VIF	1.42	

Table C.12

e(V)	aprod	period	period	period	lev	zscore	extfin	bm	retvol	gdp	growth	size	_cons
aprod	1.0000												
1.period	-0.0360	1.0000											
2.period	-0.0538	0.4866	1.0000										
3.period	-0.0548	0.3430	0.7682	1.0000									
lev	-0.0688	0.0180	0.0922	0.0717	1.0000								
zscore	0.0999	-0.0025	-0.0808	-0.1008	0.1481	1.0000							
1.extfin	0.0005	0.0343	0.0314	0.0315	0.0452	0.2947	1.0000						
bm	0.0628	-0.0903	-0.1785	-0.1162	0.0094	0.3229	0.1293	1.0000					
retvol	0.0574	-0.0863	0.0802	0.0513	-0.0073	-0.0803	-0.1096	0.0667	1.0000				
gdp	0.0020	0.2935	0.0397	-0.2035	-0.0290	0.0437	0.0285	0.0473	-0.0097	1.0000			
growth	-0.0177	-0.0170	-0.1164	-0.1962	0.0507	0.0531	-0.0054	-0.0341	0.0298	-0.1408	1.0000		
size	0.0004	-0.0518	-0.4015	-0.5756	-0.1505	-0.1081	-0.0876	0.0755	0.0078	0.2268	0.1669	1.0000	
_cons	-0.0259	0.0414	0.3912	0.5641	-0.0071	-0.2093	-0.0167	-0.2945	-0.0168	-0.2385	-0.1677	-0.9337	1.0000

Table C.13

Variable	VIF	1/VIF
bm	2.20	0.455549
size	2.06	0.484799
zscore	2.03	0.493246
lev	1.34	0.748482
growth	1.17	0.853230
period	1.09	0.913853
extfin	1.09	0.914772
gdp	1.08	0.921835
retvol	1.05	0.948523
adiscexp	1.03	0.971759
Mean VIF	1.41	

Table C.14

e(V)	adiscexp	period	period	period	lev	zscore	extfin	bm	retvol	gdp	growth	size	_cons
adiscexp	1.0000												
1.period	0.0031	1.0000											
2.period	-0.0073	0.4856	1.0000										
3.period	0.0505	0.3415	0.7661	1.0000									
lev	-0.0538	0.0154	0.0891	0.0653	1.0000								
zscore	0.0557	0.0013	-0.0762	-0.0929	0.1526	1.0000							
1.extfin	0.0377	0.0345	0.0312	0.0334	0.0432	0.2976	1.0000						
bm	-0.0927	-0.0882	-0.1743	-0.1172	0.0187	0.3118	0.1254	1.0000					
retvol	-0.0004	-0.0844	0.0836	0.0546	-0.0033	-0.0865	-0.1097	0.0631	1.0000				
gdp	-0.0383	0.2934	0.0401	-0.2052	-0.0268	0.0415	0.0270	0.0506	-0.0098	1.0000			
growth	-0.0100	-0.0177	-0.1174	-0.1977	0.0500	0.0545	-0.0058	-0.0320	0.0309	-0.1403	1.0000		
size	-0.0315	-0.0519	-0.4016	-0.5770	-0.1488	-0.1103	-0.0887	0.0782	0.0078	0.2277	0.1672	1.0000	
_cons	0.0277	0.0406	0.3901	0.5642	-0.0104	-0.2059	-0.0156	-0.2947	-0.0153	-0.2393	-0.1684	-0.9341	1.0000

Table C.15

Variable	VIF	1/VIF
bm	2.20	0.455279
size	2.04	0.490341
zscore	2.02	0.493955
lev	1.33	0.749619
growth	1.18	0.846560
period	1.09	0.914367
extfin	1.09	0.914638
gdp	1.09	0.921435
retvol	1.05	0.948402
realaccm	1.02	0.977165
Mean VIF	1.41	

Table C.16

e(V)	realaccm	1.period	2.period	3.period	lev	zscore	1.extfin	bm	retvol	gdp	growth	size	_cons
realaccm	1.0000												
1.period	-0.0100	1.0000											
2.period	-0.0924	0.4845	1.0000										
3.period	-0.0776	0.3415	0.7691	1.0000									
lev	-0.0216	0.0158	0.0905	0.0697	1.0000								
zscore	0.0184	0.0009	-0.0773	-0.0971	0.1556	1.0000							
1.extfin	0.0175	0.0342	0.0297	0.0301	0.0450	0.2964	1.0000						
bm	-0.0536	-0.0876	-0.1697	-0.1085	0.0149	0.3173	0.1284	1.0000					
retvol	0.0111	-0.0845	0.0822	0.0536	-0.0036	-0.0864	-0.1096	0.0626	1.0000				
gdp	0.0437	0.2930	0.0356	-0.2062	-0.0298	0.0445	0.0292	0.0448	-0.0094	1.0000			
growth	-0.0692	-0.0169	-0.1104	-0.1910	0.0509	0.0538	-0.0066	-0.0293	0.0300	-0.1433	1.0000		
size	0.0567	-0.0523	-0.4049	-0.5782	-0.1518	-0.1075	-0.0865	0.0724	0.0084	0.2287	0.1624	1.0000	
_cons	-0.0565	0.0410	0.3934	0.5655	-0.0077	-0.2085	-0.0176	-0.2896	-0.0159	-0.2404	-0.1636	-0.9342	1.0000

Linearity

The ACPR plots show that all the independent variable appears to linearly associated with the dependent variable diff. This satisfies the first OLS assumption of linearity. Dependent variable BM and aprod are slightly less linearity despite have transformed the variable into its natural logarithm.

