Norwegian School of Economics
Bergen, Spring, 2019

NHH

Management Accounting Tools in Large Norwegian Entities

A quantitative study of how management accounting tools are used and their effect on profitability

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Master thesis

BUS - Business Analysis and Performance management

Specialisation in Business Analytics

NORWEGIAN SCHOOL OF ECONOMICS

Preface

Working on this thesis for the past months have been very rewarding. Our thesis topic is highly relevant, and we feel fortunate to be able to contribute to a topic directly impacting entities' day to day business.

We would like to thank our supervisor, Dag Øivind Madsen, for advice and guidance. His knowledge and expertise on the topic have been very beneficial.

For our financial data, we thank Samfunns- og næringslivsforskning for providing relevant and sufficient data. We also thank Jørgen T. Homme for proofreading our thesis. We are also very grateful for all participants contributing through our survey.

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Abstract

In the last years, there has been a growing interest in the topic of management account tools. Although, research today is mainly argumentative, or focus on specific industries. Thereby, there is a need to conduct a detailed mapping regarding the use and utility of management accounting tools (MATs) for Norwegian entities. This thesis aims to contribute to this field of research by answering the two following questions

- *What are the use and utility of management accounting tools in large Norwegian entities today?*
- *How are specific management accounting tools associated with profitability in large Norwegian entities?*

In answering these questions, we perform a quantitative study. Our primary data is collecting data by surveying 500 of the largest Norwegian entities - collecting data on each entity's use and utility of Management accounting tools. This data is further analyzed using accounting data proved by SNF, which enable us to examine which tools that display an association with profitability.

We find a discrepancy between the popularity and their corresponding use and utility. We also uncover MATs that display a significant positive correlated with profitability. Although, entities seem to use MATs regardless of this association. In both cases, the adoption of such these may help entities obtain a competitive edge.

Furthermore, we find that some tools are significantly correlated with entity size for both use and utility, while the majority do not have this relation. Although entity size explains the number of tools used.

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Definitions

Table 1: Definitions of terms used in the thesis.

Term	Definition
Management accounting tools	"A management accounting tool is a framework, model, technique or process that enables management accountants to: improve performance; facilitate decision-making; support strategic goals and objectives; and otherwise add value."(CIMA, 2009, p. 3).
Management systems	A general term for tools, innovations, techniques, and processes. Often used when not referenced to specific tools or techniques.
Management tools	Can be management accounting tool, but also other forms for management tools, such as strategic or operational, not focusing on accounting. Often used when focusing on tools beyond just accounting tools.

Chapter 1

Introduction

In this chapter, we will introduce the background of this thesis, as well as our motivation for the chosen topic. In section 1.2 we introduce the research questions founded in the literature review. Last, we will present some insight into our data, research design, and method before we present the overall structure of this thesis.

1.1 Background and Motivation

In 1970, Wallander was offered the position as CEO in the Swedish bank Svenska Handelsbanken. The bank was in the middle of several crises, where the management had resigned, and results were turning low after years with deficits (Handelsbanken, 2012). Wallander demanded several changes to the bank's structure and management strategy. One of the key ideas was to abolish the budgeting process altogether, as well as trust on local branches with more responsibility. Following this strategy, Handelsbanken turned into one of the most decentralized banks in the market (Wallander, 1995). Through abolishing budgets, in addition to structural changes, Handelsbanken grew into one of the most profitable banks and is to this day the basis for several research papers on management systems.

In 1995 Wallander published a book, which led to the *beyond budgeting movement*. This movement is still affecting research and entities to this day. Followers of this movement criticize the budgeting process for being too resource and time demanding, as well as not contributing with relevant information for decision making. The latter was also the focus of a previous debate called the *relevance lost debate*, focusing on the relevance of information gathered from these tools. As for alternatives, researchers are yet to agree on any final solution.

Following the relevance lost debate and beyond budgeting movement, several management accounting tools (MATs) have been introduced in order to answer criticism, such as Activity-Based Costing (ABC), Balanced Scorecard (BSC), and Benchmarking. A Google Scholar search for management accounting tools yield over 2,8 million hits, implying the severe complexity in choosing among tools. Management compete on a day to day basis, and are dependent on relevant information. Our thesis aims to guide entities through the jungle of MATs, both mapping the use and utility, and investigating their correlation with profitability.

1.2 Research Questions

Following the literature review in chapter 2, we have chosen the following research questions.

1. What are the use and utility of management accounting tools in large Norwegian entities today?
2. How are management accounting tools associated with profitability in large Norwegian entities?

We define management accounting tools as:

"A management accounting tool is a framework, model, technique or process that enables management accountants to: improve performance; facilitate decision-making; support strategic goals and objectives; and otherwise add value." (CIMA, 2013, p. 3).

Following this definition, the tools focused on in this thesis all aim to increase some part of the daily operations of entities. We have chosen to divide our tools into the following five categories, defined by their focus; *Costing tools, Pricing tools, Budgeting tools, Profit analysis tools* and *Performance Management tools*. Costing tools focus on measuring cost at different levels and with different techniques. Pricing tools aim to provide management with the relevant information for pricing, either being internally focused or focusing on external sources. Budgeting tools consist of both traditional Budgeting tools and more modern techniques. Budgeting tools can both be planning tools, traditional budgeting, or used for predictions; forecasting. Profit analysis tools are used to measure profitability and often used in retrospective in order to measure profits. These can both focus on the entire entity, parts of the entity, or externally, such as customers. Performance Management tools are often seen as more strategic tools, focusing on future strategic planning based on accounting data. For an overview of tools included in our survey, see table A in the appendix on page 144.

This thesis focus' is large Norwegian entities. We have defined a large entity as having 250[1] or more employees, and with operating revenue of at least 100 MNOK, as of financial data from 2015. By Norwegian entities, we mean entities which are geographically located in Norway, as well as having their primary income source and activity in Norway.

We have chosen to use entities as a term, rather than firms or companies. This is mainly only impacting our choice of words, where firms or companies are seen as businesses under a specific name, while entities are seen as individual business units. Furthermore, the definition entity also includes business units with no physical location. See chapter 4 for research design and method chapter, further elaborating on this.

1.3 Methodology

In our research, we chose a deductive approach. For research question 1, we perform descriptive research, while we for research question 2 perform explanatory research.

[1] We follow Statistics Norway's definition, which classifies this as large Norwegian entities (SSB, 2014).

In terms of data and analysis, we conduct a multi-method quantitative study. For our primary data, our strategy is survey based. We collect cross-sectional data using an internet-mediated questionnaire. Our secondary data is retrieved from Samfunns- og næringslivsforskning (SNF) by signing a data exchange agreement. Our data is mainly analyzed using Descriptive statistics, multiple linear regression, and different forms of correlation calculations.

1.4 Relevance

We have found that there is a shortage on reports and research regarding use of management accounting tools (MATs) across industries, focusing on Norwegian entities. Our goal is to contribute to the academic field by mapping what tools large Norwegian entities use, and how satisfied they are with these tools. There is also a discrepancy between academia and entities in the business world. Academia tends to dislike the budgeting process, yet the majority of entities use budgets, and even reported as being satisfied in many cases. In this thesis we investigate the association specific Budgeting tools have with profitability, and try to understand why entities use budgets through a quantitative study. In addition, we also investigate more tools than previous literature has done in one paper or thesis, giving a broader view of MATs among large Norwegian entities.

1.5 Structure

In chapter 2, we present a literature review related to our research question. This is followed by how we measure profitability in chapter 3. In the next chapter, number 4, we go over research design and method. In chapter 5, we present the findings from our analyses and report on data from our survey. Chapter 6 represent a discussion regarding these findings, which are summarized in a conclusion in chapter 7. We have also presented additional information in the appendix.

Chapter 2

Literature Review

The start of this chapter represents an overview the searched for literature in the beginning phase of this thesis. The section is divided into subsections for each following sections in this chapter, explaining the use of primary, secondary, and tertiary sources. In section 2.2 we look into the *relevance lost debate* and the *beyond budgeting movement*, which criticize the budgeting process for being irrelevant and thus should be abolished. Therefore, in the next section, we present previous research regarding some specific tools and their connection to profitability. In section 2.4 we introduce the contingency theory, where the choice in management accounting tools depends on certain characteristics of the entity. In the final section, we focus on management accounting innovation. Specifically, we present perspectives used in academia for research and discuss how they affect our results.

2.1 Literature Sources

2.1.1 Literature Search Approach

In order to search for literature, we followed the literature review process proposed by Saunders, Lewis, and Thornhill (2009). The main idea behind this is to continuously redefine search parameters and keywords, as well as continuously updating the literature review and obtaining more sources as the critical review is created. The first step was to use search parameters given by relevant syllabuses, and articles suggested by our supervisor. In the following table, some of the search parameters from our initial searches are listed, although this list is not exhaustive. From this starting point, we quickly developed several new search parameters based on tertiary sources such as bibliographies and references in articles.

Mingers (2000) presents four aspects of critical review, listed below. The first aspect, it is argued, being on the simplest level, and evaluates whether or not the argument in the literature follows a logical sense, and if the conclusions follow from the premises (Mingers, 2000, p. 8). The second aspect challenges the traditional view, where assumptions are taken for granted, without being questioned. The aspect of the critique of authority questions the validity of the literature. Especially questioning the interest groups behind the published literature is key in recognizing that there are multiple perspectives which might challenge the dominant view. The fourth and last aspect we have used is the critique of objectivity. Mingers (2000) states that it is important to remember that findings do not just occur, but are the results of several choices to do with research method and processes. Taking this into account, this thesis focus on the point of view of the authors and the publishers, and how this might have impacted the conclusions, as well as the selection of findings presented.

- Critical thinking - critique of rhetoric
- Being sceptical of conventional wisdom - critique of tradition
- Being sceptical of one dominant view - critique of authority
- Being sceptical of information and knowledge - critique of objectivity

Sources	Reference
Books	Relevance Lost: The Rise and Fall of Management Accounting (Johnson & Kaplan, 1991); Budgeten: ett onödigt ont (Wallander, 1999)
Initial articles	(Bjørnenak, 2013a; Wallander, 1999, 1995; Johnson & Kaplan, 1991; Ax & Bjørnenak, 2011; Johanson & Madsen, 2017, 2018; D. Rigby & Bilodeau, 2017)
Journals	Accounting, Auditing and Accountability Journal; Accounting and Business Research; Accounting, Organizations and Society; British Accounting Review; European Accounting Review; Harvard Business Review; Journal of Accounting Research; Journal of Accounting and Public Policy; Management Accounting Research; Management Accounting Research; Praktisk økonomi og finans
Online databases	`www.Magma.no`; `www.Brage.bibsys.no`; `www.Researchgate.net`; `www.jstor.org`; `www.oria.no`; `www.scholar.google.com`
Libraries	Norwegian school of Economy; University of Agder; University of Bergen
Search parameters:	
"Accounting tools"	"Management tools"
"Management innovations"	"Profitability and (tool)"
"The beyond budgeting movement"	"Relevance lost debate"
"Use of (tool)"	"Utility of (tool)"
"Contingency theory"	"Abandon budgets"
The specific tools in our survey	Authors publishing or referencing in articles

Table 2.1: Overview of initial search parameters and literature sources. See our bibliography for a full list of literature used.

This thesis focused on three main sources for information: primary, secondary, and tertiary literature, as described by Saunders et al. (2009). Primary literature is defined as the first occurrence of a topic, or piece of work, which would typically be the first paper proposing an idea, or a theory. It could also be the first book or article which describes a phenomenon, which would not be interpreted as a new idea or theory by the authors. Secondary literature follows the primary

literature, either describing the same theory or idea or focusing on weaknesses, elaborating on the primary literature. Typically, secondary literature addresses a broader audience than the primary literature (Saunders et al., 2009). Tertiary literature is often used in order to locate primary or secondary data. This could include indexes, bibliography, and similar information sources, describing primary or secondary literature.

In this thesis, our primary focus is secondary literature, as we focus on elaborated and empirical research, rather than the original, to some degree, argumentative, source. We will present some primary literature which originally proposed ideas, theories, or management accounting tools (MATs). To some extent, we also use tertiary literature, mainly to locate and get an overview of primary and secondary literature, yet these are not necessarily discussed in our thesis.

2.1.2 Literature Resources

In this thesis, the main resources of literature are journals and books. Journals have the benefit of being easily accessible through tertiary data, such as bibliographies, published regularly, and are considered more concise and to the point than other sources, such as books (Saunders et al., 2009). The main source of journals is through online libraries, accessed through the Norwegian school of economics (NHH), and researchgate.net. See table 2.1 for some initial resources. The disadvantage of using journals has to do with how they are published, and the difficulties in determining the seriousness of the publisher (Saunders et al., 2009). Of the papers and articles presented in this thesis, most are published in academic journals or magazines. In most cases, we have presented papers that have been subjected to peer review, as well as being from recognized journals often used in academia. For papers or articles that have not published in such journals, we have as far as possible not presented these and searched for other sources of literature instead.

In our thesis, we also present some books as literature sources. One key difference from journals is that books are often published in one edition, or with no, or only small changes in the next editions. As books are mainly published in print, they are less accessible than journals, and might also be more biased due to the need for financing (Saunders et al., 2009). In our thesis, we have chosen to obtain books either through libraries or book stores, where all are either found through tertiary literature, referenced to by other researchers, or seen as the primary literature. All books presented in this thesis have been referenced in the literature mentioned elsewhere, and we have only presented books reviewed favorably by these literature sources.

In general, we have chosen not to present any literature based on newspapers, master theses, or other more dynamic sources that may be altered. Where we present articles found online, we have searched for additional secondary literature confirming citations or findings, as well as checking the source and publisher of the article.

Use, utility and profitability of management accounting tools

In the following section, 2.2, we introduce both the relevance lost debate and the beyond budgeting movement. We present books representing the primary literature in each respective field (Johnson & Kaplan, 1991; Wallander, 1995). Besides, these books, we have located secondary literature which both confirms and rejects the hypothesis and ideas made by these books to some extent, preferably through empirical evidence.

One main critique of these books is their decision not to use using empirical evidence and instead focus simply on a qualitative method. As we will see later in this chapter, researchers have questioned these arguments based on quantitative evidence and argumentative approaches, or at least moderated the initial conclusions or assumptions in the field. Furthermore, both of these books are seen in academia as pioneers in their field, representing "must read"-books. This may affect research testing assumptions from these books, and therefore, also their results. First, one might be biased through subjectively agreeing with their assumptions. Second, these books have impacted research and academia to the extent that they may create biases beyond the individual, making it harder for researchers that disagree to be heard. These books may also use a rhetoric approach where there is little room for other views in their discussion, in addition to not including examples of cases where their conclusions are not valid. One might conclude that neither are objective, as they both aim to argue for their predetermined conclusion.

The following section in this chapter, section 2.3, will be focusing on the relation between specific MATs and profitability.

We have chosen to present the following tools: Traditional budgeting, Activity-Based Costing (ABC), Benchmarking, Balanced Scorecard (BSC) and Customer Profitability Analysis. These tools are included because they are among the most discussed tools in academia. Through our literature search, we also found that they are all either used by a high number of entities or claimed to have a positive impact on profitability. Our thesis aims to contribute to the academic field with research on relevant tools; thus, it makes sense to focus on these tools individually.

For ABC the primary data representing the first thorough presentation of ABC, was published by R. Cooper and Kaplan in 1992. This article was peer-reviewed, and has in the years following, been the basis for several research papers and studies. The article was published in order to give an alternative to the traditional cost systems and use a qualitative approach. Through examples, they describe how entities could implement and use ABC. The article does not promise increased profitability through ABC, but they do state that the costing technique represents a more relevant way of measuring cost and that the goal of ABC is to increase profits (R. Cooper & Kaplan, 1992, p. 8). Both authors of this article are well-known researchers with academic authority, which may create some biases in the following articles testing ABC's impact on profitability.

For Benchmarking, we have chosen to use only secondary literature, as this tool cannot be traced back to one specific paper or research study. The secondary literature provides both argumentative discussions, as well as empirical evidence of Benchmarking either being associated with profitability or not. We will discuss these articles as we go later on in this chapter.

Customer Profitability Analysis is a tool emerging from an unclear primary literature source, thus we will mainly use secondary data. Through searches on tertiary data such as bibliographies (Helgesen, 1999; Gupta & Lehmann, 2008; Bjørnenak & Helgesen, 2009; Holm, Kumar, & Rohde, 2011; Holm et al., 2011), survey reports (CIMA, 2009, 2013; D. K. Rigby, 1999, 2001, 2005, 2011, 2015, 2017; D. Rigby & Bilodeau, 2007, 2009, 2017) and similar papers and articles, we have not found a substantial amount of research with evidence through a quantitative approach on the association Customer Profitability Analysis have on profitability. Following this, we will therefor focus on secondary literature providing arguments for profitability analysis and its benefits, as well as discussing how this tool can be used in order to increase profitability.

BSC was first proposed by Kaplan and Norton in 1992, thus representing the primary literature used in this thesis (Kaplan & Norton, 1992). As shown by secondary literature (Kaplan & Norton, 1996; Ittner, Larcker, & Meyer, 2003; Bjørnenak & Ax, 2005; Hoque, 2014), this paper has been the basis for several studies. Our theoretical discussion is mainly based on some of these secondary data, mainly those proposing quantitative methods. We will discuss these later on in this chapter.

Through our literature search, we have not found many studies looking into the use of MATs in large Norwegian entities. There have been some studies on industry-specific use such as banking industry (Bjørnenak, 2013a) and state agencies (Lægreid, Roness, & Rubecksen, 2006), or tool specific, yet lack of studies across industries on large entities. In this thesis, we have also

chosen to include two sources of literature which cover the use of MATs across industries on international entities. These are both credible sources in the sense that they are recognized as serious research contributors, and that their response rate decrease uncertainty that may occur when generalizing the results. On the other hand, none of these sources are research facilities. One is a global consulting firm, which may create biases in the communicated results.

Contingency theory

In section 2.4, we will present the contingency theory, stating that the design of accounting systems depends on contingencies within the entity. This theory became the focus of our thesis when searching for critics on the beyond budgeting movement. The theory is not a direct critic on the beyond budgeting movement, as it arose before the movement, but it has a slightly different view on the design of accounting systems. For this theory, there is no precise primary data, as this theory first emerged from entities slowly implementing this theory more and more (D. T. Otley, 1980). In academia, D. T. Otley (1980) is known for being one of the first summarizing this theory and research done, yet this does not qualify for primary literature, as the first mention of contingency theory surfaced years D. T. Otley published the paper. As a result, we conclude on interpreting the literature presented in this section as secondary literature, where some will also be used as tertiary literature. There are several papers and studies on this theory, where we have chosen to focus on the main contributors. We have also chosen to limit literature to theories and papers either building on one another or elaborating on the same topic.

Management accounting innovations

In the latest years, researchers have focused more and more on accounting systems and MATs being more dynamic and less static. As a result, several perspectives of management systems have emerged in academia. We have chosen to present four of these perspectives, which is meant to give the reader a deeper understanding of management systems and thus also MATs. For two of these perspectives, we focus mainly on the primary literature, one being the first mention of a phenomenon, the second being an introduction to a new perspective. The remaining two perspectives are presented through several kinds of secondary literature. We have chosen not to test these perspectives in our thesis, as this is not our focus, but rather use them as the basis for our discussion in chapter 6. Previous master theses and other research paper to that matter have not considered these perspectives to a large extent when studying use, utility, and

association with the profitability of different MATs. As a result, we have chosen to include them in our literature review in order to further broaden the discussion of our findings in chapter 6.

2.2 Traditional Budgets

Through the *relevance lost debate* and the *beyond budgeting movement*, academia has focused more and more on the problems associated with budgets. Some has even gone as far as saying that the use of budgets "(...) may lead to a breakdown in corporate ethics." (Hope & Fraser, 2003, p. 108) and that "budgets make people feel undervalued." (Neely, Bourne, & Adams, 2003, p. 23).

In this section and the following, we will look into arguments behind such criticism, and present empirical research for the hypothesis of budgeting being unprofitable. First, we will go over the previously mentioned relevance lost debate and the beyond budgeting movement, which will further be elaborated on in section 2.3, where we present some newer research which tries to find some empirical evidence for the hypothesis of budgeting being unprofitable.

2.2.1 Relevance Lost Debate - Arguments from Johnson and Kaplan

In 1987 Johnson and Kaplan published a book titled *Relevance lost - the rise and fall of management accounting*. Their goal was to present a historical context over the past years' debate in what they called major redesigns of management accounting systems (Johnson & Kaplan, 1991). The conclusion was that management accounting systems were to little or no help to managers in their attempt to improve productivity. As a result of this book, what later was defined as the relevance lost debate rose as a major focus area among researchers and entities. The idea behind the debate was that management did not gain relevant information from their management systems. Information was too aggregated, communication of resource allocation was too difficult, and performance measures were untrustworthy (Bjørnenak, 2010).

Johnson and Kaplan start their book by introducing the *Du Pont Powder Company*, a multi-divisional entity succeeding with the increased structural complexity as they acquired other entities (Johnson & Kaplan, 1991). The main idea behind introducing DuPont as an example was to show how entities could design their accounting system in order to overcome increased complexity. Their solution was not to let department executive focus on budgets or returns,

but rather focus on cash flows, Benchmarking, resource efficiency, and similar tools and measures (Johnson & Kaplan, 1991, p. 67). By doing so, the department managers were able to gain relevant information, while the top management distributed resources after each department's return on investement (ROI).

In their next example, General Motors (GM), Johnson and Kaplan go on discussing where to place responsibility for decision making. In GM, the top management chose a more decentralized structure, where the decision was made far down in the organization, closer to the day to day operations. Not unlike the Du Pont Powder Company, GM focused on forecasts and Benchmarking. Each division was measured after their actual performance, and allowed top management to allocate resources among departments based on similar performance criteria (Johnson & Kaplan, 1991, p. 102).