Figure C.1

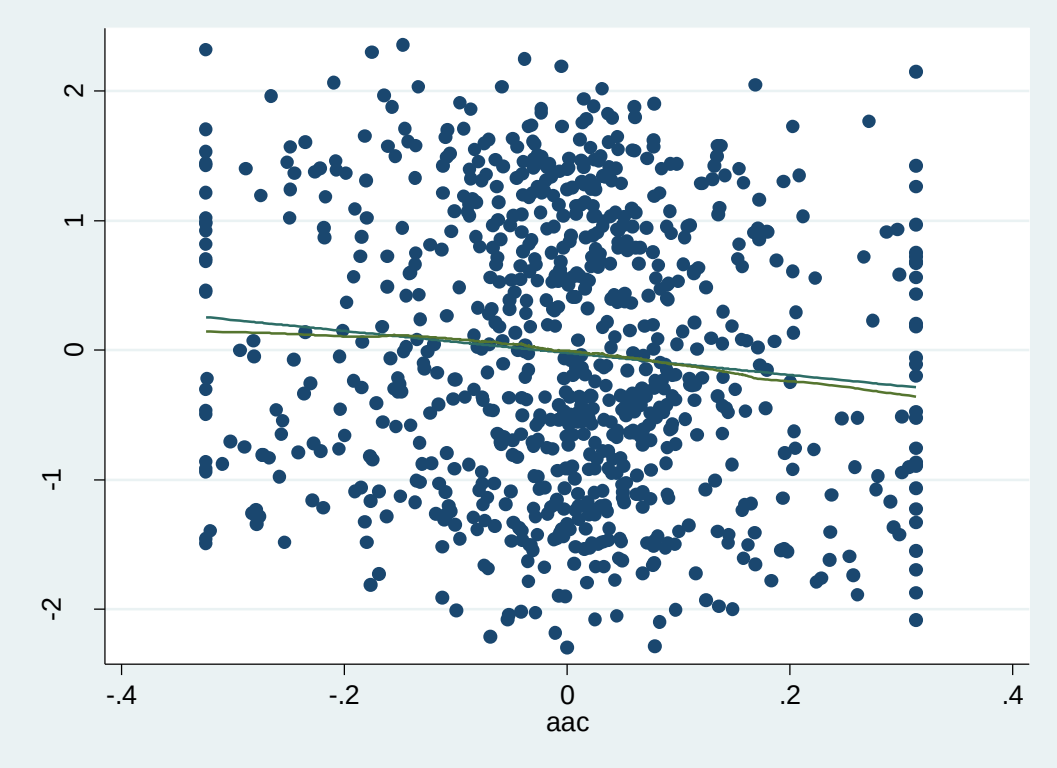


Figure C.2

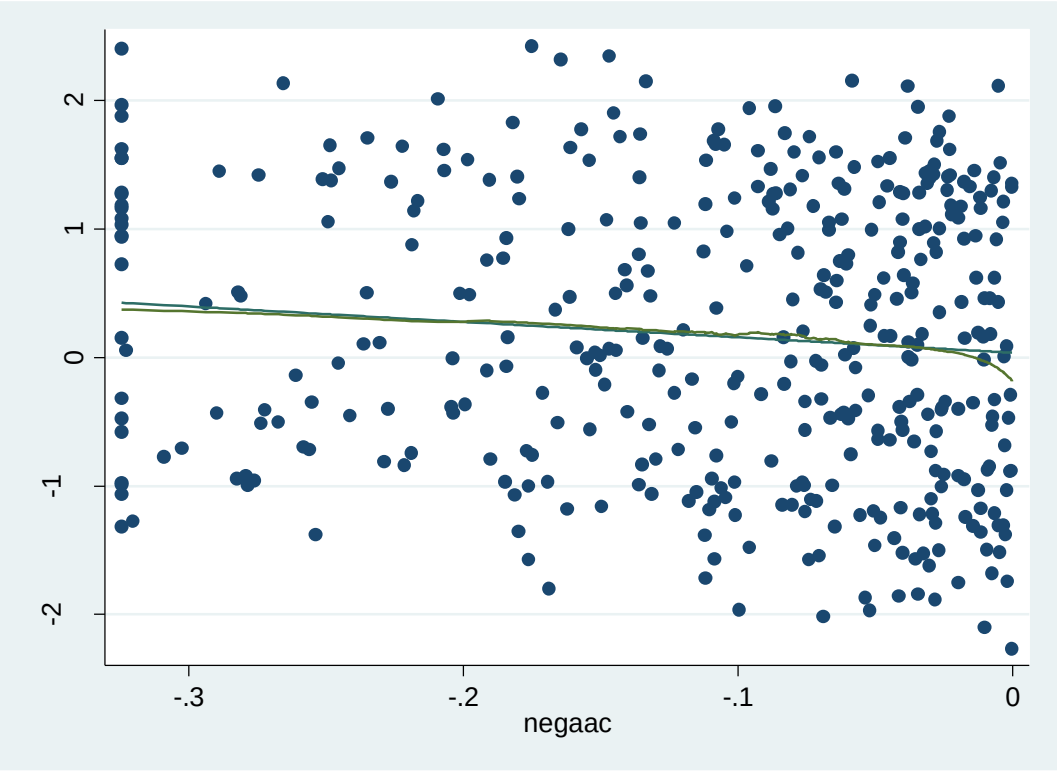


Figure C.3

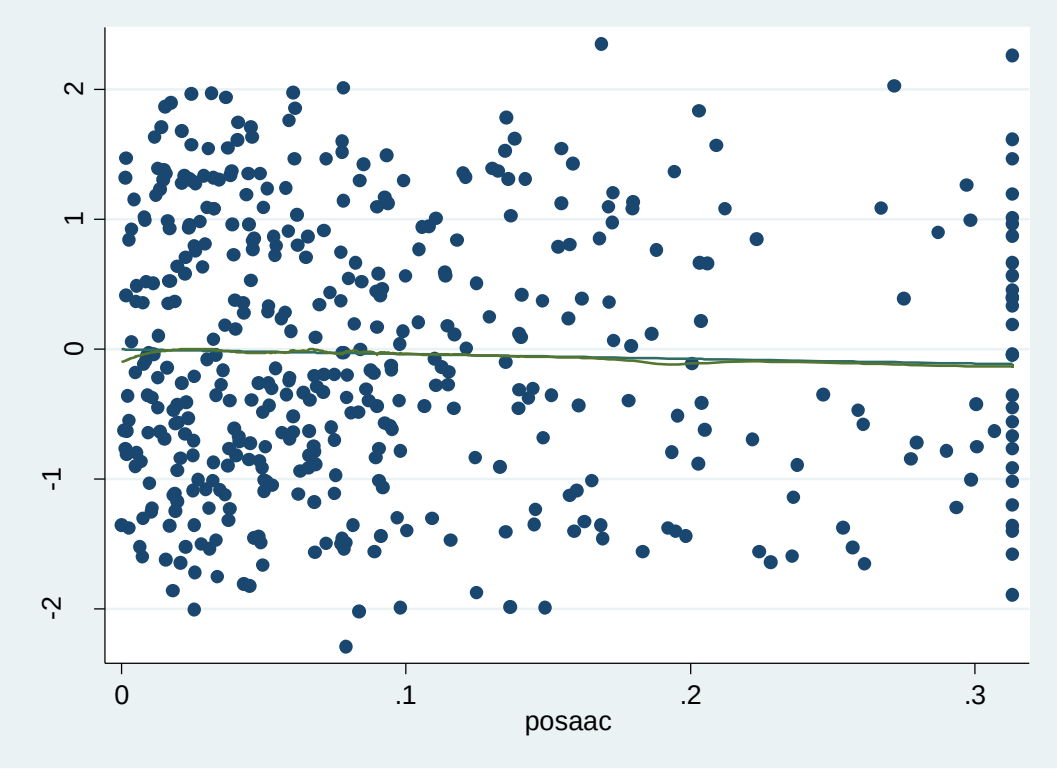


Figure C.4

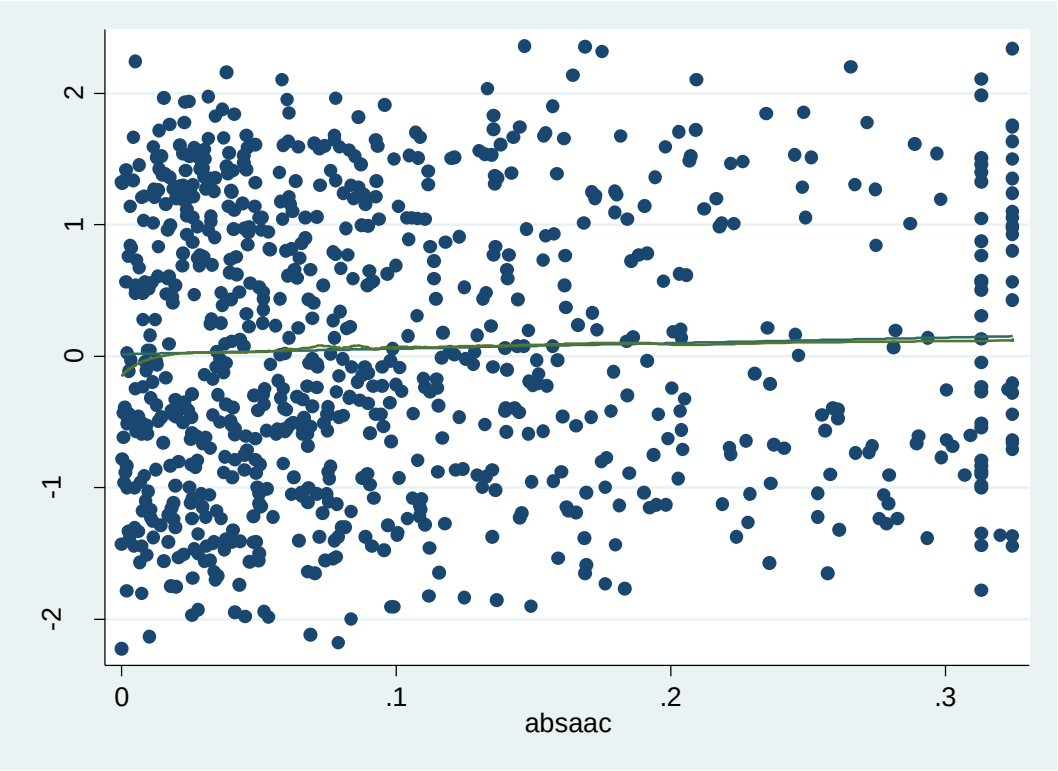


Figure C.5

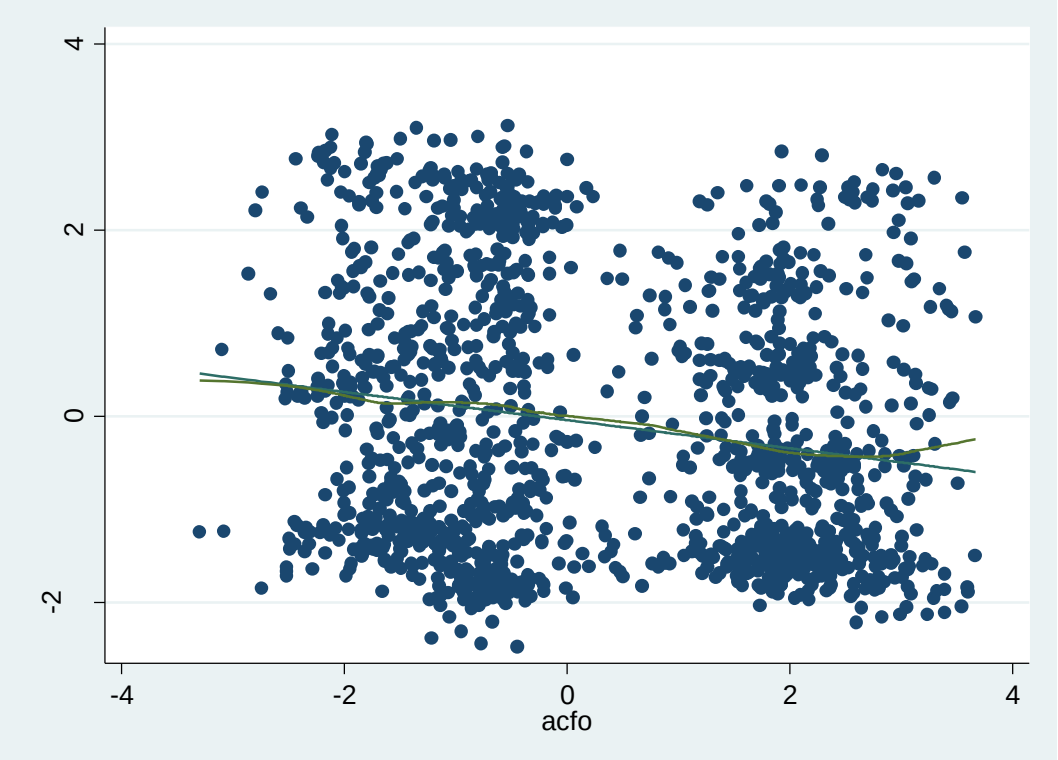


Figure C.6

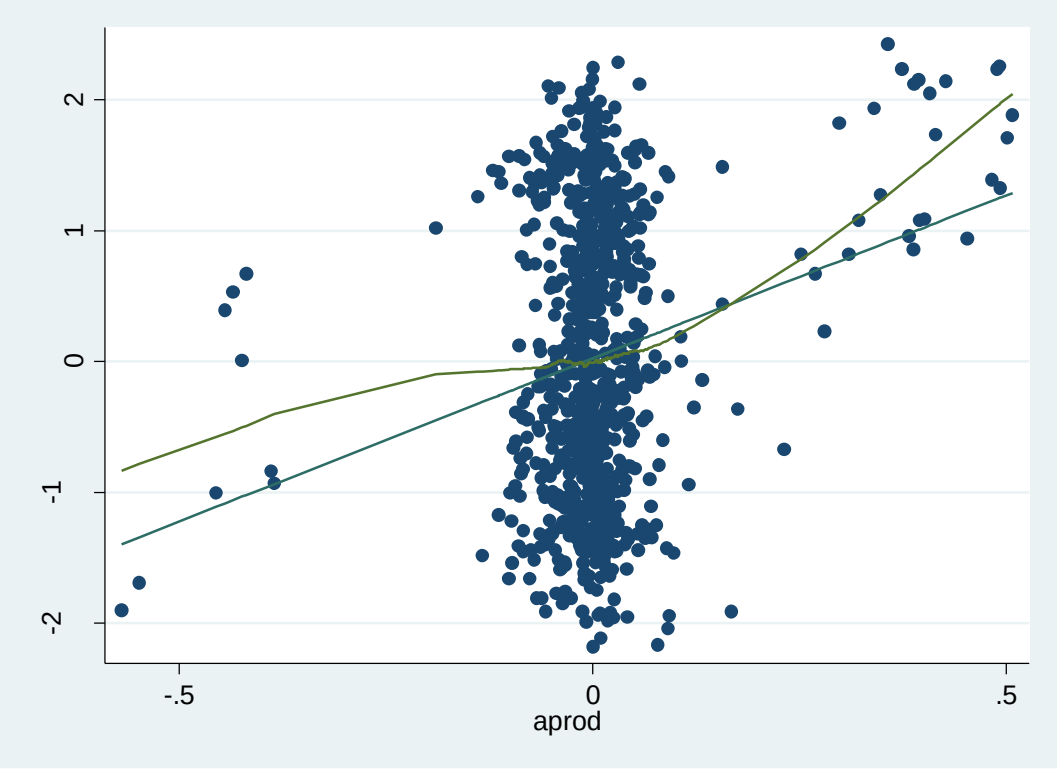


Figure C.7

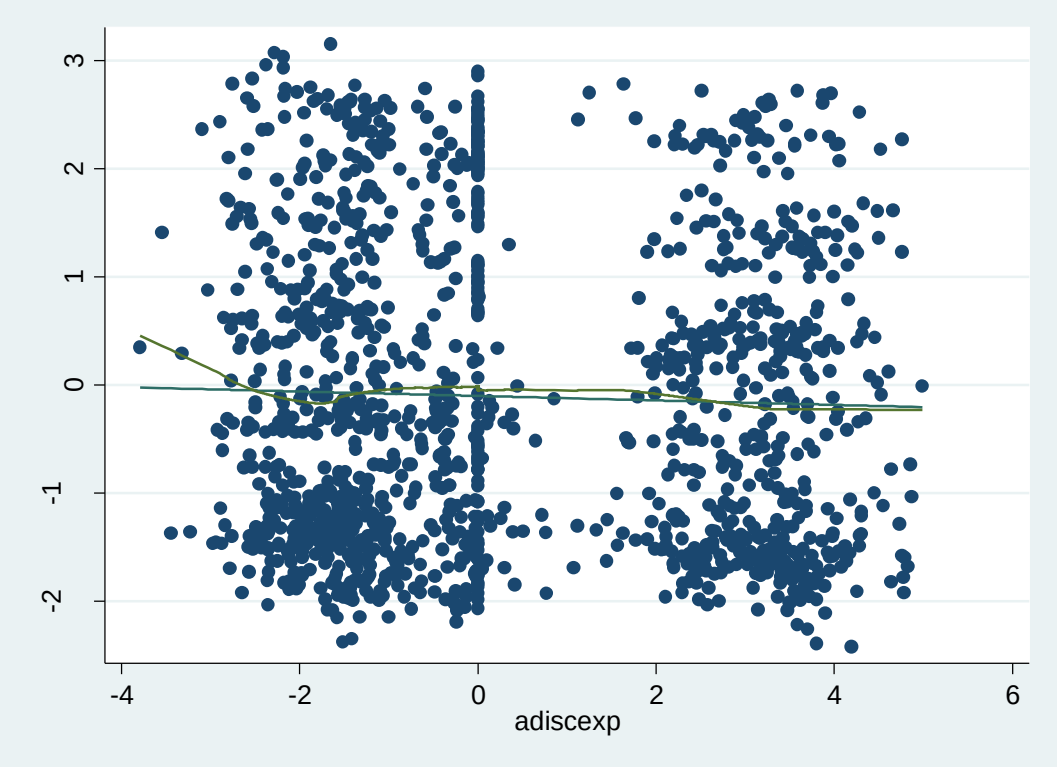


Figure C.8

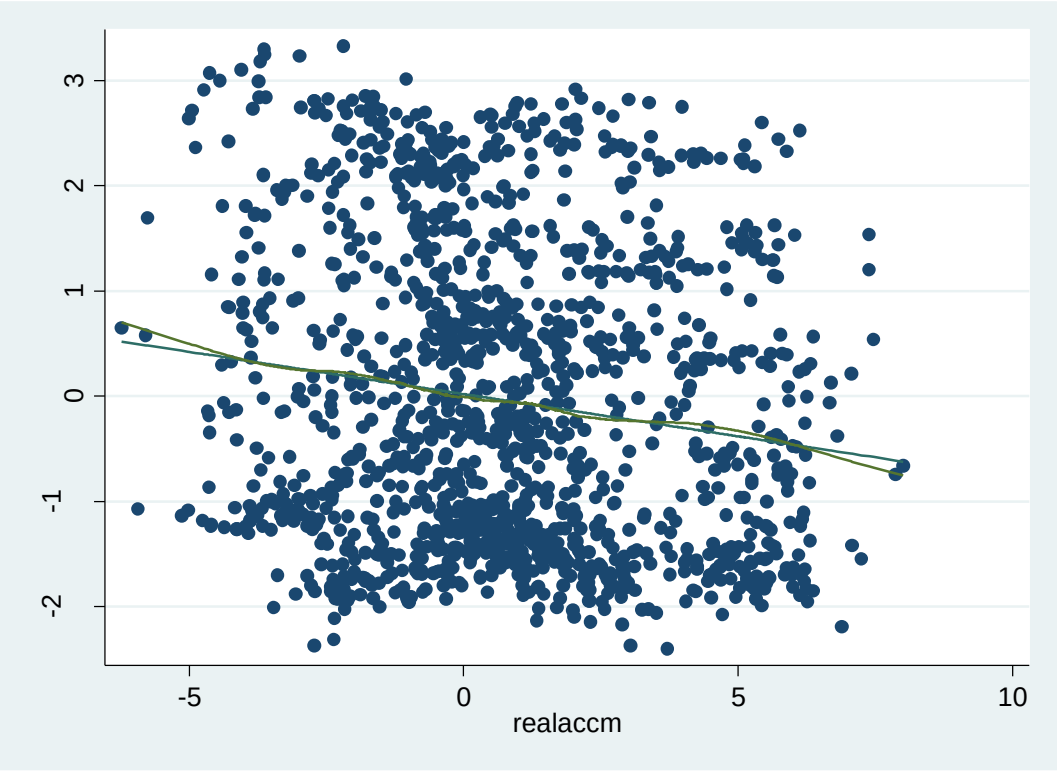


Figure C.9

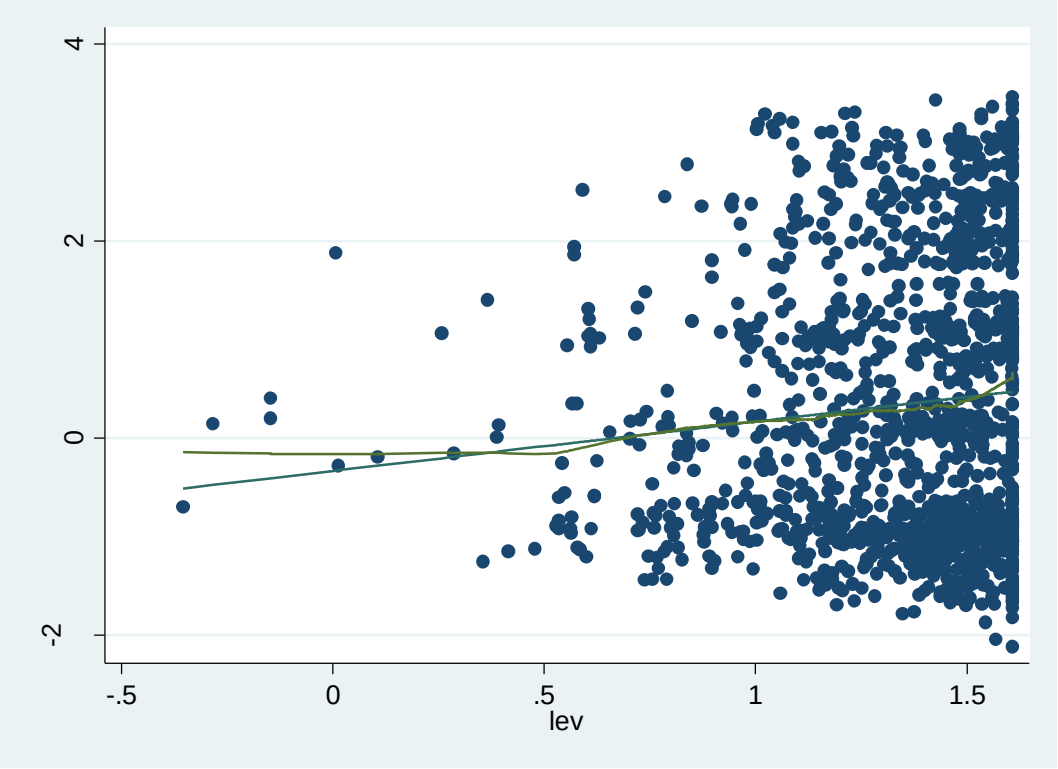


Figure C.10

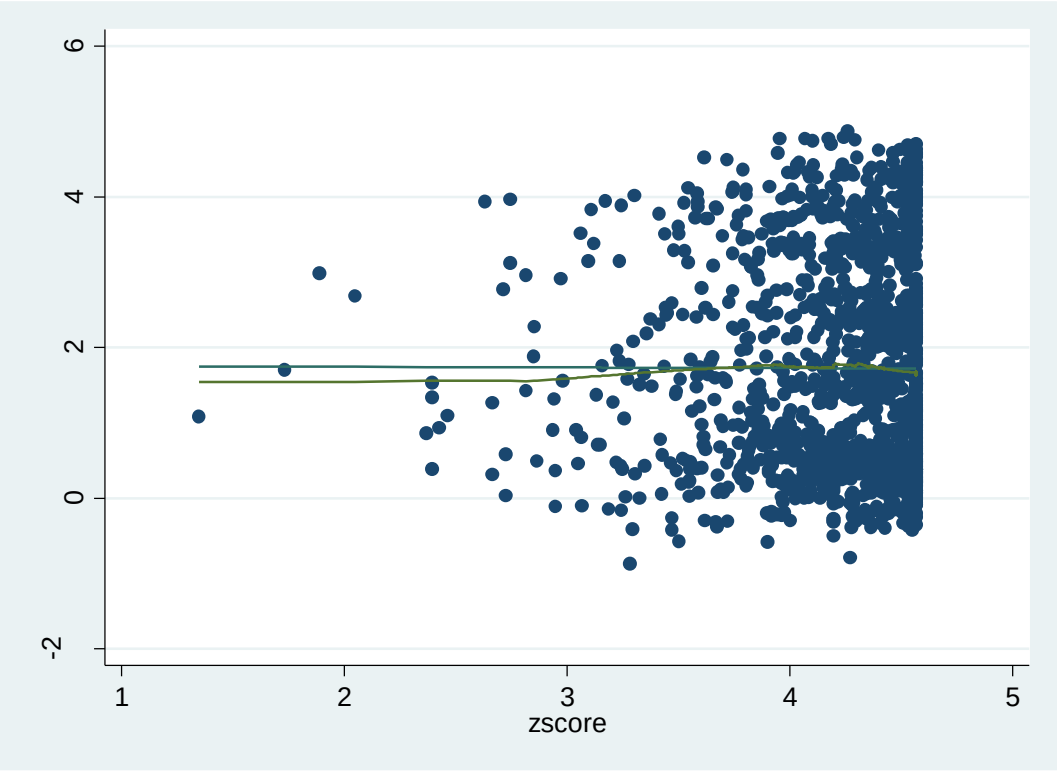


Figure C.11

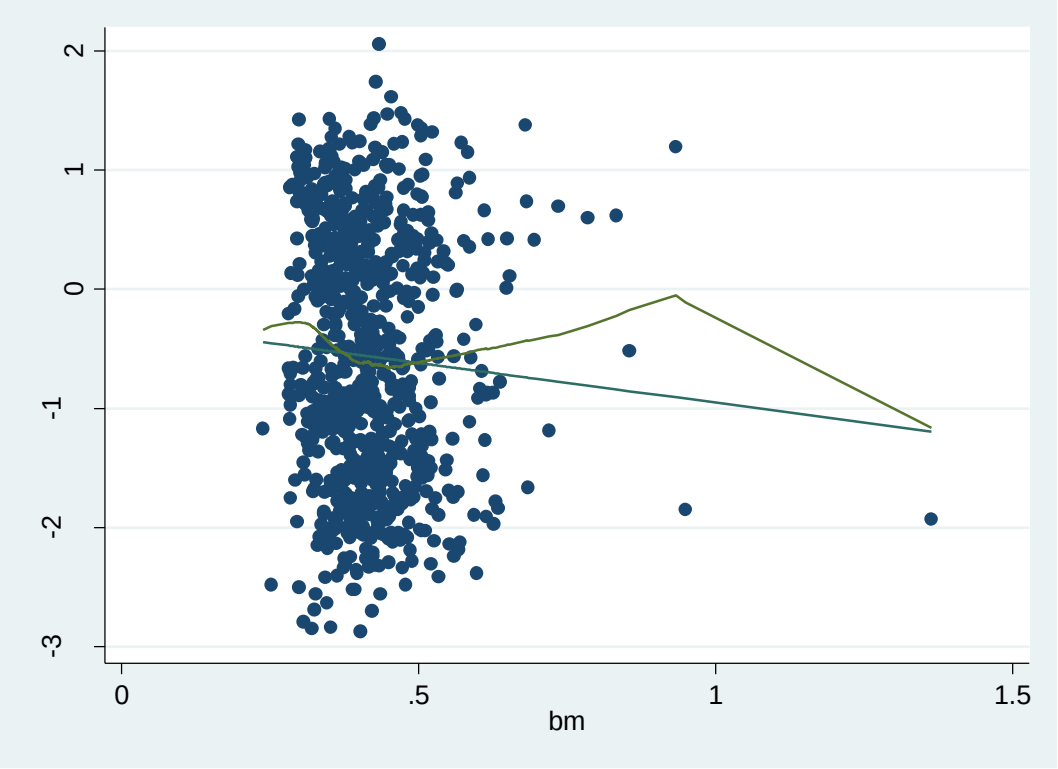


Figure C.12

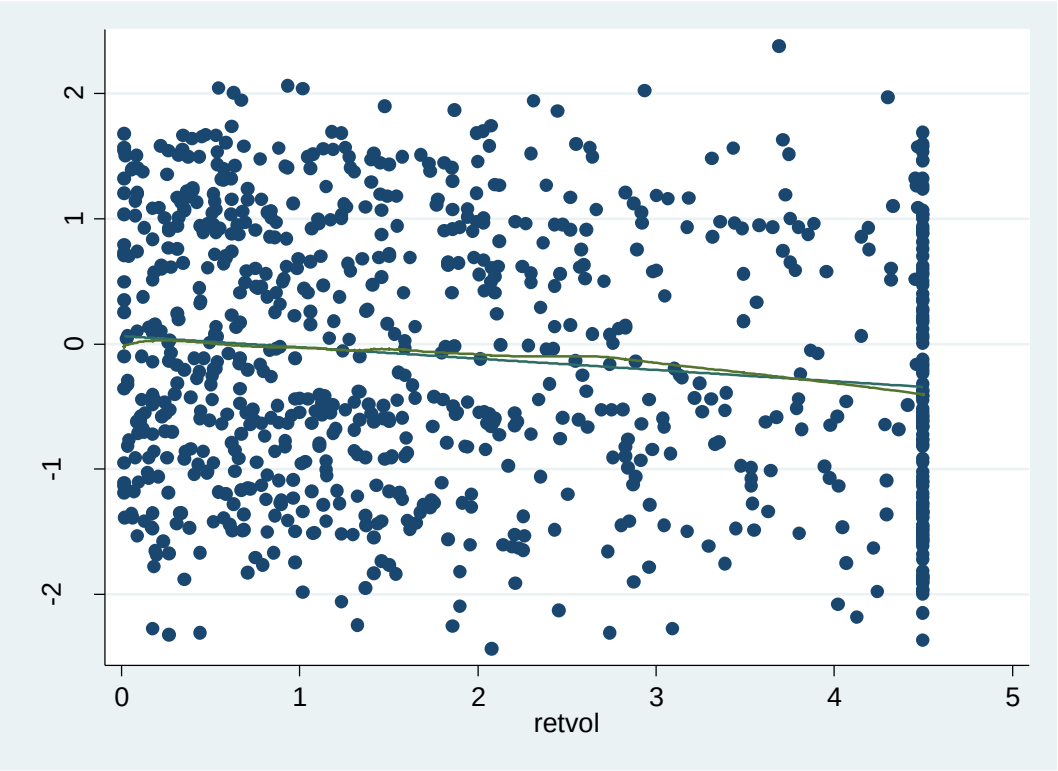


Figure C.13

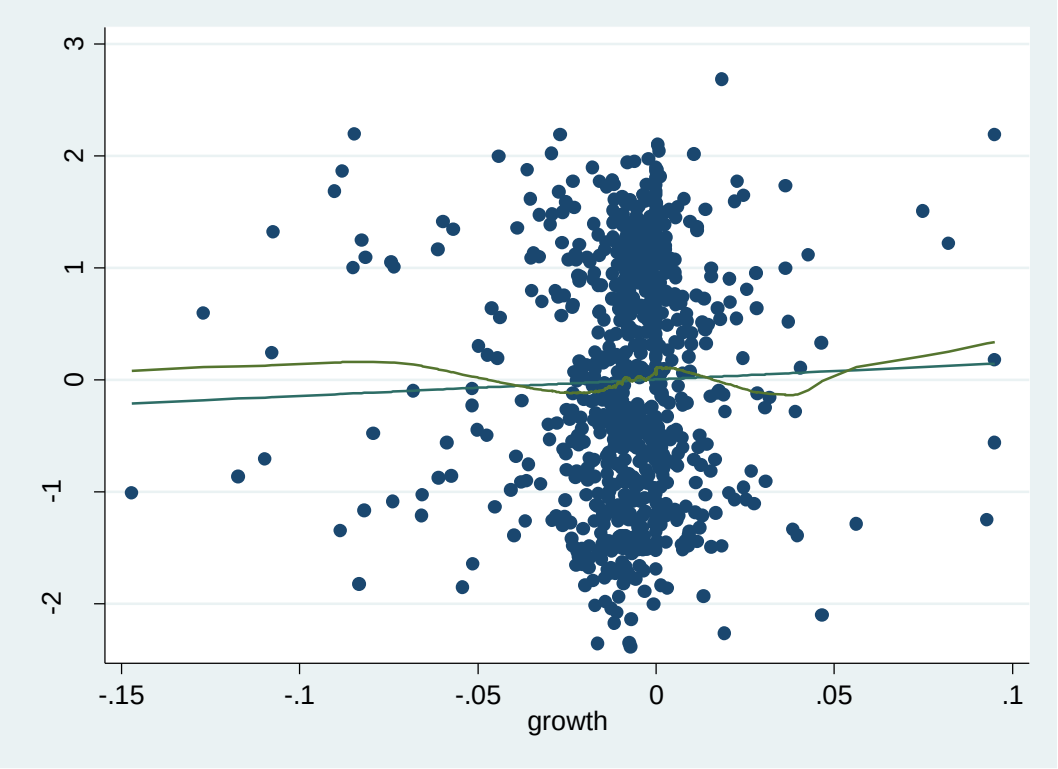
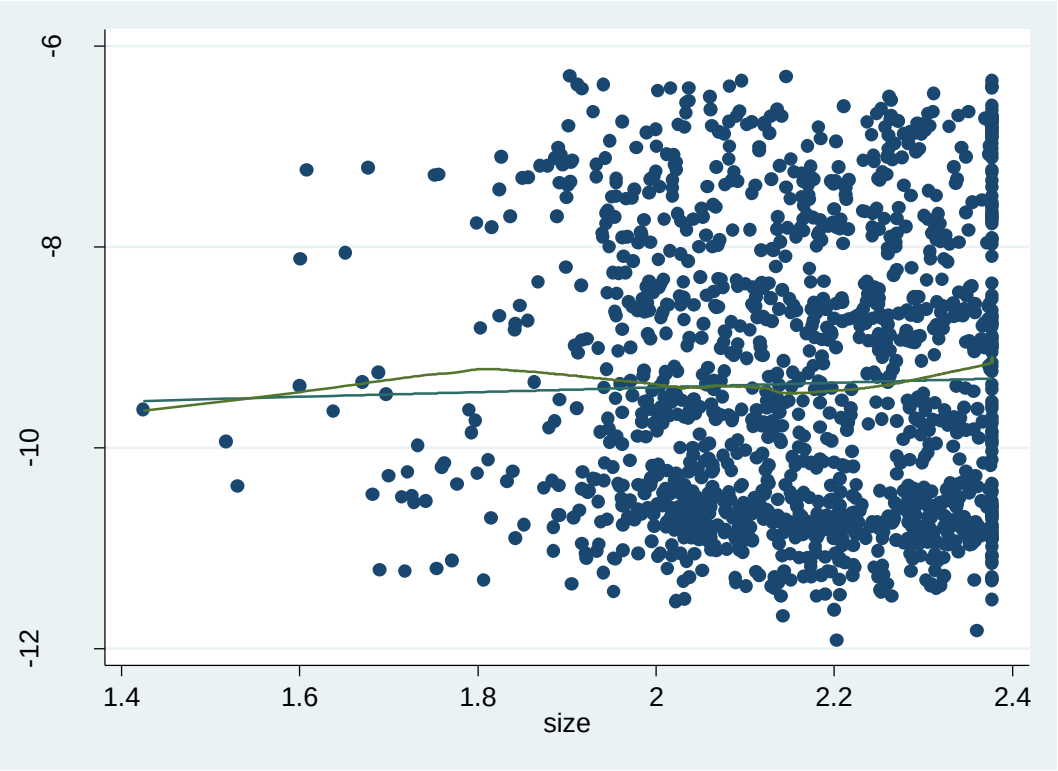


Figure C.14



Independence of errors

Results from the Wooldridge test shows that the hypothesis of no first order autocorrelation is not fulfilled for all regressions. Therefore, the regressions contain autocorrelation between the residuals. I corrected for this by adjusting the dependent variable and independent variables but could not reach a solution that will have no autocorrelation in the residuals without disturbing the other OLS assumptions.