Although the book did start the relevance lost debate in academia, as well as among entities, they did not present any empirical evidence. Johnson and Kaplan published this book in order to argue that management accounting systems had lost their relevance. Following this debate, the *beyond budgeting movement* surfaced through critics of the budgeting process. In a rhetorical aspect, the book has some indications of picking its examples after what fit their conclusion. The conclusion follows from the discussion, but there is some uncertainty whether this conclusion is transferable to all entities and industries.

2.2.2 Beyond Budgeting Movement - Arguments from Wallander

In 1995, the CEO of the Swedish bank *Handelsbanken*, Wallander, published a book explaining why he demanded to abolish traditional budgets, and why Handelsbanken was successful in doing so (Wallander, 1995). Later, he also published a paper in the *Scandinavian journal of management* (1999) where he summarized his arguments and clarified the past years' debate arising from his first published book (Wallander, 1999). Although this book is mainly targeting the banking industry, many of its arguments are transferable to other industries. As a result of this book and the following debate, the beyond budgeting movement was introduced, where supporters agree with Wallander in abandoning budgets all together (Hope & Fraser, 2003). The movement has since its beginning focused more and more on beyond budgeting being a management model, rather than just critics of Traditional budgeting (*Beyond Budgeting Round Table*, n.d.).

Wallander describes in his book that many entities suffer from what he calls the *Budgeting Bu-*

reaucratic Complex (Wallander, 1995). This complex is defined as the situation that occurs when entities are tied to budgets, not because they necessarily benefit from this, but as a result of old habits, or the idea that budgets are beneficiary. His main critic of budgets is that they often project historical development as the future, rather than try to understand what drove the underlying developments. Budgeting is a problem since entities will assume that they experience "(...) same weather tomorrow as today." (Wallander, 1999, p. 409). One problem with this emerges when entities experience shifts or breaks in the environment. Management will not be able to make rational choices based on their budgets, which are not showing a predicted future based upon these shifts. This is also shown by others where budgets in addition to be quickly out-dated are seen as the cause for budget gaming, time-consuming, costly and lack of flexibility (Nguyen, Weigel, & Hiebl, n.d.; Hope & Fraser, 2003; Libby & Lindsay, 2010; Neely et al., 2003; S. C. Hansen, Otley, & Van der Stede, 2003).

The second problem with budgets, according to Wallander, is due to the situation where a shift leads to a new reality, and management does not acknowledge this as a result of their strategy and thinking being mentally locked to budgets (Wallander, 1995). In many cases, information gained from budgeting is not relevant to the employees nor the management to make changes that affect cost, production, or efficiency. His main argument is that if there are no breaks in the environment, entities do not need a budget since everyone can keep on doing what they do. If there is a shift, the information from budgets are irrelevant and should be tossed away. Either way, budgets are not relevant and should be abolished.

2.2.3 Critics of the Beyond Budgeting Movement

Even though the beyond budgeting movement has been given strong focus in academia (Nguyen et al., n.d.), and promises increased management control, researchers have shown that it has its shortcomings. In 2010 Libby and Lindsay published a paper where they studied US and Canadian firms, and the use of beyond budgeting and the budgeting process (Libby & Lindsay, 2010). Among others, one of their findings is that the majority of entities do not experience unsteady environments to the point where budgets may quickly be irrelevant (Neely et al., 2003, p. 67). This means that they challenge the assumption of Wallander and the beyond budgeting movement. Furthermore, entities revise their budgets much more often than previously thought, so that they overcome the problems with unpredictable environments. Budgeting should thus not be seen as being used or not used, but rather with a dynamic focus, as there are entities with success on both sides (Libby & Lindsay, 2010, p. 67).

If beyond budgeting is what it promises to be, we would expect to see a large degree of use among entities. Several researchers have tried to answer why this is not the case. One of the main findings is that entities use budgets, and still experience benefits from this (Johansen, 2010; Libby & Lindsay, 2010; Bjørnenak, 2013a). In an article from 2003 S. C. Hansen et al. show that it might not be practically possible to use non-financial, subjective measures for decision making, thus making budgets a valid alternative (S. C. Hansen et al., 2003). Furthermore, Libby and Lindsay (2010) also show that the beyond budgeting process is not adaptable for all industries, especially not for all entities in all situations. Rickards (2006) also show that even though beyond budgeting is targeting the weaknesses of budgeting, there are a lack of empirical evidence on beyond budgeting actually being beneficiary (Rickards, 2006).

2.3 Management Accounting Tools and Profitability

2.3.1 Traditional Budgeting

As a result of changes in the banking industry from Traditional Budgeting tools, through the relevance lost debate and the beyond budgeting movement, Bjørnenak (2013a) investigated if banks without budgets are more profitable than those depending on budgets (Bjørnenak, 2013a). Bjørnenak is clear that he agrees with the arguments of Wallander (1995, 1999) and Johnson and Kaplan (1991), and he aims to find empirical evidence for the hypothesis regarding traditional budgets in the banking industry.

Bjørnenak found a significant negative relationship between the use of budget and financial performance measured as cost income-ratio and return on equity (ROE). Despite this, he finds that budgets are the most used tool among Norwegian banks at 89%, and that budgeting is seen as very useful by its adopters, seemingly not being affected or focusing on the problems discussed through the beyond budgeting movement. This follows the previous paper published by Libby and Lindsay (2010), where entities adapt to their environments in order to overcome the weaknesses of budgeting. From the paper of Bjørnenak, one can not conclude that there is a cause-and-effect link between budgets and performance, only that there is a significant negative correlation. Furthermore, his analyze is only based upon one differentiating factor, budgets, or no budgets, in addition to using size as a control variable. His measure of use is also a subjectively variable, depending on each specific respondents own interpretation of budgets and survey questions. Furthermore, there is some uncertainty whether these findings are transfer-

able to other industries, or if they should be indications of possible relations.

In 2003 Hope and Fraser published a paper where they discussed *who needs budgets?* Their finding is that managers use 30% of their time on the budget process, which also demands a large amount of financial resources (Hope & Fraser, 2003, p. 111). A similar study published by Neely et al. (2003) show that entities use about 20% of their time in the budget process (Neely et al., 2003). Following these findings from Bjørnenak (2013a), Hope and Fraser (2003) and Neely et al. (2003), one might interpret them as support for the Budgeting Bureaucratic Complex proposed by Wallander (1995). Entities use budgets to a large extent, yet they do not benefit from this even though they report being highly satisfied (Bjørnenak, 2013a), and they use a large amount of time and resources on the process (Hope & Fraser, 2003; Neely et al., 2003).

This conclusion is questioned by the previous mentioned Libby and Lindsay (2010), following that entities report having a high degree of satisfaction from budgeting. They show that only 18% and 13% of Canadian and US entities, respectively, state that they experience little, no value or negative value from their budgeting systems (Libby & Lindsay, 2010, p. 67), which is supported by others (Bjørnenak, 2013a; Dugdale & Lyne, 2010). Entities may have a tendency to overcome the problems with budgets, thus actually benefiting from them. In general, Libby and Lindsay (2010) conclude that the assumptions made by the beyond budgeting movement are over-generalized when it comes to the average firm (Libby & Lindsay, 2010).

2.3.2 Activity-Based Costing

The main idea of ABC is to allocate cost to products and services based on a cause-and-effect link (R. Cooper & Kaplan, 1992). ABC is a two-step process, where one first allocates indirect cost to activities following the specific use of resources. Second, these activities are then allocated to products, services, or customers, following the consumed portion of resources (Bjørnenak, 2013b). Furthermore, costs are not seen as just variable or fixed but sorted in a cost hierarchy system ordered after how variable the costs are (Bjørnenak, 2013b). ABC was introduced in the 1980s for production industry entities, and has later been developed into further purposes and industries (Bjørnenak, 2005). As shown by Kennedy and Affleck-Graves (2001), the success of implementing ABC have been varied, where some entities have succeeded, while others have abolished the tool later on, mainly due to the complexity and advanced technique (Kennedy & Affleck-Graves, 2001).

The arguments behind ABC being positively correlated with profitability, are founded in that

it helps entities better allocate costs and measure the financial performance of products and services, as well as customers, thus being able to increase their relevant information for decision making (R. Cooper & Kaplan, 1992). By better measuring the cost of activities, entities can reduce the demand of resources by reducing the number of times each activity is being performed, or by increasing the efficiency of the activities being performed (R. Cooper & Kaplan, 1992, p. 10).

Kennedy and Affleck-Graves (2001) investigated the impact ABC has on firm value. In their research, 853 of the 1000 largest entities in the UK contributed through a questionnaire survey (Kennedy & Affleck-Graves, 2001). 47 of these 853 firms had implemented ABC, implying an user rate at 5,5% (Kennedy & Affleck-Graves, 2001, p. 26). They used a matching approach to investigate whether or not there were any causal effects in their data, using stock performance as the dependent variable. Their main finding is that there may be a significant positive impact on performance through implementing ABC. Even though they do conclude that there is a significant difference, they are cautious when it comes to causal effects due to uncertainty in their models. In general, studies using this approach may have high uncertainty due to the determination of the precise implementation time, the sampling method and the subjectively reported the degree of implementation of ABC. As a result, we are cautious on trusting in these findings as a causal effect, but will use them as an indication of ABC having a positive effect on firm value.

Another study of ABC and profitability were published by L. A. Gordon and Silvester in 1999, where they investigate the effect on performance through implementing and adapting ABC (L. A. Gordon & Silvester, 1999). Similar to Kennedy and Affleck-Graves (2001), they measure profitability as stock value, yet they are looking at American firms, not British. Their approach was to see if the communication of ABC being implemented affected stock value. According to their paper, there was no significant effect on stock value in the 1980s through communicating that ABC had been implemented. As they argue, if one does not find any effect on stock value among profit-maximizing entities through implementing ABC, there might not be any effect from ABC.

A third study, published by Cagwin and Bouwman in 2002, looked into a more internal financial measure, ROI (Cagwin & Bouwman, 2002). In order to test if ABC were associated with profitability, they included variables such as favorable competition, technology, capacity, and similar characteristics often argued making ABC easier to implement (Cagwin & Bouwman, 2002, p. 3). Their finding is that there is a significant positive relation between ABC and ROI, yet this

do not apply for all entities, only entities which are complex and diverse, operating in environments where costs are relatively important, and there are limited numbers of intra-company transactions to constrain benefits (Cagwin & Bouwman, 2002, p. 27). One might interpret this as if ABC are going to increase profit, one must focus on these factors, in addition to ABC. This is also supported by Ittner, Lanen, and Larcker (2002), which look into relations between ABC and financial performance measured as return on assets (ROA) and product quality (Ittner et al., 2002). They found that the use of ABC is significantly correlated with higher product quality, as well as higher cost efficiency through production. There are some shortcomings in their results. First, there is a concern in the endogeneity of cost accounting choices, and some potential inconsistency in their parameter estimates (Ittner et al., 2002, p. 725). Furthermore, they also find potential self-selection biases in their sample, some unknown psychometric properties, and problems regarding the time of implementation. Finally, they also conclude that their results do not say anything on causality due to their data being cross-sectional.