Table C.17

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      85) =     83.072
           Prob > F =      0.0000
```

Table C.18

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      15) =     15.927
           Prob > F =      0.0012
```

Table C.19

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      20) =      4.631
           Prob > F =      0.0438
```

Table C.20

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      85) =     80.578
           Prob > F =      0.0000
```

Table C.21

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      85) =     81.640
           Prob > F =      0.0000
```

Table C.22

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      85) =     81.829
           Prob > F =      0.0000
```

Table C.23

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      85) =     81.199
           Prob > F =      0.0000
```

Table C.24

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      85) =     81.511
           Prob > F =      0.0000
```

Expected value of the residuals is zero

The results for the linktests show that there are no specification errors in the regressions. This can be seen by the predicted values of (_hatsq) being insignificant (larger than 0.05).

Table C.25

Source	SS	df	MS	Number of obs	=	840
				F(2, 837)	=	64.64
Model	149.412603	2	74.7063015	Prob > F	=	0.0000
Residual	967.368349	837	1.15575669	R-squared	=	0.1338
				Adj R-squared	=	0.1317
Total	1116.78095	839	1.33108576	Root MSE	=	1.0751

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.2835254	.5964018	0.48	0.635	-.8870935	1.454144
_hatsq	.1533352	.1262263	1.21	0.225	-.0944221	.4010925
_cons	.8094551	.7002044	1.16	0.248	-.5649077	2.183818

Table C.26

Source	SS	df	MS	Number of obs	=	398
				F(2, 395)	=	36.97
Model	87.5883402	2	43.7941701	Prob > F	=	0.0000
Residual	467.941811	395	1.18466281	R-squared	=	0.1577
				Adj R-squared	=	0.1534
Total	555.530151	397	1.39932028	Root MSE	=	1.0884

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.0167719	.7259474	0.02	0.982	-1.410432	1.443976
_hatsq	.2142175	.1560667	1.37	0.171	-.0926078	.5210428
_cons	1.07839	.8379494	1.29	0.199	-.5690083	2.725788

Table C.27

Source	SS	df	MS	Number of obs	=	442
				F(2, 439)	=	34.84
Model	76.7624424	2	38.3812212	Prob > F	=	0.0000
Residual	483.592761	439	1.10157804	R-squared	=	0.1370
				Adj R-squared	=	0.1331
Total	560.355204	441	1.27064672	Root MSE	=	1.0496

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.4186339	.8902695	0.47	0.638	-1.331086	2.168354
_hatsq	.1238762	.1879605	0.66	0.510	-.2455382	.4932905
_cons	.6606874	1.043155	0.63	0.527	-1.389512	2.710887

Table C.28

Source	SS	df	MS	Number of obs	=	840
				F(2, 837)	=	60.86
Model	141.787699	2	70.8938493	Prob > F	=	0.0000
Residual	974.993254	837	1.16486649	R-squared	=	0.1270
				Adj R-squared	=	0.1249
Total	1116.78095	839	1.33108576	Root MSE	=	1.0793

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.3660882	.6386868	0.57	0.567	-.8875278	1.619704
_hatsq	.1362061	.1358315	1.00	0.316	-.1304042	.4028163
_cons	.7141321	.7457189	0.96	0.339	-.7495667	2.177831

Table C.29

Source	SS	df	MS	Number of obs	=	840
				F(2, 837)	=	81.89
Model	182.756834	2	91.3784171	Prob > F	=	0.0000
Residual	934.024118	837	1.1159189	R-squared	=	0.1636
				Adj R-squared	=	0.1616
Total	1116.78095	839	1.33108576	Root MSE	=	1.0564

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.2525012	.5452311	0.46	0.643	-.8176797	1.322682
_hatsq	.1577198	.1138402	1.39	0.166	-.065726	.3811656
_cons	.8516606	.6439361	1.32	0.186	-.4122586	2.11558

Table C.30

Source	SS	df	MS	Number of obs	=	840
				F(2, 837)	=	74.72
Model	169.190677	2	84.5953385	Prob > F	=	0.0000
Residual	947.590275	837	1.13212697	R-squared	=	0.1515
				Adj R-squared	=	0.1495
Total	1116.78095	839	1.33108576	Root MSE	=	1.064

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.6170056	.492489	1.25	0.211	-.349653	1.583664
_hatsq	.0777284	.0985561	0.79	0.431	-.1157177	.2711745
_cons	.4558311	.6115151	0.75	0.456	-.7444521	1.656114

Table C.31

Source	SS	df	MS	Number of obs	=	840
				F(2, 837)	=	66.34
Model	152.816103	2	76.4080514	Prob > F	=	0.0000
Residual	963.96485	837	1.15169038	R-squared	=	0.1368
				Adj R-squared	=	0.1348
Total	1116.78095	839	1.33108576	Root MSE	=	1.0732

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.4212254	.6225744	0.68	0.499	-.8007651	1.643216
_hatsq	.1239445	.1320129	0.94	0.348	-.1351708	.3830598
_cons	.6528141	.7268801	0.90	0.369	-.7739078	2.079536

Table C.32

Source	SS	df	MS	Number of obs	=	840
				F(2, 837)	=	76.85
Model	173.259554	2	86.6297771	Prob > F	=	0.0000
Residual	943.521398	837	1.12726571	R-squared	=	0.1551
				Adj R-squared	=	0.1531
Total	1116.78095	839	1.33108576	Root MSE	=	1.0617

absdiff	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
_hat	.1923123	.5362919	0.36	0.720	-.8603226	1.244947
_hatsq	.1729017	.1134779	1.52	0.128	-.049833	.3956363
_cons	.9075144	.6276932	1.45	0.149	-.3245233	2.139552

Homogeneity of variance

The results from the Breusch-Pagan test indicate that there is no problem with heteroscedasticity in the error terms of the regressions. This means that the variance of the errors is constant and no correction for heteroscedasticity needs to take place.

Table C.33

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: aac dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =     9.55
         Prob > chi2   =   0.6557
```

Table C.34

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: negaac dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =     5.91
         Prob > chi2   =   0.9204
```

Table C.35

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: posaac dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =     8.27
         Prob > chi2   =   0.7635
```

Table C.36

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: absaac dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =    10.64
         Prob > chi2   =   0.5599
```

Table C.37

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: acfo dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =     9.75
         Prob > chi2   =   0.6375
```

Table C.38

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: aprod dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =    10.32
         Prob > chi2   =   0.5879
```

Table C.39

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: adiscexp dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =    12.81
         Prob > chi2   =   0.3826
```

Table C.40

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: realaccm dperiod1 dperiod2 dperiod3 dperiod4 lev zscore extfin bm retvol gdp growth size

         chi2(12)      =    12.56
         Prob > chi2   =   0.4017
```

Normality of residuals

Observing the kernel density, Q-Q and P-P plots there is indication that the residuals have some variation to normality. Since these are not extreme normality is assumed for the residuals of the regressions.