In a more recent article, Bjørnenak (2017) discuss ABC in the light of new technology (Bjørnenak, 2017). His conclusion is that technology moves fixed costs further up the cost hierarchy, where costs are seen as less variable. A result of this is that costs are harder to allocate in the hierarchy, and new levels have to be created, making ABC even more complex to use (Bjørnenak, 2017). In addition to this, Bjørnenak also states that new technology creates permanent unused capacity. When using ABC activity costs include the costs of unused capacity, which in the long term are either reused for alternative purposes or reduced by the entity (Bjørnenak, 2013b). Through new technology, this is not the case, as unused capacity are not reduced or reused (Bjørnenak, 2017). There are several solutions to this problem, which all illustrate the increased complexity of ABC as entities develop and implement new technologies (Bjørnenak, 2017).

In 2006 Lægreid et al. published a working paper about modern management tools in Norwegian state agencies (Lægreid et al., 2006). They investigated the different tools that were used among these state agencies and how they are used and interrelated. The paper is based on a survey from 2004, where all administrative units, except for ministries, were asked to contribute. The survey questioned the agencies about 18 different tools, where 150 agencies answered the survey (Lægreid et al., 2006, p.10). Lægreid et al. Lægreid et al. report that only 1% use ABC (Lægreid et al., 2006, p. 21). The authors argue that the reason for this is that state agencies are not profit-maximizing, thus making several tools not relevant. This argument assumes that entities that are not profit-maximizing will not focus on high resource demanding tools such as ABC in order to reduce costs or increase profits. Another implication may be that entities with their primary income not affected by a competitive market do not find any use in tools such as

pricing tools. What Lægreid et al. find is that Norwegian state agencies tend to use more traditional tools which demand fewer resources than more modern tools. This is especially true for tools with high implementation or start-up cost (Lægreid et al., 2006), such as ABC.

Following these research papers, the results concerning the association between ABC and profitability may be heavily affected by the research design and method. None of the papers above can with certainty conclude that ABC lead to increased profitability, only that the tool may be associated with better profitability. As Cagwin and Bouwman (2002) discuss, the managements' acts and choices are what mainly control whether or not the entity will be successful in implementing ABC. This may also explain Bjørnenak's (2013a) findings, where he find no significant effect from ABC on profitability among banks, and that the 15% users also reported the perceived usefulness of ABC as low. One reason being that ABC is a relatively complex tool, and that its usefulness might be hard to communicate internally. Furthermore, one can not conclude on whether a significant effect is due to ABC or an unobserved variable outside the model, as discussed by Kennedy and Affleck-Graves (2001). All of the above might be reason for why ABC is not implemented by a high number of entities (Kennedy & Affleck-Graves, 2001; Bjørnenak, 2013a; Lægreid et al., 2006), even though it is communicated having many benefits (Gosselin, 2006).

2.3.3 Benchmarking

Benchmarking is defined as "The continuous process of comparing the levels of performance (...) and executing activities against the best levels of performance in competing companies or companies having similar processes." (Horngren, Datar, Foster, Rajan, & Ittner, 2009, p. 280). In other words is the main idea of Benchmarking to evaluate performance against some goal, a gold industry standard. Benchmarking has historical also been one of the most used tools, with users reporting being satisfied with their use and benefits from this tool (Chenhall & Langfeld-Smith, 1998; CIMA, 2009, 2013; Bjørnenak, 2013a; D. K. Rigby, 2015; D. Rigby & Bilodeau, 2017; Nguyen et al., n.d.). On the other hand, some researchers report that entities not necessarily are satisfied with Benchmarking, or that few report high degree of satisfaction (Madsen, Slåtten, & Johanson, 2017).

One of the main key arguments for Benchmarking is that it reminds the entity always to compete and stretch for a golden goal (Ax, Johansson, & Kullvèn, 2010). Besides, entities will also achieve a competitive focus an advantage if these goals are met (Horngren et al., 2009). Benchmarking

can be used externally against other entities, as well as internal among divisions (Wallander, 1995). Madsen et al. (2017) show that Benchmarking also have been used in order to communicate necessary internal changes (Madsen et al., 2017). As a result of several ways to use Benchmarking, it may be argued that all entities are using Benchmarking, either formally or informal (Adebanjo & Mann, 2010). Following the same research study, the authors also state that only a small portion of the entities used the best practice version of Benchmarking, as this is seen as more resource demanding (Adebanjo & Mann, 2010).

Among banks, Benchmarking has traditionally been one of the most used tools for decision making and strategical thinking, in order to measure performance against competitors (Bjørnenak, 2013a). Bjørnenak found that Benchmarking is significantly positive correlated with performance through both lower cost-income ratio and higher ROE (Bjørnenak, 2013a, p. 66). This result implies that banks using this tool is expected to do better than others that do not. He also reports that Benchmarking is widely used among banks with 79% users and that most respondents see Benchmarking as very useful (Bjørnenak, 2013a, p. 66). This is also supported by Chenhall and Langfeld-Smith (1998), who find that Benchmarking can be used both for entities using a skimming price strategy, as well as high quality-focused entities (Chenhall & Langfeld-Smith, 1998). The reason being that entities may use Benchmarking both to achieve high quality, but also to achieve a cost-efficient production. This increases the purpose and possibilities of Benchmarking, but also increases the ways to use, and evaluate the benefits from the tool.

2.3.4 Balanced Scorecard

Balanced Scorecard (BSC) were introduced by Kaplan and Norton in 1992, with the main idea to give managers complex information, both financial and non-financial, at a glance (Kaplan & Norton, 1992, p. 71). This enabled them to improve the planning, control, and performance measurement related to management accounting (Davis & Albright, 2004, p. 136). As shown by Johanson and Madsen (2017), BSC has been in continuous development since its beginning, and the tool is to a large extent different today relative to what Kaplan and Norton introduced in 1992 (Hoque, 2014). Originally, BSC were used with three perspectives: customer satisfaction, internal business processes, and innovation and learning (Kaplan & Norton, 1992). De Geuser, Mooraj, and Oyon (2009) specify furthermore that BSC answer three critical strategic questions for entities, the first being the markets in target, second, products and services offered to that market, and last how they should produce and deliver its value to customers. As shown by Hoque (2014), BSC has had a major influence on the academic world of management

accounting, as well as affecting entities worldwide.

One of the main problems with analyzing BSC is that it is often used different between entities and industries, as well as often being combined with other tools (Johanson & Madsen, 2017; Bjørnenak & Ax, 2005; Modell, 2009). One key argument for BSC is its possibility to affect profitability not only through financial measures and information but also through the entity's strategy (Kaplan & Norton, 1992). Yet, as Kaplan and Norton say it "Even an excellent set of Balanced Scorecard measures does not guarantee a winning strategy." (Kaplan & Norton, 1992, p. 77).

In the literature of BSC, there is a tendency that researchers report on BSC having a significantly positive effect on profitability (Davis & Albright, 2004; De Geuser et al., 2009; Papalexandris & Ioannou, 2004; Speckbacher, Bischof, & Pfeiffer, 2003; Ittner et al., 2003). Davis and Albright (2004) specifically show that banks implementing BSC had a higher positive profit than their competitors not using BSC. One important notice to be aware of from this study, is that these banks implemented a specific form of BSC, and the authors are clear that the findings do not support any casual effect of implementing BSC. What they do conclude on, is that their finding support the hypothesis of BSC being able to increase entities' profit, compared to tools that only focus on financial measures. On the other hand, in his study of Norwegian bank, Bjørnenak (2013a) actually found that BSC is significantly negative correlated with cost-income ratio among his respondents. He also reports that this tool is being used by 53% of the banks, and the adopters see BSC as highly useful.

These contradicting results may be due to the different versions of BSC, as discussed earlier. For entities, BSC has become a highly versatile and dynamic tool, which may affect results. Malina, Nørreklit, and Selto (2007) show that managers tend to make strategic choices, as well as operation choices, based on information from BSC, regardless of evidence of cause-and-effect relations in these measures. One implication following might be that managers think their entity experience benefits from their specific BSC, while in reality, their version is not optimal.

2.3.5 Customer Profitability Analysis

Customers has been an increased focus in academia the latest decades (Bjørnenak & Helgesen, 2009), even stated being more important than product calculations (Lem, 2010). As a definition, Customer Profitability can be defined in many ways, but are often seen as the difference between the revenue and cost associated with the specific customer (Bjørnenak & Helgesen,

2009). Furthermore, as shown by Helgesen (1999), there is high uncertainty in the different calculations of revenue and costs. A Customer Profitability Analysis can focus on the present value of all future benefits, or cover a specific period. Furthermore, some techniques also include effects the specific customer has on other customers, such as having the largest customer as a quality stamp, while other versions almost exclusively focus on direct revenue and cost from one specific transaction. Another difference between analyses is that they may focus on individuals, segments, or the entire population, which affect the way entities use these analyses.

Despite the increased customer focus, there has not been reported much empirical research paper on this topic. The main argument of Customer Profitability Analysis is associated with increased profitability, is that entities using this tool may shift their focus on profitable customers or customer segment, which may affect the long term financial performance of the entity (Bjørnenak & Helgesen, 2009). In the earlier mentioned paper, Bjørnenak (2013a) show that Customer Profitability Analysis is significant positive correlated with performance among Norwegian banks, measured as cost income-ratio and ROE. Furthermore, 84% of the banks use this tool, and also see this as very useful, which might indicate that banks see the benefit from using this tool, and also experience financial benefit from this, yet this is only supported with empirical evidence in this one paper presented here.

Table 2.2: Summary of literature review for association between traditional budgeting and profitability.

Reference	Conclusion	Summary
(Johnson & Kaplan, 1991; Wallander, 1995)	Negative	Primary data for the Relevance Lost-debate and the Beyond Budgeting movement. Both are argumentative.
(Wallander, 1999)	Negative	Further elaboration from primary data on the Budgeting Bureaucratic Complex.
(Libby & Lindsay, 2010)	Unrealistic assumptions	Entities may overcome weaknesses and be more flexible, thus budgets should be seen as dynamic tools.
(Johansen, 2010; Libby & Lindsay, 2010; Bjørnenak, 2013a)	High satisfaction	Entities tend to use budgets, and report high satisfaction.
(S. C. Hansen et al., 2003)	Valid alternative	Not practical to use non-financial measures for decision making.
(Bjørnenak, 2013a)	Negative	Through negative correlation using OLS, based on survey in the Norwegian banking industry.
(Hope & Fraser, 2003; Neely et al., 2003)	Negative	Managers spend a substantial amount of time and resource in the budgeting process.

Table 2.3: Summary of literature review for association between Customer Profitability Analysis and profitability.