Figure C.15

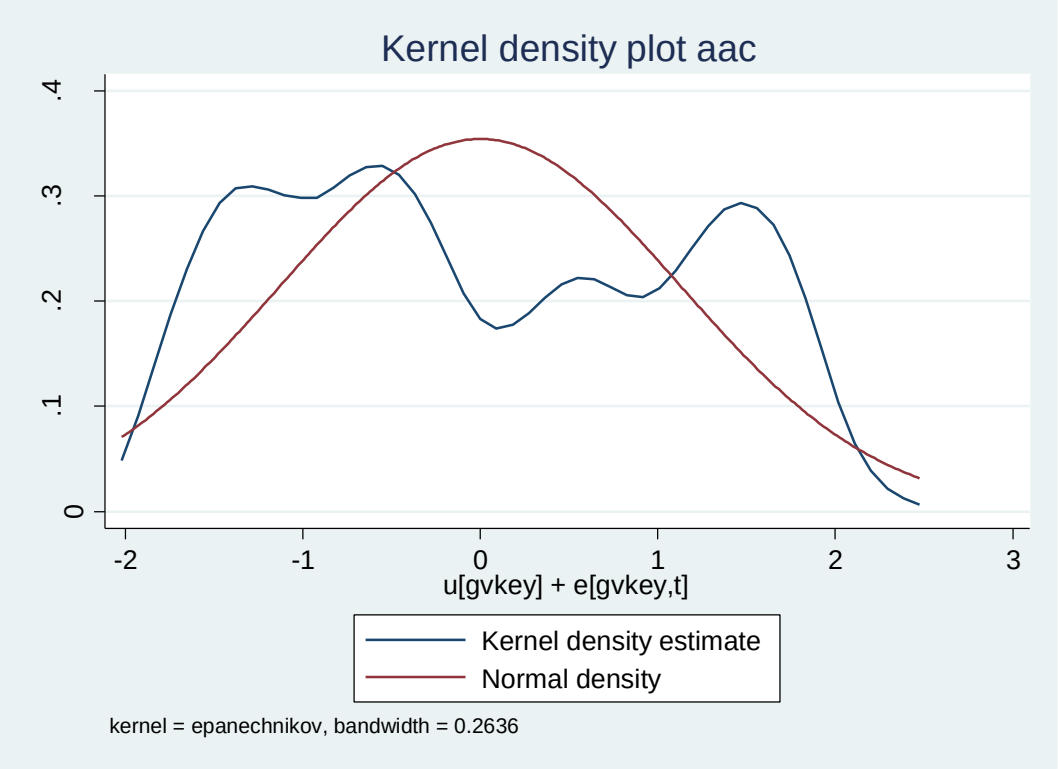


Figure C.16

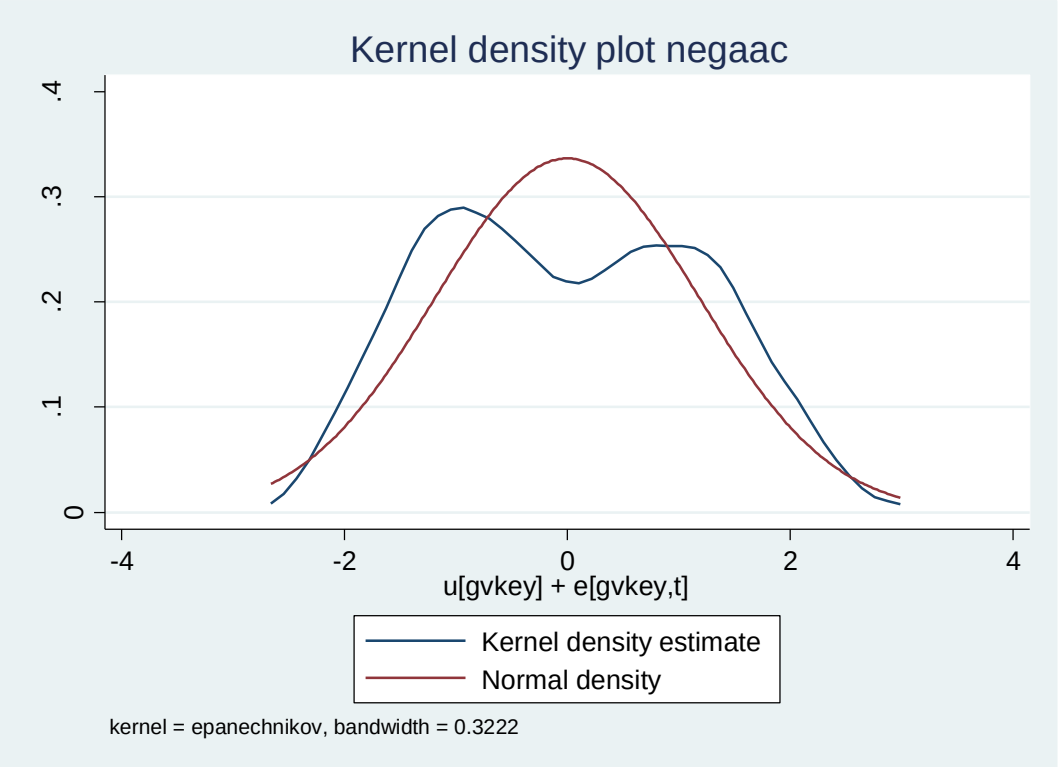


Figure C.17

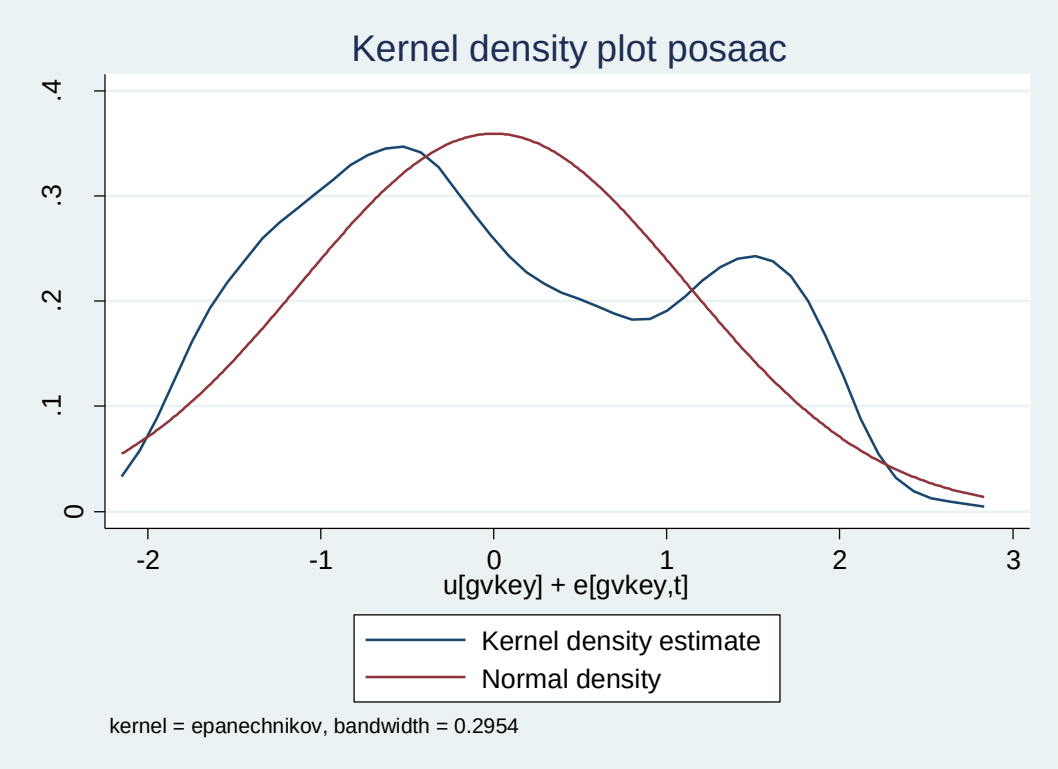


Figure C.18

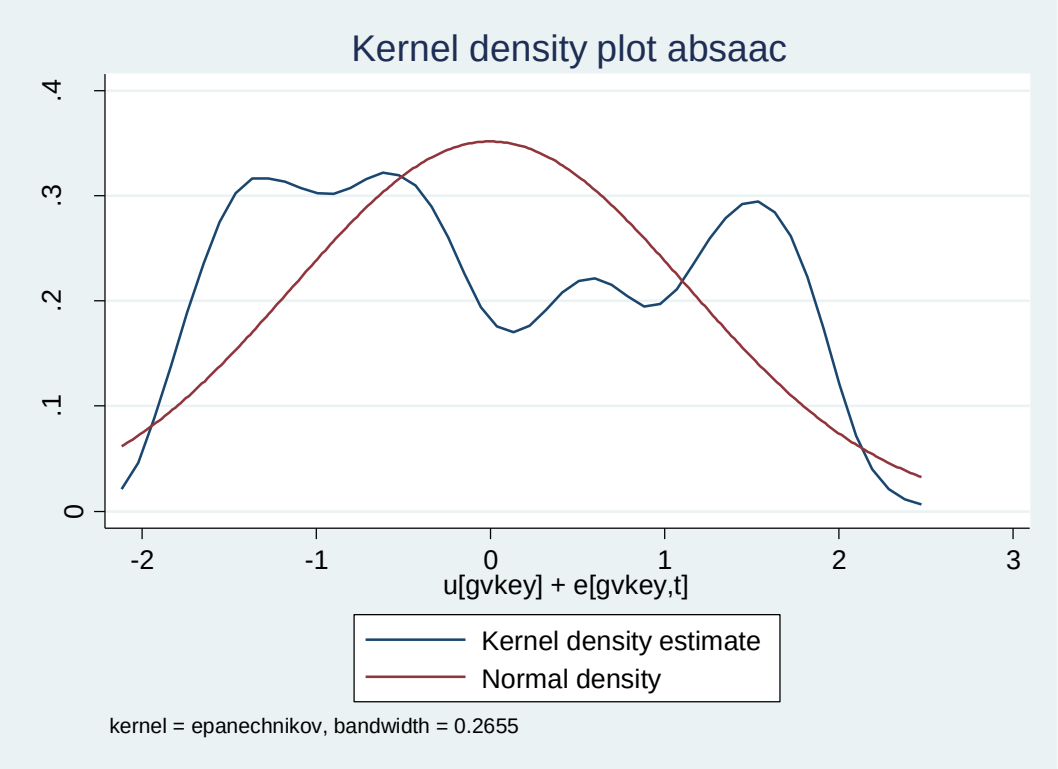


Figure C.19

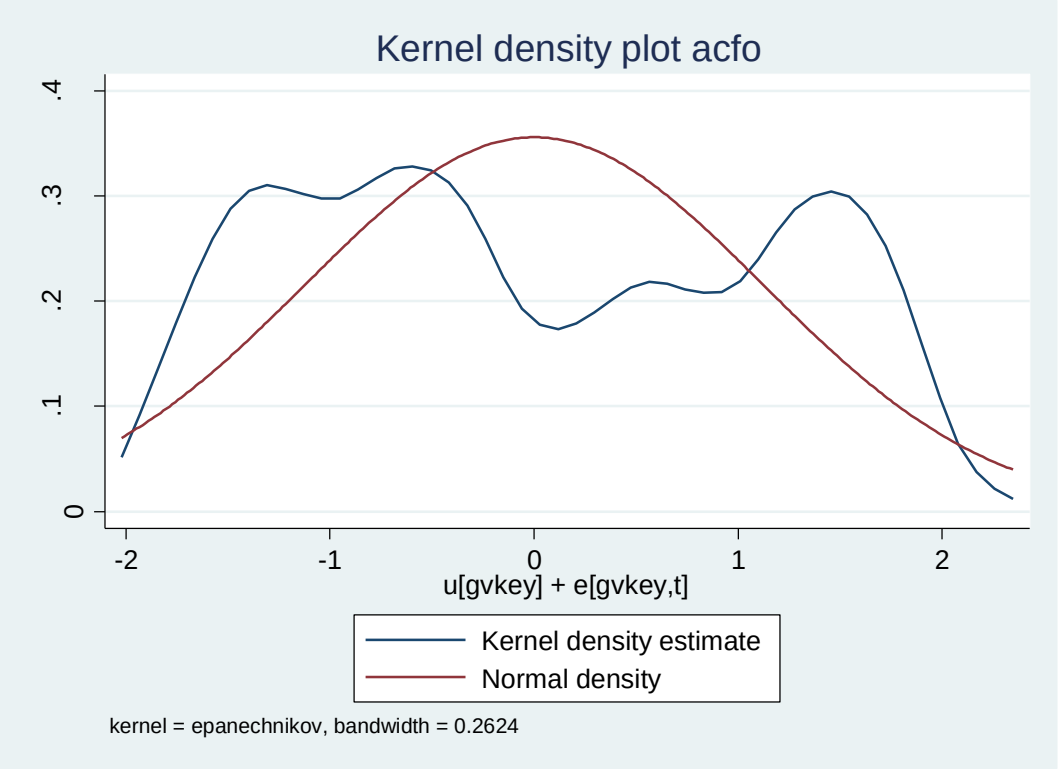


Figure C.20

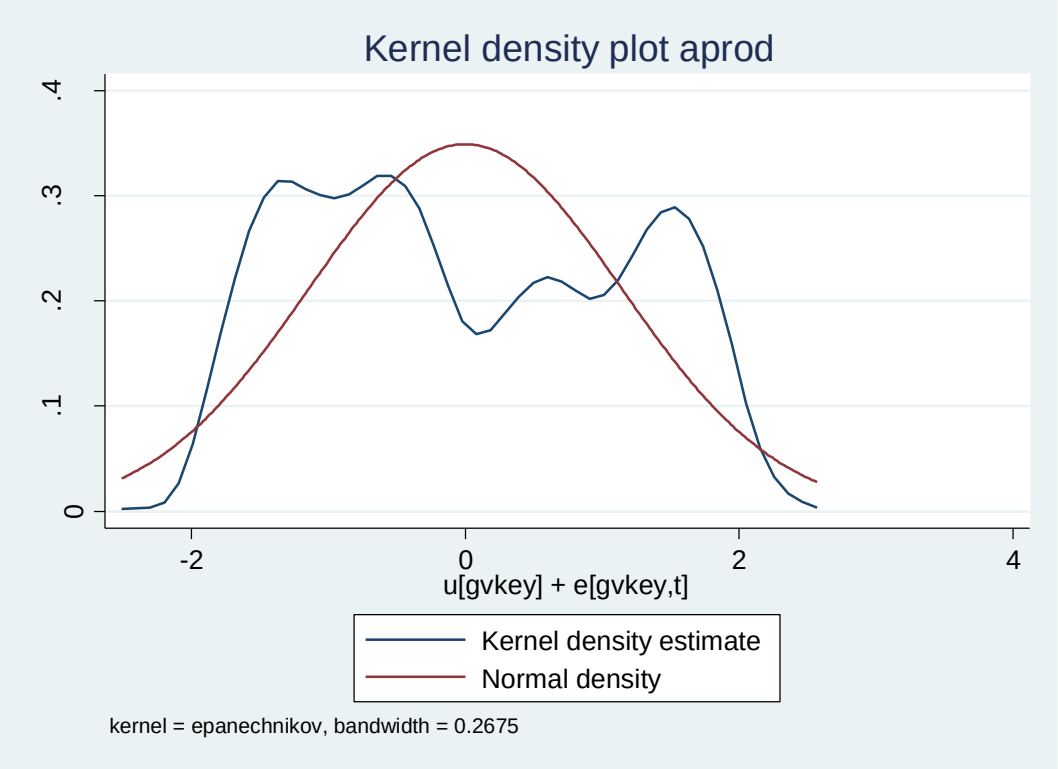


Figure C.21

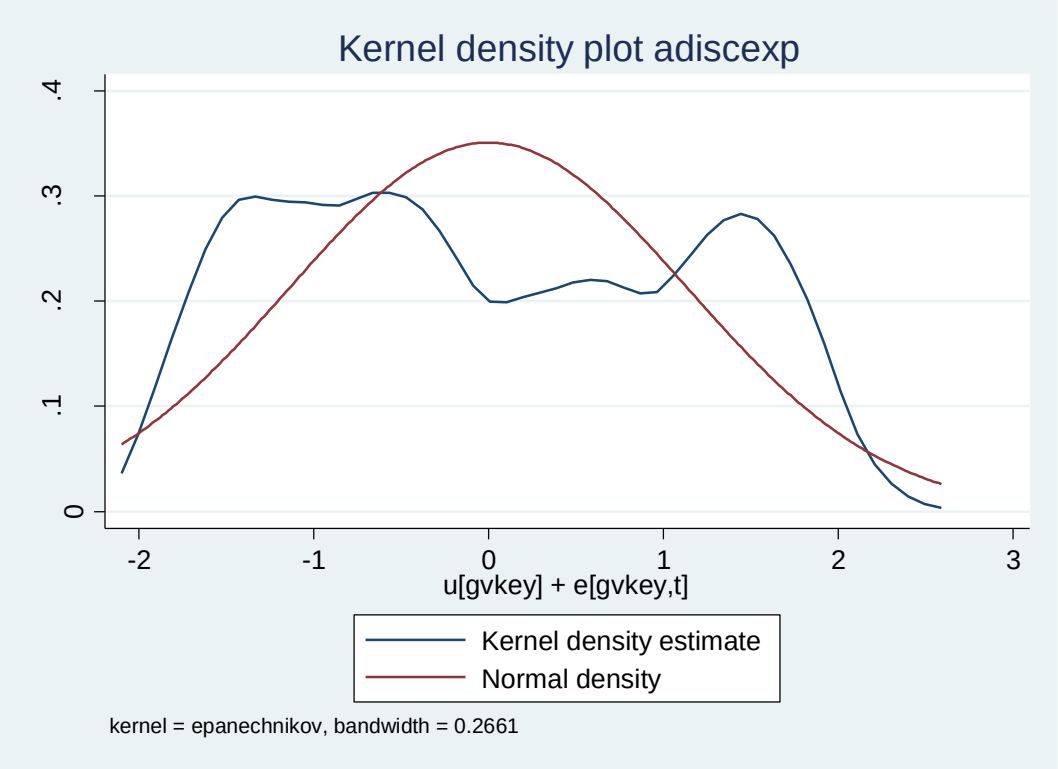


Figure C.22

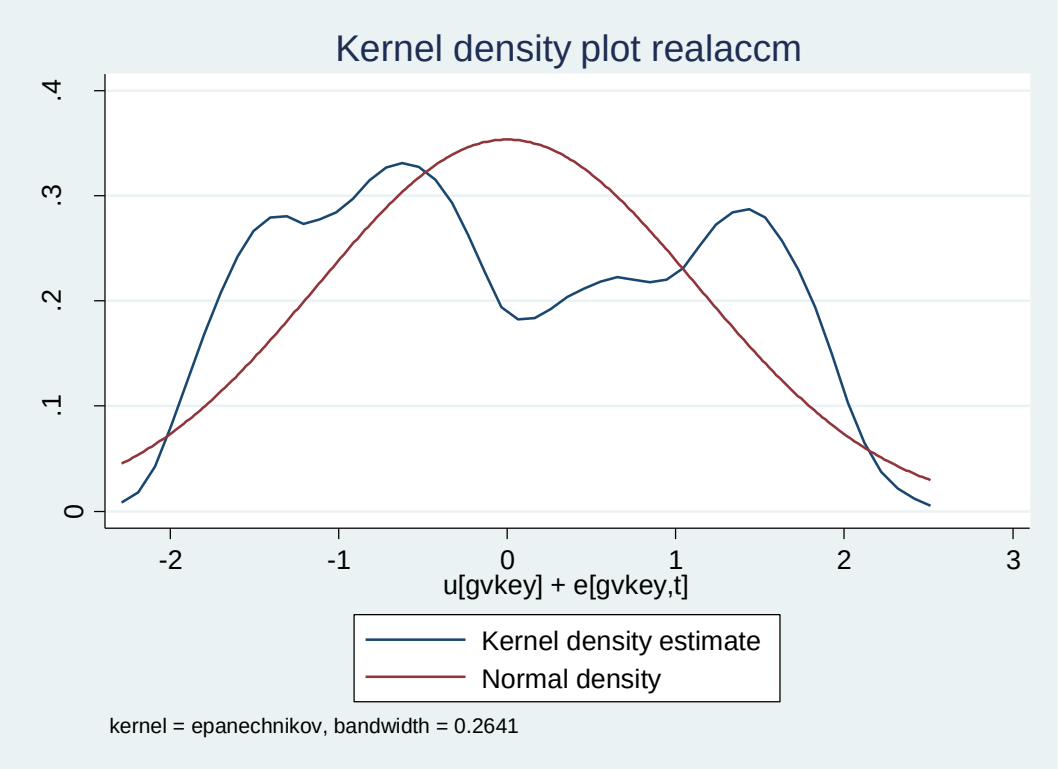


Figure C.23

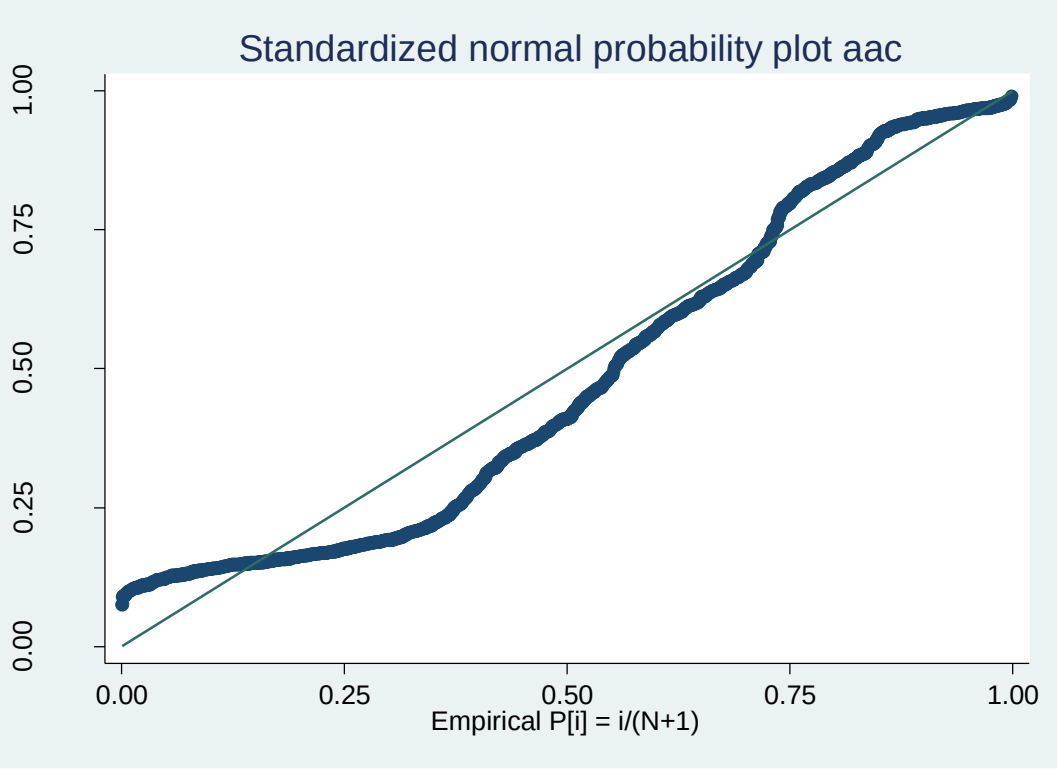


Figure C.24

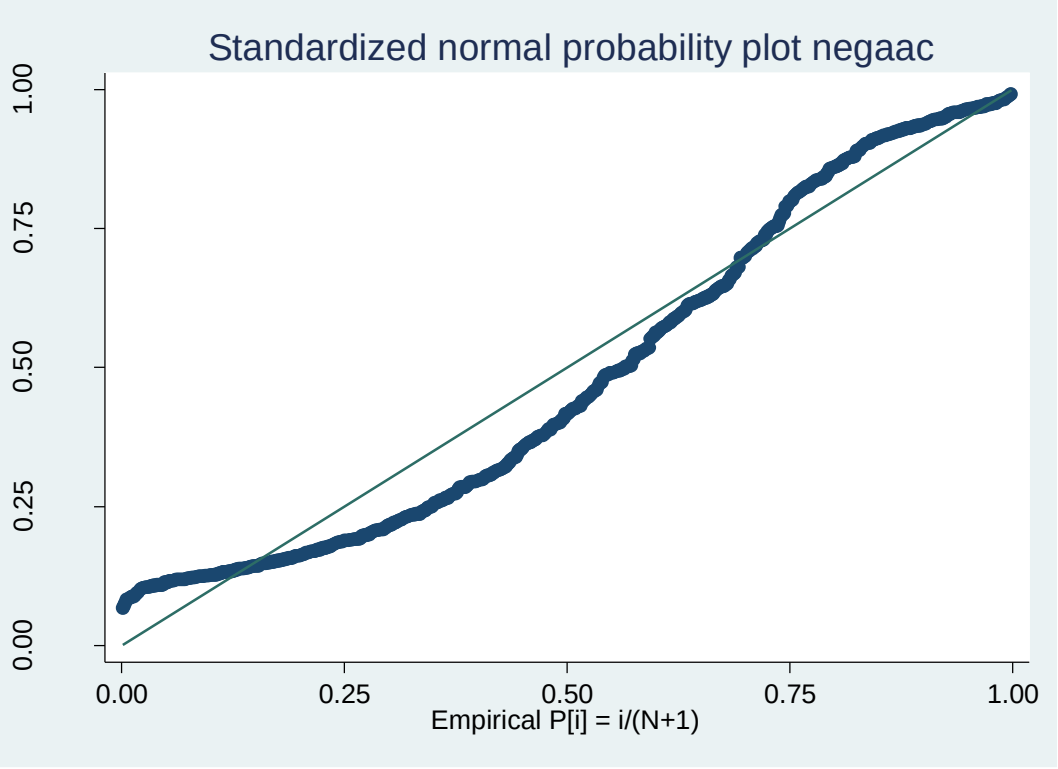


Figure C.25

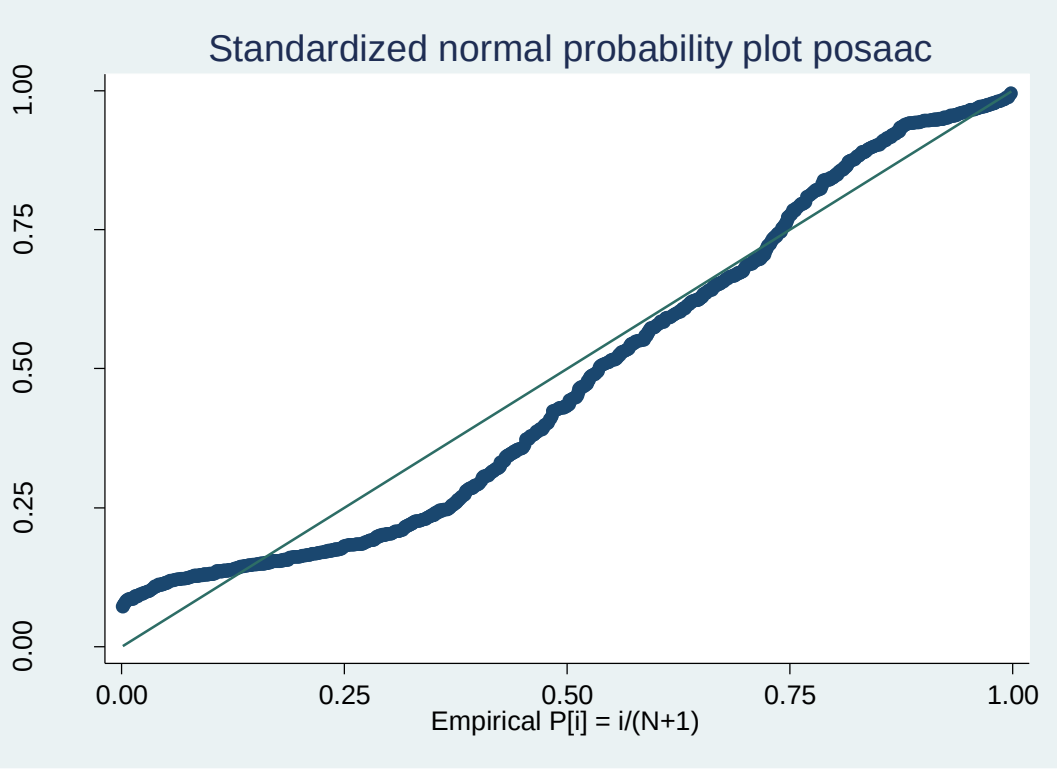


Figure C.26

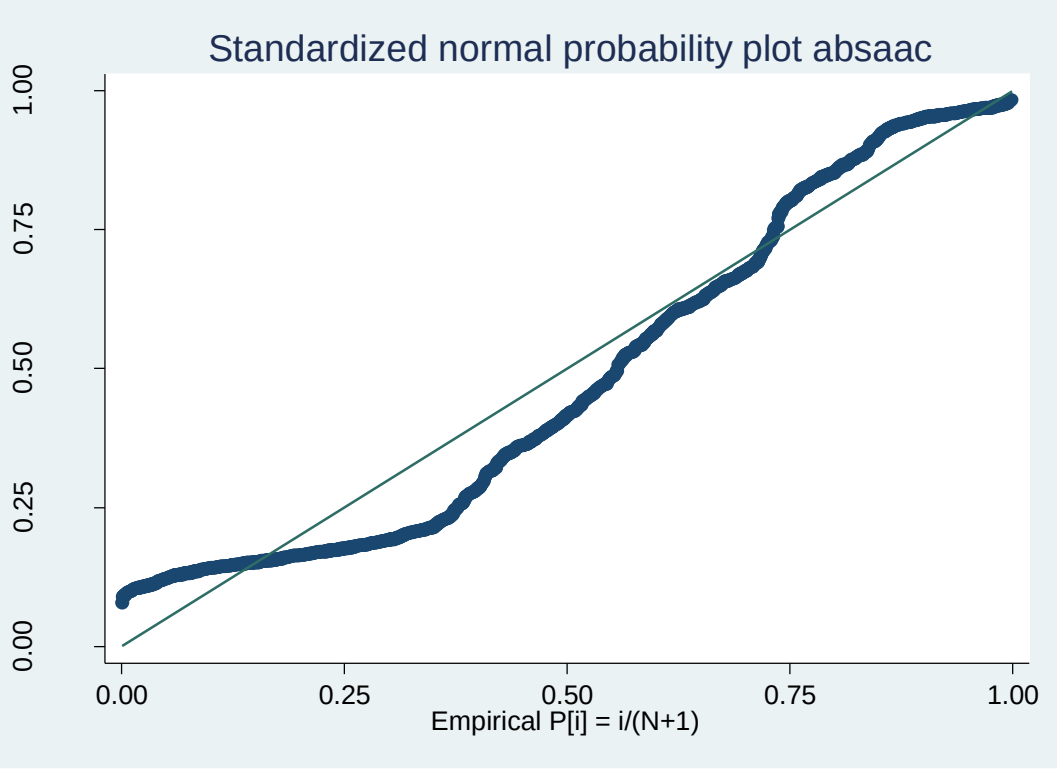


Figure C.27

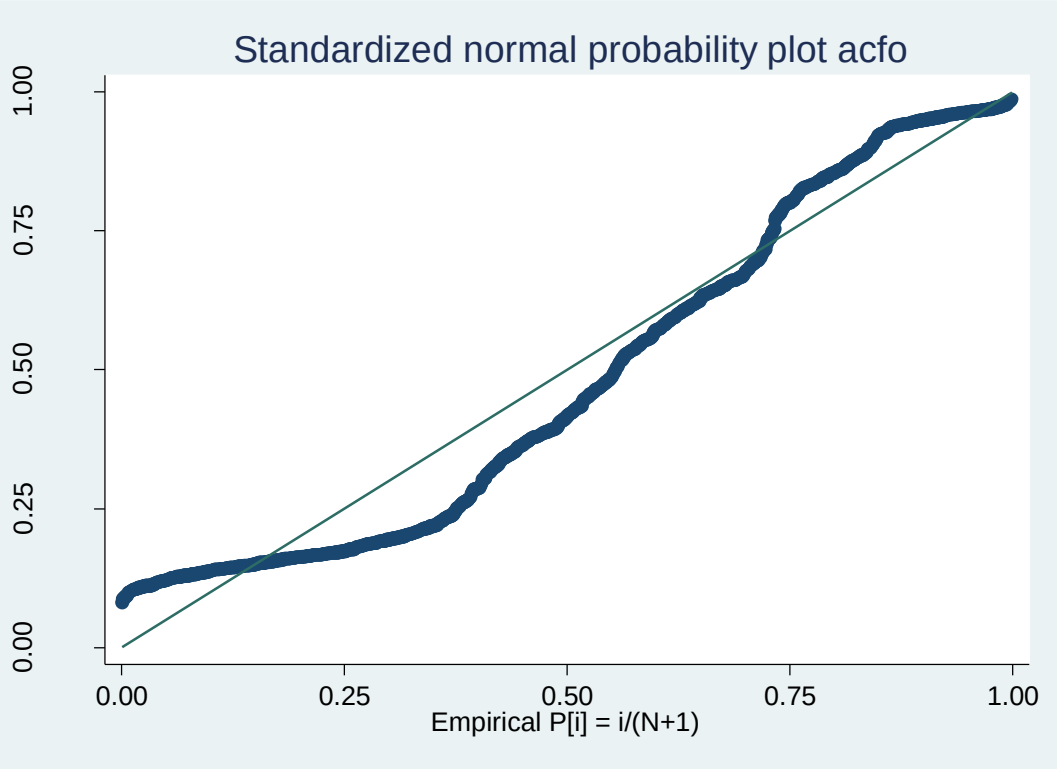


Figure C.28