Reference	Conclusion	Summary
(Helgesen, 1999)	Different versions	High uncertainty regarding the different ways to calculate revenue and cost
(Bjørnenak, 2013a)	Positive	Positive impact on ROE and cost-income ratio. 84% of Norwegian banks use this tool, and report high satisfaction.

Table 2.4: Summary of literature review for association between Activity-Based Costing and profitability.

Reference	Conclusion	Summary
(R. Cooper & Kaplan, 1992)	Positive	Argumentative, primary literature. ABC may increase profits through more relevant cost measures.
(Kennedy & Affleck-Graves, 2001)	Positive	Few have succeeded in implementing ABC. Associated with higher profitability, yet uncertain causal effect.
(L. A. Gordon & Silvester, 1999)	Uncertain	No effect on firm value.
(Cagwin & Bouwman, 2002)	Positive	Dependent on specific entity factors, which may be more important than ABC itself.
(Ittner et al., 2002)	Positive	ABC increases product quality, and entities are more cost efficient through production.
(Bjørnenak, 2013b, 2017)	Complex	New technology increases the complexity of ABC through introducing new problems regarding unused capacity.
(Gosselin, 2006)	Positive	Research review - communicated having many benefits.
(Lægreid et al., 2006)	Uncertain	Only 1% use ABC among Norwegian state agencies. No empirical evidence on profitability.
(Bjørnenak, 2013a)	Uncertain	No significant correlation among Norwegian bank. 15% use ABC.

Table 2.5: Summary of literature review for association between Benchmarking and profitability.

Reference	Conclusion	Summary
(Ax et al., 2010; Horngren et al., 2009)	Positive	Benchmarking creates specific goals, being an advantage against competitors.
(Chenhall & Langfeld-Smith, 1998; CIMA, 2009, 2013; Bjørnenak, 2013a; D. K. Rigby, 2015; D. Rigby & Bilodeau, 2017; Nguyen et al., n.d.)	High satisfaction	Entities use Benchmarking to a large degree, and report being satisfied.
(?, ?)	Low satisfaction	Some entities report low satisfaction.
(?, ?)	High degree of use	All entities use Benchmarking formally or informally.
(Bjørnenak, 2013a)	Positive	Through both cost-income-ratio and ROE. 79% banks use benchmarking.

Table 2.6: Summary of literature review for association between Balanced Scorecard and profitability.

Reference	Conclusion	Summary
(Kaplan & Norton, 1992)	Positive	Argumentative, primary literature. Increases profitability through including non-financial measures with financial measures for decision making.
(Hoque, 2014)	Highly used	Used by a high number of entities, in addition to influencing the academic field of accounting systems world wide.
(Bjørnenak & Ax, 2005; Modell, 2009; Hoque, 2014; Johanson & Madsen, 2017)	Complex	BSC is used different among industries, as well as entities. Often combined with other tools.
(Davis & Albright, 2004; De Geuser et al., 2009; Papalexandris & Ioannou, 2004; Speckbacher et al., 2003; Ittner et al., 2003)	Positive	Tendency in the literature to find positive implications of BSC
(Bjørnenak, 2013a)	Negative	Negative impact on cost-income ratio for Norwegian bank. 53% still use BSC, and see this as highly useful.
(Malina et al., 2007)	Impact decision making	Management tend to make decisions based on BSC regardless of cause-and-effect relations.

2.4 Designing Accounting Systems

In the mid-1960s, accounting systems were affected by what was later defined as the contingency theory (D. Otley, 2016). The theory originally spread among entities and was not focused on by academia until the 1970s. Since the 80s, the contingency theory has been the focus of an increasing number of journals (D. Otley, 2016, p. 48). A contingency is recognized as a theory that "(...) identify specific aspects of an accounting system which are associated with certain defined circumstances and demonstrate an appropriate matching." (D. T. Otley, 1980, p. 413). In other words, there is no specific accounting system that will work for all entities in all industries. This might seem trivial, but as we will see later in this section, many management accounting tools are used by a large portion of entities independent of industry to this day.

In 1980, D. T. Otley published a paper summarizing the past years' research results in the field of contingency theory. In the years before this paper being published, researchers tried to define specific frameworks or maps for entities to follow when designing accounting systems,

which would communicate the contingencies to base accounting systems on. One problem that D. T. Otley found was that the assumption of "it all depends" often was used as an excuse among entities to avoid specific implications, rather than focusing on these implications (D. T. Otley, 1980, p. 414).

Bruns and Waterhouse (1971) conclude that whether or not to use budgets is mainly contingent on the entity's structure. They particularly state that an entity with a decentralized structure in a stable environment is well suited to use budget controls. The reason being that when an entity operates in a market with low uncertainty and few shocks, the future is relatively easy to estimate and plan for, thus overcoming the problems later discussed by the beyond budgeting movement, while an entity acting in the opposite situation, will to a far extent experience almost no value from budgets.

In 1978, Draft and MacIntosh contributed to the contingency theory when they introduced technology as a major explanatory variable on the entities' accounting system. They argue that an entity with high technological capital have the resources to expand their accounting system, and should therefore also do this both in the number of tools, but also complexity. By doing so, entities gain as much relevant data as possible, which implies expanding their management system in both the number of tools and more advanced, resource demanding tools.

The idea of increasing the number of tools contradicts what Wallander recommends in his book from 1995. In addition to expanding the accounting system beyond budgets, Wallander argues that it is better to focus on a few tools with relevant information, rather than focusing on many tools. The problem is not that entities lack access to tools, but rather that it is difficult to choose a limited number of them (Wallander, 1999, p. 419). One of the key recommendations is that entities should focus on *keeping it simple*. Following this thought, one might expect to find that the number of tools is either negative correlated or not significantly correlated, with performance. On the contrary, Draft and MacIntosh (1978) argue that entities actually should increase their accounting system in correlation with size, and one might expect to find the number of tools to be correlated positively with size.

L. A. Gordon and Narayanan (1984) introduced a new three dimensional framework based on previous work by L. Gordon and Miller (1976). They conclude that managers tend to choose more external, non-financial, and ex-ante information when their entity operates in uncertain environments, in addition to internal, financial, and ex-post information. Their paper states that environmental uncertainty is a fundamental variable for designing accounting systems, thus supporting Bruns and Waterhouse (1971). Following this, we might expect to find that en-

tities in uncertain environments choose an accounting system with more external information, such as Benchmarking and market-sensitive pricing, rather than internal information-based tools. L. Gordon and Miller (1976) also state that these external information-based tools should not replace other tools, but rather complement them.

In the initial years of research on the contingency theory, articles focused mainly on one independent variable (D. Otley, 2016). As argued by Fisher (1995), it is essential to investigate and get a grasp of the interactions between the multiple contingent factors, when studying the design of systems (Fisher, 1995). He argued that including multiple variables will make the concluding frameworks even more efficient. One problem with research on the contingency theory is that there is a substantial amount of uncertainty in each entity (D. Otley, 2014). This makes the results and findings regarding the contingency theory even more uncertain and may impact results and how to interpret findings.

2.4.1 Additional Research - Contingencies

From 1993 D. K. Rigby, partner in the Boston office of Bain and Company[1], has been responsible for several global surveys investigating the use of management tools[2]. The Bain surveys are unique reports in the sense that they gain insight into the change in use and satisfaction of specific management tools over time. In the period from 1993 to 2017, Bain and Company have published the findings from these surveys, as well as more detailed reports giving final remarks and recommendation.

One finding that D. Rigby and Bilodeau report from their 2017-survey, is that size is a major explanation for variation in the use of tools and on the number of tools being used (D. Rigby & Bilodeau, 2017). This follows the arguments of Draft and MacIntosh (1978) where use may be correlated with size. On average, managers in their survey from 2017 report that they use on average 7.5 tools, which implies using 28% of the 25 tools in the survey (D. Rigby & Bilodeau, 2017, p 3). This is a significant decrease from their prior years' surveys, where they in 1999 reported an average number of tools in the UK at 9.5 (38%) and 11.4 (46%) in France[3] (D. K. Rigby, 1999, p. 2), while in the 2007-report they reported that the average number of tools were 15 (60%) in 2006 (D. Rigby & Bilodeau, 2007, p. 12). In 2004 this number was 13 (52%) (D. K. Rigby, 2005, p. 6),

[1] A global consulting firm.

[2] Their survey is not only on accounting tools but also on pure management tools, such as customer satisfaction, Internet of Things, strategic alliances and so on.

[3] The worldwide average was 10.9 (42%), we have presented findings from Europe.

while the average number of tools peaked in 2002 with 16.1 (64%) tools (D. Rigby & Bilodeau, 2017, p. 3). One should keep in mind that Bain and Company is a global consulting firm, thus being possible bias in their communication of such surveys to potential clients. The report of the 2017-survey (2017) do recommend their readers of specific tools and how to design their management system, without any discussion of their research weakness or shortcomings.

The hypothesis of size being correlated with different tools is also supported by Bjørnenak (2013a) in his study of Norwegian banks. He shows that the use of both ABC and BSC are significantly correlated with size[4], as well with each other (Bjørnenak, 2013a, p. 56). The conclusion he draws is that size is the reason for the correlation between the tools, and that larger banks are using ABC and BSC which are more resource demanding. This supports the arguments of Draft and MacIntosh, where larger entities should and can use more resource demanding tools. Furthermore, Bjørnenak also finds that Benchmarking and ABC might be associated with lower cost, as a result of them being positively associated with higher profitability through cost (Bjørnenak, 2013a, p. 66). Bjørnenak also tested for possible non-response bias in regards to size but did not find any significant differences.

Chartered Institute of Management Accountants (CIMA) define themselves as the "(...) world's leading and largest professional body of management accountants." (CIMA, 2009). With American institute of certified public accountants (AICPA) they established Chartered Global Management Accountant (CGMA) to provide members with resources regarding management accounting. In this context, they perform a periodically survey where they ask multiple international entities about their use of management tools[5].

CIMA's survey shows that size matter when it comes to the number of tools being used (CIMA, 2009, p. 6). What is interesting is that this does not only apply for advanced tools. Following Draft and MacIntosh (1978) one might expect larger entities to choose more complex and resource demanding tools, which also Bjørnenak found for BSC and ABC. CIMA found that size is also positively correlated for simpler tools. However, for some tools, they found that size did not have a significant effect on whether or not they were used. This applied for strategic tools, and to a lesser extent, Budgeting tools (CIMA, 2009, p. 6). This implies that Budgeting tools may be used independently of size. CIMA defined entity size after the number of employees, and not as total capital as Bjørnenak, which may affect the results to some extent.[6] Furthermore, CIMA analyzed a sample of international, not industry-limited entities, while Bjørnenak studied only

[4]Where size is measured as total capital.
[5]Their focus is managerial tools, strategic tools, operational tools, and accounting tools.
[6]For CIMA; small <50, medium 50-200, large, 250-10.000, very large >10.000.

Norwegian banks, which also is expected to impact results. The fact that they investigate such different populations may indicate higher strength of acceptance of the hypothesis of size is positively correlated with the number of tools being used.

Lægreid et al. state that the use of modern management tools is widespread within governmental agencies in Norway, where they on average use six tools, which is considered a low number of tools by the authors (Lægreid et al., 2006, p. 4). Their findings support a high variation in the use of tools, yet BSC, and managerial tools[7] seem to be adapted to the same extent in all kinds of agencies (Lægreid et al., 2006, p. 27). Their main finding is that agency size is what explains the use of tools best[8]. One reason for this, they argue, might be that more prominent agencies have more resources, enabling them to follow trends and introduce new tools. We see from their findings some tendencies that the agencies use tools which requires ex-post information, such as Benchmarking and BSC, and that they also use non-financial information-based tools. Given that the agencies experience a steady environment, these findings support the arguments of L. A. Gordon and Narayanan (1984).

The hypothesis that the use of tools among state agencies are correlated with size is also supported by other researchers such as Brudney, Hebert, and Wright (1999) and Moynihan and Ingraham (2004). The first article studies the variation in the implementation of reinvention across the states in USA (Brudney et al., 1999, p. 28). They discuss that size actually may be a barrier for implementation of tools, simply because of their complex structure (Brudney et al., 1999, p. 25), they do conclude that this is not the case. They show that size is significantly positively correlated with the use of tools (Brudney et al., 1999, p. 27).

[7] The paper defines tools in this category as knowledge-based management, team-based management, service-based management and total quality management (Lægreid et al., 2006, p. 22)

[8] Also, they ran analyses on market competition, criticism, agency age, service culture, the form of affiliation and primary task.

Table 2.7: Summary of literature review of contingency theory.

Reference	Contingency	Comments
(Bruns & Waterhouse, 1971)	Structure	Decentralized structure may benefit from budgets.
(Draft & MacIntosh, 1978)	Capital	Technological capital lead to more complex tools and more tools.
(Wallander, 1999)	Keep it simple	Not main focus point. Focus on few tools, rather than many.
(L. A. Gordon & Narayanan, 1984)	Environment	Three dimensional framework. Uncertain environment lead to external, non-financial, and ex-ante information based systems.
(D. Otley, 2016; Fisher, 1995)	Multiple contingencies	There are multiple contingencies, and researchers should focus on the interrelations between these.
(D. Otley, 2014)	Uncertain	Due to high degree of uncertainty, research in the contingency theory will complicate the interpretation of findings.
(Lægreid et al., 2006)	Environment	Empiric discussion. State agencies use few tools. Larger agencies use more tools. Agencies use tools with ex-post information.
(Brudney et al., 1999)	Size	US firms. Complex structure is not a barrier for the choice in tools.
(CIMA, 2009)	Size	Survey report. Size is major explanation for use. Applies also for simpler tools, yet not for budget tools.
(Bjørnenak, 2013a)	Size	Norwegian banks, where benchmarking and ABC are correlated with size and each other.
(D. Rigby & Bilodeau, 2017)	Size	Survey report. Size is the key explanation for use.

2.4.2 A Dynamic Perspective - Bundling

In 2011 Ax and Bjørnenak published[9] a paper proposing a new conceptual framework for a more dynamic perspective on management accounting innovations (MAIs). The authors argue that MAIs consists of two major components - design characteristics and rhetorical elements. The purpose of the paper is to investigate and report on how MAIs have been communicated in the years after the relevance lost debate (Ax & Bjørnenak, 2011, p. 4). The authors state that this perspective identifies a new type of innovations defined as *housing innovations* where both components mentioned above are dynamic.

They report that researchers have shown that specific MATs even can be seen as existing in a different version as a result of this dynamic view (Ax & Bjørnenak, 2011, p. 4). As they say one "(...) prevalent example of this is the integration of ABC and Budgeting." (Ax & Bjørnenak, 2011, p.6). They also show that this has been done with BSC, which also is confirmed by Hoque (2014) in his field study of 20 years of BSC-research, and by Bjørnenak and Ax (2005) in their case study of BSC in Sweden.

In 2009 Modell published a paper regarding bundling of MAIs, especially focusing on total quality management and BSC. His finding contradicts previous research to some extent, where he found little evidence of bundling on the supply side (Modell, 2009, p. 82). Following the findings, the states that entities are not to be seen as blind accepting new solutions (Modell, 2009, p. 83), contradicting the previously mentioned management fashion perspective, where trends are argued control design and use. Modell's conclusion is that entities are selectively choosing elements of innovations, meaning that change is to be found among entities rather than in fashions or trends.

Following a dynamic perspective of bundling, tools may be highly correlated with each other. One implication of this, beyond the pure statistical, is that using one specific tool may only be beneficiary when using this tool with specific other tools. As a result, the combination of these tools is what increase profits, rather than the specific tool itself. As Bjørnenak and Ax (2005) show, BSC is supplemented with other tools or innovations, as well as being changed to appear more attractive in the current business culture. A result may be that BSC first of all is used different among different business cultures, but they may also in many practical ways be different tools.

[9] This version is a preliminary version published by Bjørnenak on Researchgate.net January 2011.

2.5 Section Summary

In this section, we have presented some perspectives on the management system. We have elaborated further on the term management accounting innovation, as well as showing how these perspectives may affect the use and benefits from these innovations. Through a management fashion perspective, how tools are used may not be affected by the specific entity, yet this is argued not taking into consideration that tools may be affected at a micro level. As boundary objects, tools are recognizable, yet they are also altered to fit each entity's reality better. This is also a result of the traveling idea perspective, even though this perspective mainly focuses on change through different geographical locations. Through a fourth perspective, MAIs are seen as viruses, affecting entities as they develop through phases, as well as innovations being affected by the entities. This may highly affect our data, implying problems with tools being used individually and different between entities. In addition to these perspectives, researchers have also shown that MAIs should be seen as bundled objects, and that interrelations between tools may impact results and profitability different than using them individually.

Chapter 3

Framework for measuring profitability

In the following chapter, we introduce measures for profitability. We will start by introducing an alternative approach, using relative measures, comparing profitability against industry mean. In addition to these relative measures, we also use absolute values, presented in this chapter. At last, we present some research on entity circumstances that may affect profitability, which later will be used as the basis for choice in control variables.

3.1 Measuring Profitability

In this thesis, we have chosen to use several measures for profitability in order to gain a broader investigation of our data. First, this is due to our data consisting of several industries, where different measures may be more or less relevant for different industries, in addition to gaining more robustness in our results. Second, some measures may not be relevant for specific tools, as they focus on different parts of entities. Third, we also want to compare entities against their competitors, measuring advantages that may stem from using specific management accounting tools (MATs).

In subsection 3.1.1, we first present the reader with an overview of our relative measure framework, and what relative measures we have used. Second, we will look deeper into what each of these measures is and how we measure them in our data. Following this, we will present in subsection 3.1.2 the simple measures we use in our analyses, and how they are defined and measured. Last, in subsection 3.2, we discuss some of the problems with analyzing entities from different industries, and what variables that may create problems or biased results in our analyses.

3.1.1 Relative Measures

Just analyzing profitability as absolute values may, in some cases, create a non-representative image. It would emphasize entities with characteristics where the returns naturally are higher, making it more complex to evaluate performance. Another argument for using the relative measure as comparing return to the industry average is that entities are competing with their competitors within their industry, and not against other industries. As Wallander puts it "The challenge is to beat the other one or the other ones." (Wallander, 1999, p. 415). Gjerde, Knivsflå, and Sættem (2010) discuss this as a problem when it comes to research papers. Often, researchers may use absolute values, e.g. return on revenue (ROR) or return on assets (ROA), while Gjerde et al. concludes on using competitive advantage[1] as their measure of profitability. The main reason being that they are analyzing performance across industries.

Our relative measures are based on strategic advantage, defined in figure 3.1.1. This is defined as the difference between return on equity (ROE) and the return on equity demand (ROE_D), often referenced to a competitive advantage or strategic performance (see (Knivsflå, 2018) and

[1] The paper split competitive advantage into industry-based CA and resource-based CA, which in turn is split into return difference and risk difference. For a more thorough definition, see (Gjerde et al., 2010, p. 279).

(Gjerde et al., 2010)). This advantage stems from two sources; strategic operational and strategic financial advantage. Our focus in this thesis is on the operations of the entities, thus focusing on the strategic, operational advantage, defined as the difference between the ROA and the return on assets demand (ROA_D). The strategic operating advantage comes from either a resource advantage, using the resources available more efficient than your competitors, or an industry advantage, which is a higher industry return than what you demand or expect. Furthermore, the resource advantage stems from either higher margins than competitors or a higher asset turnover ratio. Of these measures, we will analyze resource advantage, margin advantage, and asset turnover ratio (ATR) advantage.

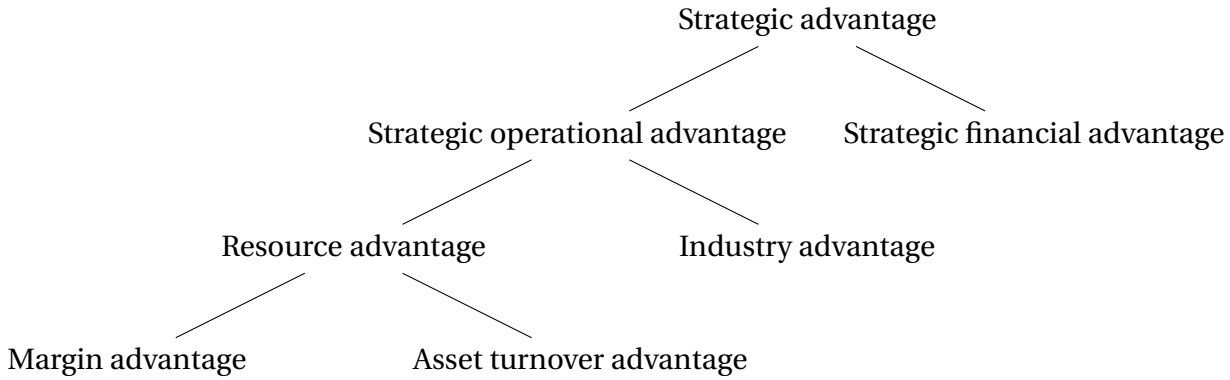

Figure 3.1: Overview of the framework for measuring relative performance

Resource advantage

A resource advantage occurs when the entity gains a higher return from their available resources than their competitors. This is defines in equation 3.1, where the components are ROR and ATR, where variables denoted with I are industry mean return. Margin advantage is computed as the difference between ROR that the entity experience, and the mean average ROR in the industry for that entity, with a weighted value equal to the entity's ATR. The ATR advantage stems from a higher ATR than the average value for the industry, weighted with the average ROR for that industry.

$$\begin{aligned} \textit{resource advantage} &= (ROR - ROR_I) \times ATR + (ATR - ATR_I) \times ROR_I \\ &= \textit{margin advantage} + \textit{asset turnover ratio advantage} \end{aligned} \tag{3.1}$$

The resource advantage also has the benefit of not requiring any estimates when it comes to the expected return, also referenced to as the demanded return. This makes the measures more reliable since the expected return would vary considerably between entities and industries. In other words, all the components of the resource advantage can be calculated from financial data, without the need for additional estimations. It also makes it possible to analyze what effect specific inputs to a regression model have on the different sources of profitability. Significant positive effect on margin advantage may be interpreted as a cost-benefit, while the significant positive effect on ATR advantage may be interpreted as a revenue benefit.