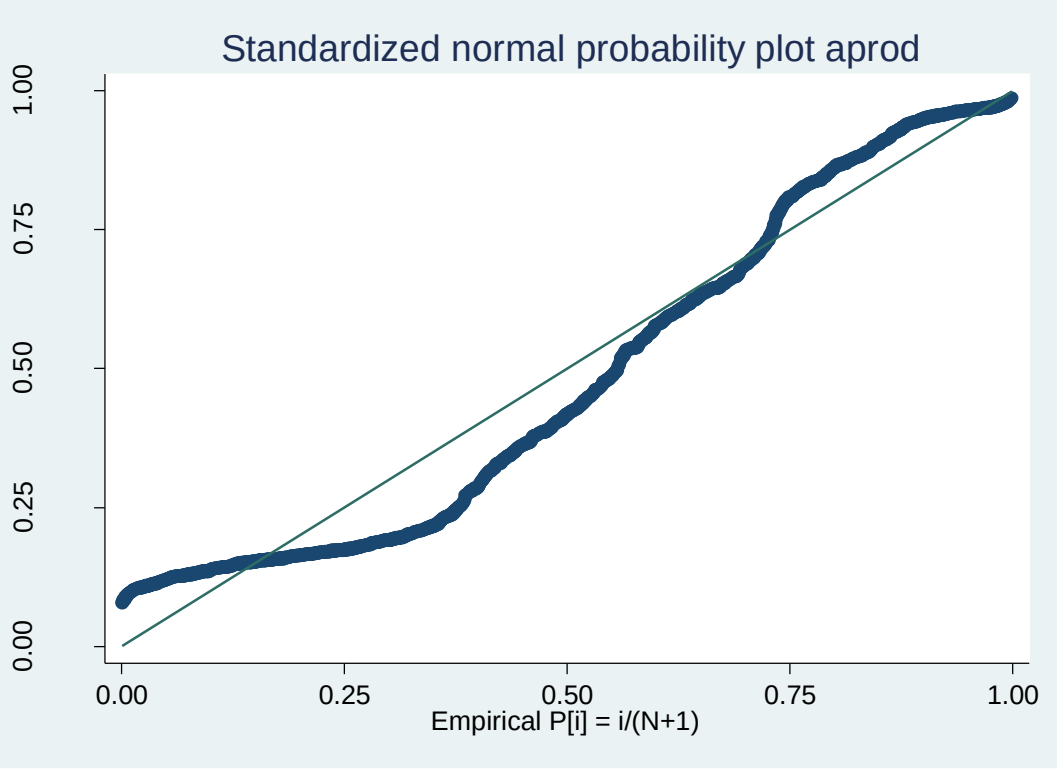


Figure C.29

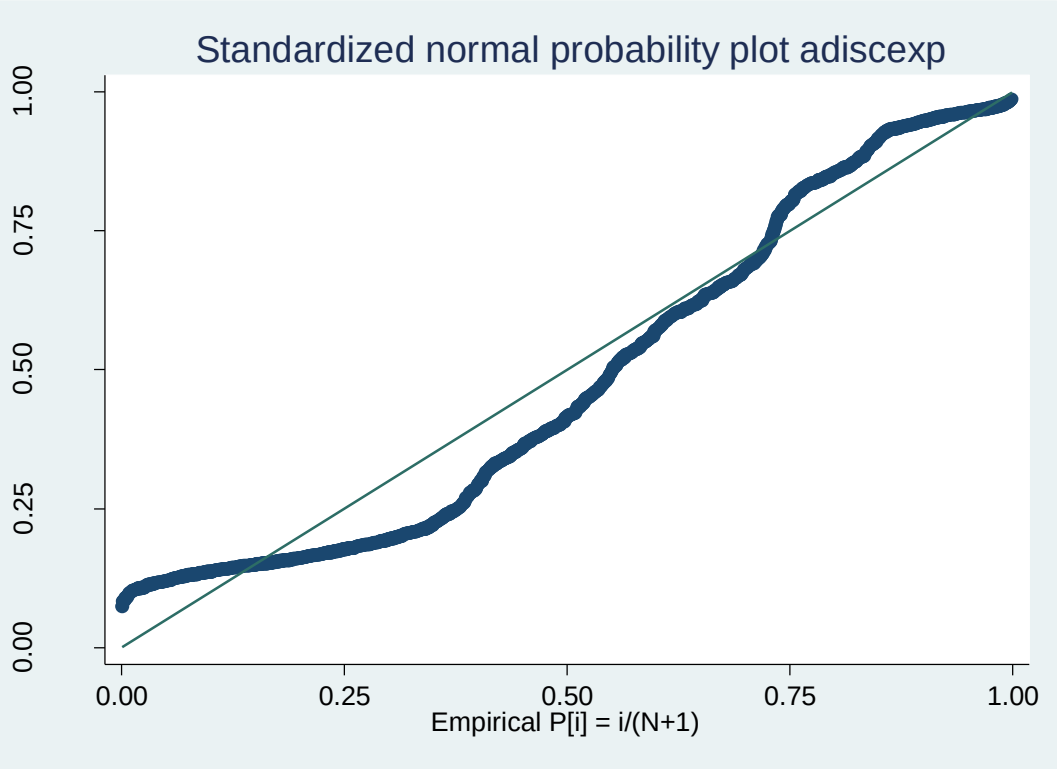


Figure C.30

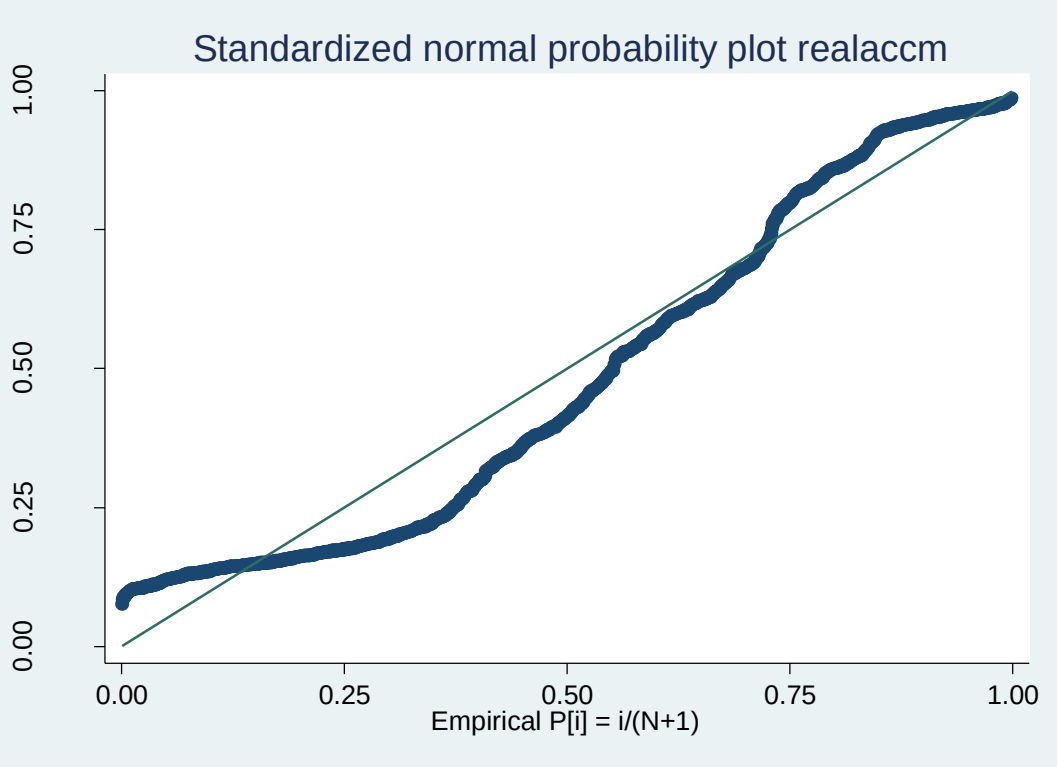


Figure C.31

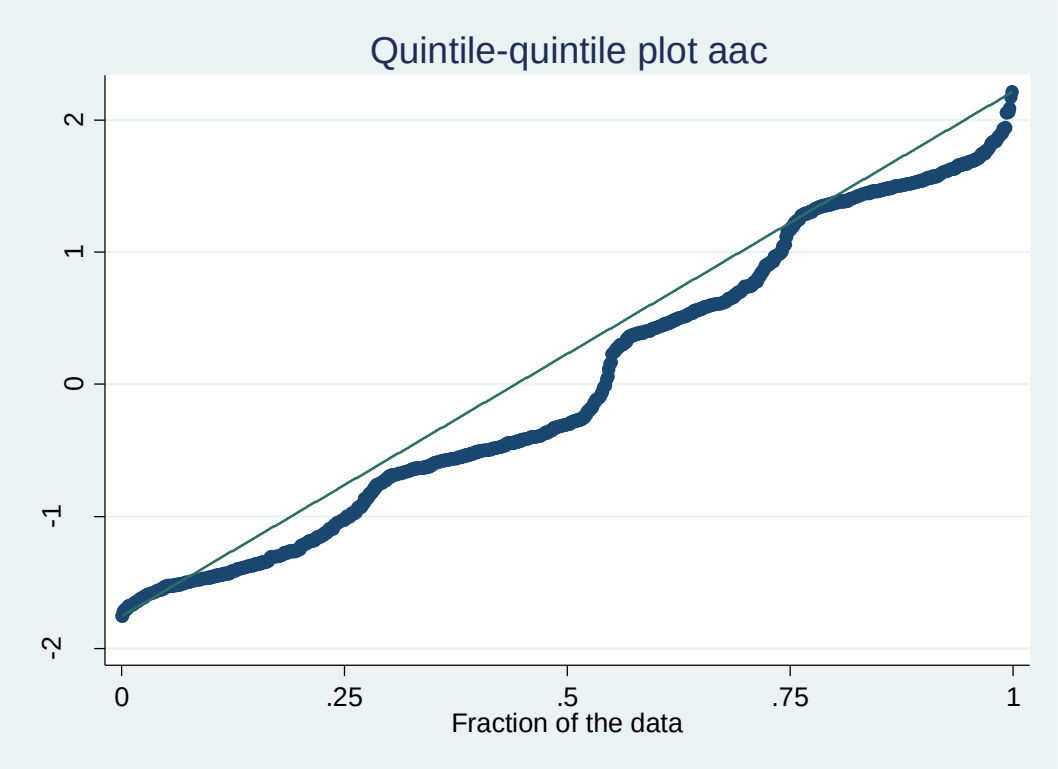


Figure C.32

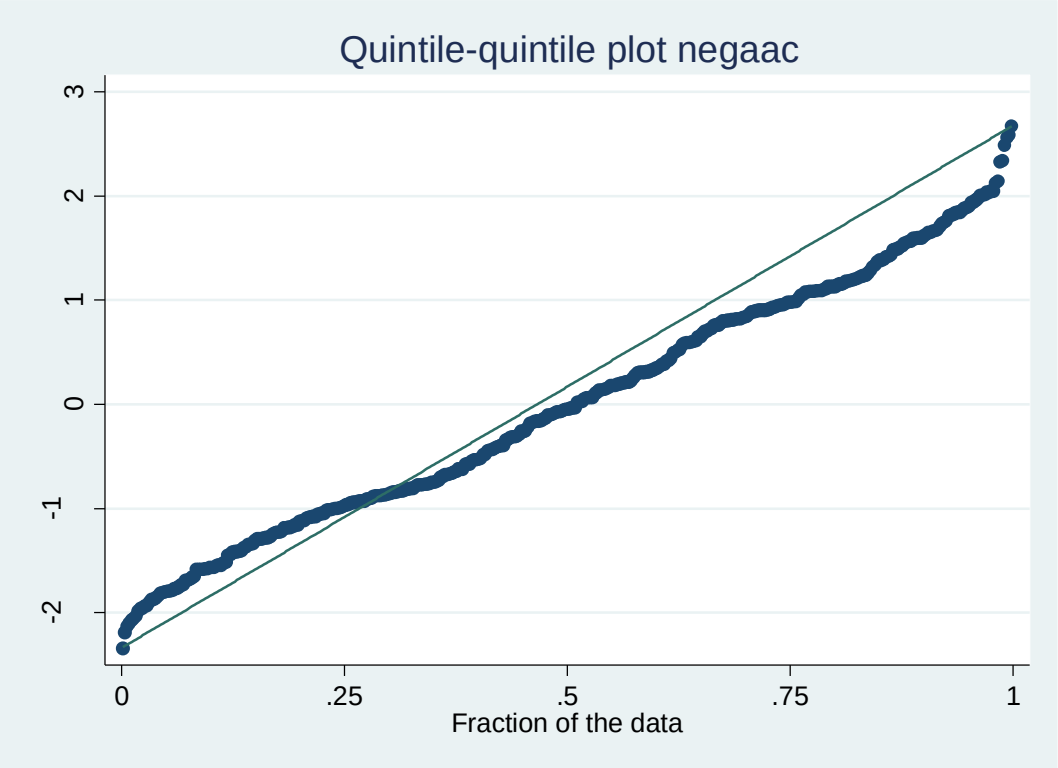


Figure C.33

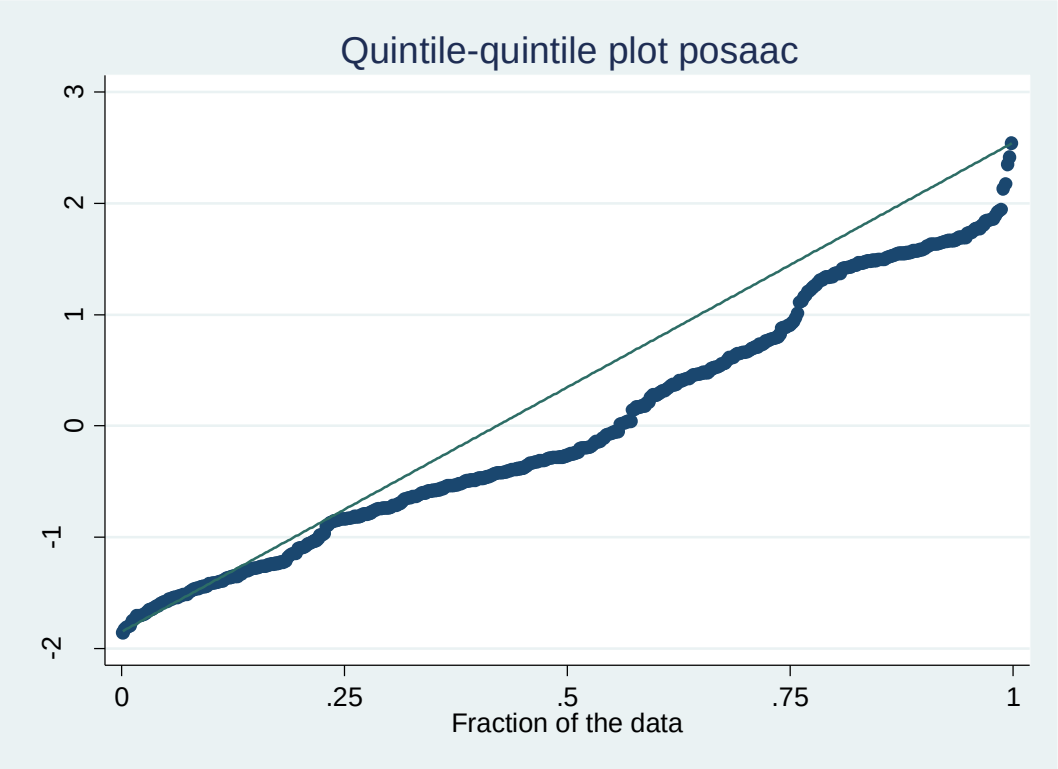


Figure C.34

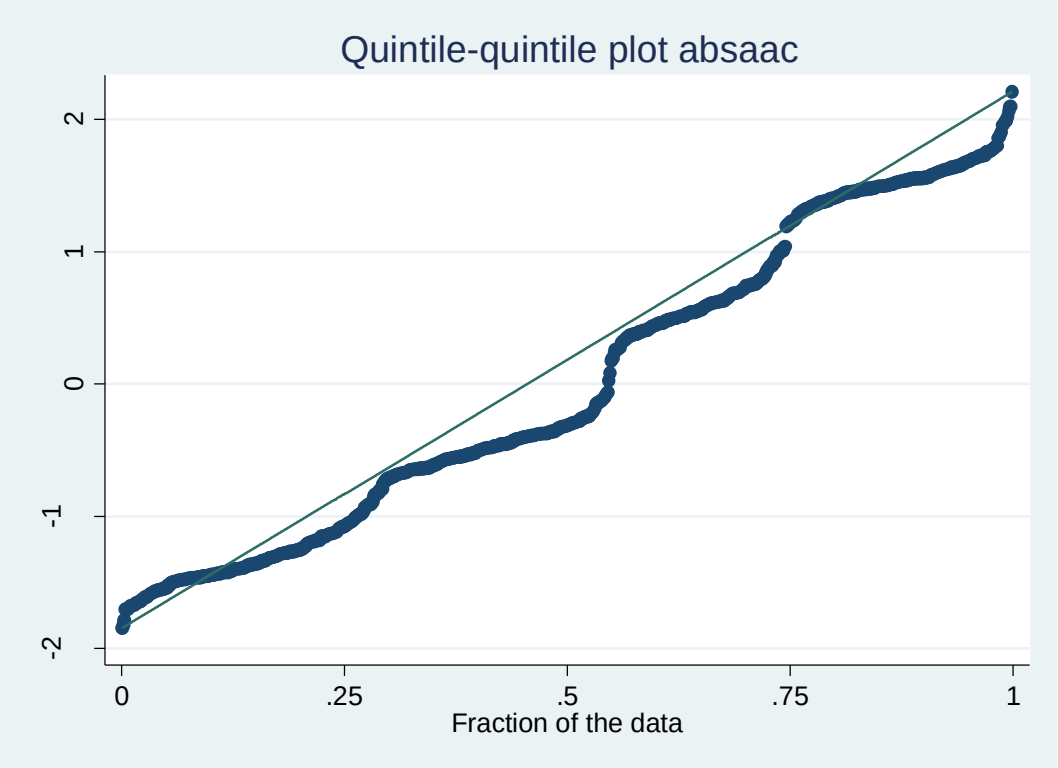