3.1.2 Absolute Measures

In addition to relative measures, we will also include some more traditional measures for profitability. These are defined in the following equation. We will later, in chapter 5, present what values we use as e.g., revenue and pretax income, based on our financial data from Samfunns- og næringslivsforskning (SNF). The main thing to present from the following equations is that we define the average value of book value of equity (BVE) as the mean between the outgoing and ingoing value, denoted with t and $t-1$.

$$ROR = \frac{\text{Pretax income}}{Revenue} \tag{3.2}$$

$$ROA = \frac{\text{Pretax income}}{\text{Total assets}_{t-1}} \tag{3.3}$$

$$ATR = \frac{Revenue}{\text{Average total assets}} = \frac{Revenue}{0.5 \times (\text{Total assets}_t + \text{Total assets}_{t-1})} \tag{3.4}$$

$$\begin{aligned} ROE &= \frac{Net\ income}{Average\ book\ value\ of\ equity} \\ &= \frac{Net\ income}{0.5 \times (Book\ value\ of\ equity_{t-1} + Book\ value\ of\ equity_t)} \end{aligned} \tag{3.5}$$

3.2 Entity Circumstances and Its Effect on Profitability

An ongoing debate in strategy research field discusses what has the largest effect on entity performance, resources, or industry. In 1997 McGahan and Porter published a paper where they signal that problems with relevant and available data complicate research studies in this debate (McGahan & Porter, 1997, p. 15). There has been a substantial amount of contributions to this research field, where Rumelt (1991) might be the most important study, according to McGahan and Porter (1997).

In 1985 Schmalensee contributed to this debate, stating that approximately 75% of the variance in ROA could be explained by industry (Schmalensee, 1985). He also specifies that there is a substantial amount of variance explained outside his model and that results may be affected by a severe recession and energy price shock in 1975 (Schmalensee, 1985, p. 350). Where Schmalensee found that industry effects may have the strongest effect on ROA, Rumelt (1991) reaches a different conclusion. He does so by distinguishing between stable and fluctuating effects. Rumelt's findings support that there is a small stable industry effect and a substantial business-unit effect.

Newer research done by Gjerde et al. (2010) on Norwegian firms, suggests that *(...) firm-specific factors are about 3-4 times more important than industry-specific factors.* (Gjerde et al., 2010, p. 296). Their approach is to analyze the effect on competitive advantage[2]. Concerning industry effect, they find that this is significant on a five-year basis, and do effect competitive advantage in Norwegian firms, as well as superior stock market performance, thus supporting Rumelt (1991) (Gjerde et al., 2010, p. 295-297).

[2]For a more precise definition, see (Gjerde et al., 2010, p. 279)

Chapter 4

Research Design and Method

The purpose of this chapter is to elaborate on our research's design and methodological choices. First, we briefly state our research philosophy. Second, we explain our research's purpose and our research design. Third, we explain how primary and secondary data was obtained. Fourth, we explain how we increased our research's reliability and validity. Fifth, we describe the various data analysis techniques used to conduct our analysis. Sixth, we address ethical issues of collecting our primary data. Finally, we provide a section summary for this chapter.

4.1 Methodological Choices

As the philosophical commitments influence both what choices we make and how we understand our subject of investigation (Saunders et al., 2009), we find it necessary to discuss our philosophical underpinnings briefly. We adopt a positivist philosophy to how we answer our research questions, which assumes a peculiar epidemiological, ontological, and methodological perspective (Abrutyn, 2013). This entails that our research aims to explain and predict, be value-free, and only judged by logic (Dudovskiy, 2016). Furthermore, it adheres the view that only factual knowledge gained through observation is trustworthy. For our research, this implies answering our research question by selecting a highly structured research strategy that can provide large quantitative, measurable samples (Saunders et al., 2009).

Furthermore, we chose a *deductive approach* to our research. According to Saunders et al. (2009) this entail the following. First, we aim to explain causal relationships between variables. Second, we incorporate controls that allow us to test the hypothesis. Third, we ensure reliability by using a highly structured methodology. Fourth, we operationalize concepts that enable facts to be measured quantitatively. Finally, we allow for generalizations to be drawn by selecting samples of sufficient numerical size.

4.2 Research Design

In this section, we declare our research's purpose and explain the three layers of our research design; research strategy, research choices, and time horizon.

4.2.1 Purpose of the Research

The purpose of our thesis is to examine the use and utility of MATs in large Norwegian entities and their association with profitability. Thus, the following three research questions guide this thesis:

1. What are the use and utility of Management accounting tools in large Norwegian entities today?
2. How are management accounting tools associated with profitability in large Norwegian entities?

Given the nature of these questions, our research purpose may be classified as both *descriptive* and *explanatory*. Research question one is descriptive and serve as a precursor for the remaining explanatory research questions. A descriptive study was motivated as we wanted to portray an accurate profile on the popularity of MATs among large Norwegian entities. For our descriptive study, the emphasis is to explain the relationship between our variables (Saunders et al., 2009).

4.2.2 Research Strategy

Guided by our research questions, existing knowledge on the topic and philosophical underpinnings (Saunders et al., 2009), we chose a survey-based strategy for collecting our primary data. This allowed us to gather quantitative and easily comparable data in large amounts from a sizeable population (Saunders et al., 2009), which we considered a necessity to produce adequate findings.

One of the biggest concerns with the survey strategy is the capacity to design and form the questionnaire poorly (Saunders et al., 2009). Furthermore, the number of questions we can ask is often constrained by the respondents' goodwill. Hence, the data collected by a survey strategy is likely to be less wide-ranging compared to those of other strategies (Saunders et al., 2009).

4.2.3 Research Choices

We decided on a multi-method quantitative study, implying that we used more than one quantitative data collection technique and analysis procedure to answer our research questions (Tashakkori & Teddlie, 2002). We collected both primary- and secondary data. After examining our secondary data, a primary data collection was considered necessary and performed through the use of online questionnaires (section 4.3.1). Our secondary data was retrieved through a data exchange agreement (section 4.3.2). Analysis techniques are discussed in section 4.5.

4.2.4 Time Horizon

We considered a cross-sectional study as most suitable for our research, which implies that we study a phenomenon at a particular time (Saunders et al., 2009). Neuman (2014) assert that

compared to other alternatives, it is simple and less resource demanding, which aligns with the time-frame of our research.

4.3 Data Collection

In this section, we elaborate on the choices we made associated with our primary- and secondary data collection. We focus on the first, in which we begin by explaining our overall technique and process used. Next, we explain how our sampling was performed. From there, we describe how our survey was designed and the concept we operationalized. Finally, we address our secondary data collection.

4.3.1 Primary Data

Technique

Aligned with the survey strategy, we chose an *internet mediated questionnaire*. Given the busy nature of our respondents, this channel and self-administration of our questionnaire have allowed us to effectively collect data from individuals who would be difficult, if not impossible, to reach otherwise (Wright, 2005). Furthermore, this technique enabled us to reach our entire sample in a short time, despite being geographically scattered (Evans & Mathur, 2005).

A concern with applying this technique has been the evident risk of receiving insufficient data. There are several reasons as to why. Wright (2005) attest that it can be challenging to obtain our respondents' email addresses. Furthermore, there is also the risk that our survey invitations are perceived as junk mail (Evans & Mathur, 2005). Also, internet-mediated questionnaires increasingly suffer from survey fatigue, which consequently yields a lower participation rate (Brick & Williams, 2013).

Process

Primary data was retrieved through a process of four steps. The first step began by extracting the respondents' contact information through the company websites. For those emails that at first was irretrievable, we sought to further obtain these by issuing a formal information request to the company email. Securing a vast amount of these contacts at an early stage was important,

as this gave us an indication of how many responses we could expect to receive. The second step involved designing the questionnaire and submitting the final project to Norwegian Centre for Research Data (NSD). After receiving approval (Appendix A page 146), the third step was to initiate pilot testing. Minor flaws were accounted for in both cases, in addition to providing an estimated completion time. Lastly, the questionnaire was administered to our selection through a formal participation letter (Appendix A page 148). Data collection took place from 15. June - 20. December 2019, using the service provider, *Qualtrics*.

Sampling

We performed sampling as our time constraint prevented us from surveying the entire population (Saunders et al., 2009). Furthermore, given that we knew the probability of each subject being selected, we chose a probability sampling technique, which allows us to generalize our findings. Following Saunders et al. (2009), we performed our probability sampling through four successive stages.

First, we identified a suitable sampling frame that harmonized with our research questions. Our frame was identified through three defined research criteria:

1. Norwegian entities with at least 250 employees[1].
2. Entities that have operating revenue of at least 100 MNOK.
3. No holding company.

These criteria aim to narrow down our selection of entities that, to some extent, are more similar to reduce unexplained variation. A particular concern has been the entity size as this has proven to influence the use of different tools (CIMA, 2009). Using these criteria, our sample frame thereby consists of 987 entities.

Second, we decided on a sampling size suitable for our research. For this purpose we used Saunders et al. (2009) formula to compute our actual sample size: $n^a = \frac{n \times 100}{re\%}$. Here, n denotes the minimum sample size and $re\%$ denotes our estimated response rate. Given the approximate size of our sample frame Saunders et al. (2009) suggest a minimum sample size to be 278 (margin error of 5%). Assuming an estimated response rate of 55%, our actual sample is then $n^a = \frac{278 \times 100}{55} \approx 500$.

[1] We follow Statistics Norway (SSB)'s definition, which classifies this as large Norwegian entities (SSB, 2014).

When estimating our response-rate, we conducted the following reasoning. Baruch and Holtom (2008) find that the response-rate in academic studies of top management are usually around 35% and 52.7% for other respondents. However, our sample frame does not solely consist of top management, and we do not know who will participate in advance. Hence, an average of these values provides a rough estimate (44%). Moreover, we also adjusted for the increasing issue of survey fatigue. Conversely, our timeframe allows us to collect data patiently and is therefore assumed to increase our response rate notably. In sum, we contemplated that a response-rate of $\approx 55\%$ would be obtainable.

Third, we selected an appropriate sampling technique and defined our sample. For this purpose, we used *Simple random sampling* (SRS). This technique is appropriate as our data collection can be done remotely, and since our sample frame does not contain any periodic patterns. Alternatively, we considered using *stratified random sampling* in which our industry categories would constitute our strata. Applying this technique would, in theory, give us a more representative sample as the proportion of industries varied within our sample frame. However, given the large size of our sample, it was in our assessment that SRS would provide an adequate approximation of industry distributions.