Figure C.35

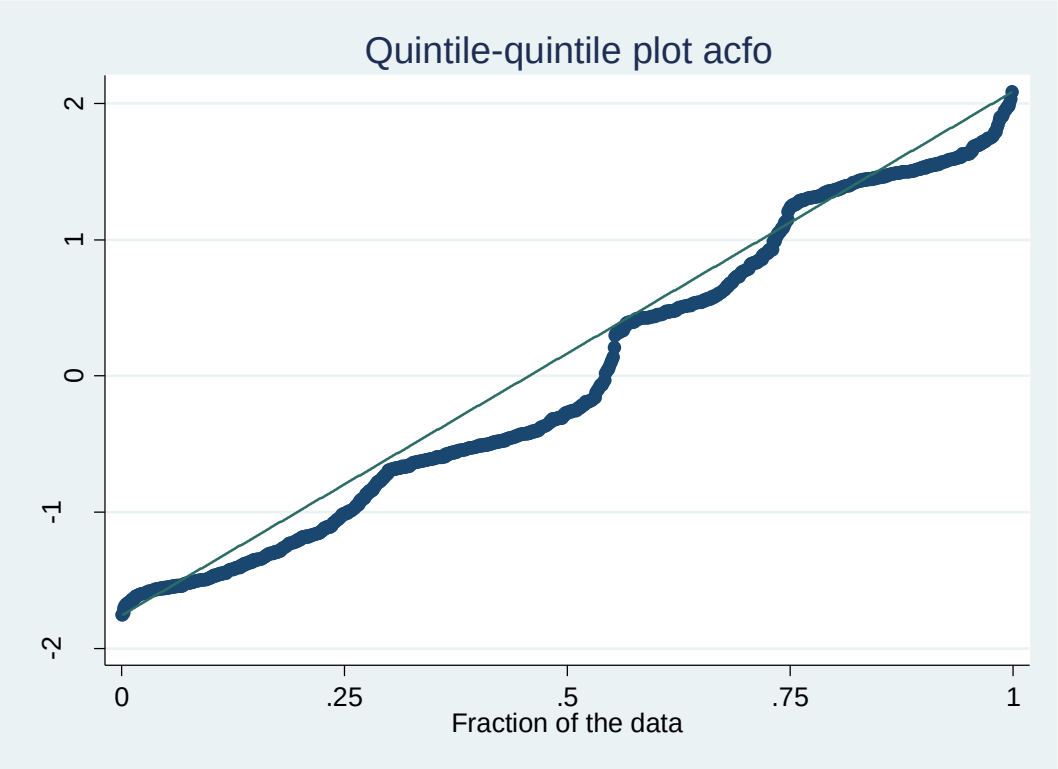


Figure C.36

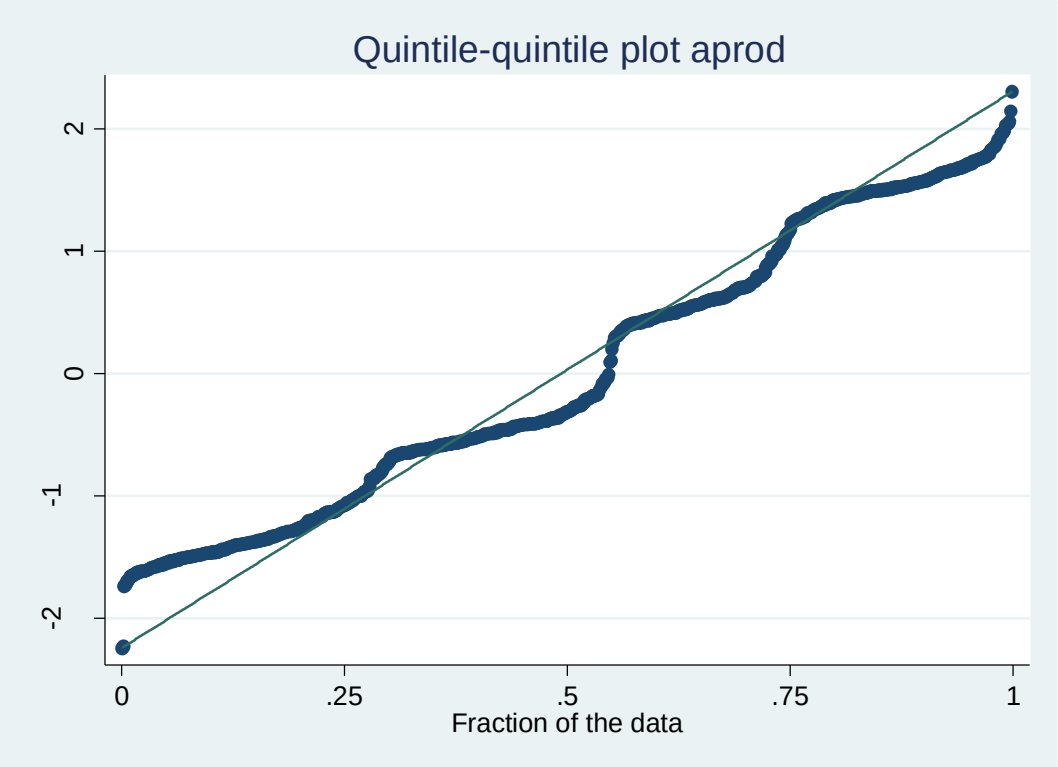
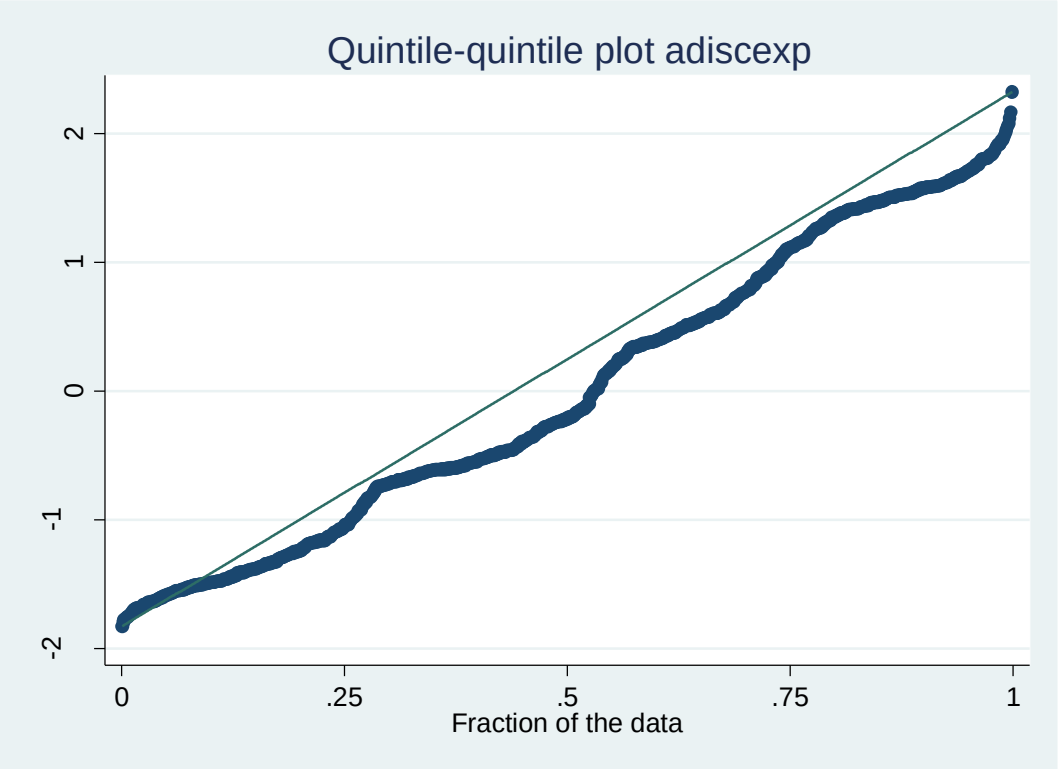


Figure C.37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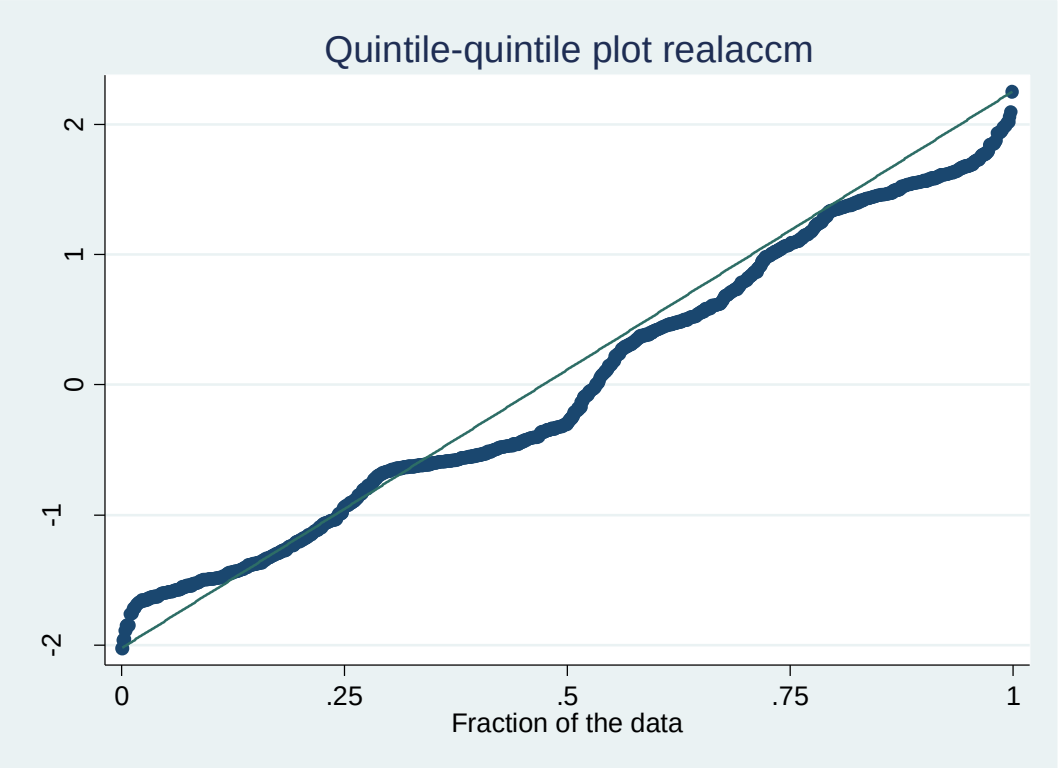
.5
.75
1
Fraction of the data

Figure C.38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Fraction of the data