Fourth, we validated that our sample was representative of our sample frame. Johannessen, Christoffersen, and Tufte (2011) suggests this can be done by comparing the two based on central characteristic variables. As displayed in CIMA (2009), different tools are used in differences industries. Hence, we considered it important that our industry distribution was representative of our population. A comparison is shown in table 4.1. When assessing industry distribution alone, we consider our sample to be representative.

Table 4.1: Sample representativeness based on industry distribution. Here, P stands for population (referred to as sample frame), and GS for gross sample (referred to as sample)

Industry	P	GS	P - GS
Construction	9 %	12 %	-3 %
Energy/Water/Sewage/Util.	3 %	4 %	-1 %
Finance, Insurance	4 %	3 %	1 %
General services	13 %	15 %	-2 %
Manufacturing industries	12 %	12 %	0 %
Oil/Gas/Mining	4 %	3 %	1 %
Primary industries	1 %	1 %	0 %
Public sector/Culture	8 %	12 %	-4 %
Real Estate, Services	8 %	7 %	1 %
Research & Development	1 %	1 %	0 %
Shipping	2 %	1 %	1 %
Telecom/IT/Media	6 %	5 %	1 %
Trade	21 %	16 %	5 %
Transport, Tourism	9 %	8 %	1 %
n	987	500	

Survey Design

Our survey is divided into five sections: (1) *Introduction*, (2) *Use*, (3) *Utility*, (4) *Time of implementation* and (5) *Background information*. Per literature guidelines, the introduction consists of soft trivial questions as a warm-up for a more comprehensive midsection, (2) - (4). Each midsection is further divided into the subcategories of MATs to make it more comprehensible for the respondent. Questions concerning the respondent directly are placed in the end to mitigate the risk of this influencing their submitted answers.

As suggested by Saunders et al. (2009), the questionnaire is designed to only satisfying our minimum research objectives. Despite this, pilot testing revealed a low response rate and high average completion time. Measures to increase response rate included improving questionnaire aesthetics and personalizing questions (Frolich, 2002). The latter has most importantly been accomplished by only carrying forward questions relating to those MATs their entity exclusively used.

In order to secure more accurate data, we provided both a Norwegian and English survey. This was motivated as several of the respondents in our selection are not native Norwegian speakers. For this purpose, we used the technique *Parallel translation*. Following Saunders et al. (2009),

we independently translated our source questionnaire to our target questionnaire before comparing them in the creation of our final version. This reaped the benefit of a proper wording, but could not ensure that lexical, idiomatic, and experimental meanings were kept. We mitigated this problem by supplementing our translation MATs with terms and tools widely used in economic literature (See appendix A.1)

Operationalization

Operationalization is concerned with how the measure of an abstract concept should be developed in the form of an indicator (Dahlum, 2016). In our research, utility represents a concept that some can perceive as abstract (Khan & Toseef, 2011), and was therefore operationalized. By doing so, we are likely to have reduced the risk of our respondents interpreting this concept differently and the thus risk of obtaining ambiguous data.

Following the approach by Neuman (2014) we began by conceptualizing utility into the construct; ordinal utility. Next, we developed an indicator that we believe sufficiently reflect the crucial aspects of the construct aligned with our research purpose. In our measurement questions, we maintained using the name utility as the formal indicator but conveyed the meaning of our construct intuitively through the use of a Likert scale, and appropriate label descriptions, aiming to reflect an equal distance between the respective levels on the scale. While we could have specified our construct more thoroughly, our follow up interviews from our pilot survey revealed no confusion among the respondents. Furthermore, our final target group consists of respondents whose title imply extensive economic knowledge. Therefore, we decided not to risk confusing our respondent by providing additional explanations. Appendix table A on page 144 provides an extensive list of all measurement questions and indicators used in our questionnaire.

4.3.2 Secondary Data

We decided to include secondary data in our analysis. Using this type of data save time and resources and enable us to allocate more time and effort to analyze and interpret our data (Saunders et al., 2009). Our secondary data was retrieved from SNF's accounting database, providing us with accounting- and enterprise data for Norwegian entities. Access was obtained by signing a data exchange and confidentiality agreement. An assessment of our data's suitability follows from section 4.4.2.

4.4 Reliability and Validity

In this section, we explain the measures taken to increase the reliability and validity of our primary data. Furthermore, we evaluate the validity and reliability of our secondary data.

4.4.1 Primary Data

To conduct high-quality research in a cross-sectional study Johannessen et al.(2011) suggest the following. Our research must be reliable, (2) measure what it intends actually to measure and (3) allow for our potential findings to be transferred in time and space. In the following, we explain the techniques we implemented to increase the validity and reliability of our primary data.

Reliability

Reliability is concerned with whether or not our questionnaire will produce consistent findings at different times and under different conditions (Saunders et al., 2009). There are several ways of improving reliability. According to Neuman (2014), two of these methods are to (1) use pilot studies and replication and (2) to increase the level of measurement. Both were applied when designing our questionnaire.

The first method involved testing different versions of our questionnaire to uncover ambiguity. This was done in two terms. The first group consisted of business students and the second of company representatives similar to those in our selection. By doing follow up interviews, we identified and accounted for trivial, however relevant, errors successively in both trials. As suggested by Neuman (2014), we were especially concerned about our measures being perceived as clear for all subjects as we accumulated towards constructing the final questionnaire.

The second method suggests that indicators of higher or more precise levels of measurement are more likely to be reliable than less precise measures (Neuman, 2014). Determining the level of detail was thus an important consideration in terms of increasing reliability, as the majority of our questions used a Likert-scale to indicate how strongly the respondent agreed or disagreed with a statement. Although the scale points conceptually have no limits, Johns (2010) confirm that data becomes significantly less accurate when the number of scale points drops below five or above seven. Although both of these levels are suitable of our research, and in terms of relia-

bility, a five-point scale was preferred as it appear to be less confusing and to increase response rate (Hayes, 1992; Devlin & Dong, 1993; Babakus & Mangold, 1992).

After our data had been collected, we tested our reliability by comparing our data with data from other sources. In addition, we used what Saunders et al. (2009) refer to as a *Internal consistency* analysis. This involved correlating responses to each question in the questionnaire with those to other questions in the questionnaire. To calculating internal consistency, we used the method of Cronbach's alpha and Omega coefficient.

Content Validity and Face Validity

Validity address the issue of whether our findings are what they appear to be about (Saunders et al., 2009). Hence, we want our validity to be high. We aim to do so by addressing two types of validity; *content validity* and *face validity*.

Content validity refers to the degree in which measurement questions provide adequate coverage of our investigative questions (R. Cooper Donald & Schindler, 2014). We determined what was considered as adequate coverage based on the questions' relevance. This procedure began by examining previous research similar to ours and generating a list of potential questions. Subsequently, the list was classified based on their level of importance and included in our questionnaire after that. To ensure an adequate selection, we finally self-assessed our questionnaire using the approach of *average congruency percentage* (ACP). This was done by individually evaluating and computing the percentage of questions we perceived as relevant. By refining our questionnaire, we ultimately obtained a score exceeding 90%, which, if being assessed and accomplished by experts, would be evaluated as having a sufficient content validity (Polit & Beck, 2006)

Face validity refers to whether or not our questionnaire appears valid its surface (Saunders et al., 2009). We have emphasized designing the questionnaire in terms of acquiring a high sense of readability, feasibility, layout and style, and clarity of wording. This was further addressed and refined through interviewing our pilot-test respondents.

External Validity

External validity is the ability of our data to generalize across persons, settings, and times (R. Cooper Donald & Schindler, 2014). Provided this can be claimed, we are only able to generalize to the

population which we have sampled our selection from (Jacobsen, 2005). However, a paramount concern is that those who respond to our survey (*net sample*) is representative of the population (Jacobsen, 2005). Of the several factors that could cause an unrepresentative selection, non-responses bias, and response bias appear to pose the greatest threat.

Non-response bias is likely to be induced due to self-selection. As respondents ultimately choose if they wish to participate, the group that submits their response may differ significantly in terms of characteristics from those who opt out (Glen, 2015a). To mitigate this potential problem Glen (2015a) suggests applying measures to increase our response rate (section 4.3.1)

Response bias is when a person tends to answers questions in an untruthful or misleading manner (Glen, 2015b). This is likely to occur if our respondents have a hard time fully understanding the question and recalling information (Glen, 2015b). To mitigate this problem, we focused on clarifying ambiguous questions and included a "Don't know" option for section 3 and 4. This option was implemented cautiously, and therefore not included elsewhere, as there are several pitfalls with proving this option for the respondent. Participants may, for instance, simply select the "Don't know" option before even starting to retrieve information needed to address the question (Krosnick & Presser, 2010).

4.4.2 Secondary Data

Saunders et al. (2009) suggests assessing the validity and reliability of our data by considering its level of *overall suitability* and *precise suitability*.

Overall Suitability

We consider our data set from SNF to have high overall suitability. Aligned with our needs, it contains the necessary financial variables regarding our entities' income statement and balance account, in addition to other computed financial variables. An extensive overview is presented by (Berner, Mjøs, & Olving, 2016). Furthermore, the data set provides extensive coverage for Norwegian entities. A minor limitation is regarding the time-horizon which only spans from 92-2015. To align our primary- and secondary data sources, we, therefore, had to disregard tools which respondents implemented after 2015. We did not identify any unmeasured financial variables given our specific needs.

Precise Suitability

Our data set also appears to have high precise suitability. This assessment was made by evaluating the authority and reputation for the sources we know are involved (Saunders et al., 2009).[2]

Our data set was distributed by SNF, a leading research environment within applied economic- and business administration research (SNF, n.d), for research- and dissertation purposes. The data set is compiled from multiple sources, in which Menon Business Economics AS has delivered the primary data (Berner et al., 2016). This is a company who for many years has developed accounting- and activity information for all enterprises in Norway and Sweden (Menon Economics, 2019). Their data set contains detailed information on profitability, growth, debt export, employment, and ownership for all enterprises (Menon Economics, 2019). Additional sources include Statistics Norway, Brønnøysund Register Centre, Oslo Stock Exchange, and the central bank of Norway. These are widely regarded as highly credible institutions.

4.5 Data Analysis Techniques

In this section, we explain the data analysis techniques used for each of our research questions. For research question 1, we use descriptive statistics, while for research question 2, we use Multiple linear regression and Pearson's r.

4.5.1 Descriptive Statistics

In our descriptive statistics, we present our variables' mean value, standard deviation, and skewness. Aligned with common practice, we allow ourselves to compute these values for our ordinal data (Jamieson, 2004). Although this is theoretically inappropriate as with ordinal data, we cannot presume that the distance between each level is equal. To mitigate this problem to some extent, our Likert scale was designed so that the label descriptions corresponding to each value, on each end, would be in perfect symmetrical opposition to each other. Regardless of this, the values presented in our descriptive analysis should only be interpreted as indications for the actual truth.

[2] A more detailed analysis of the methods used to collect data could not be performed due to insufficient data.

4.5.2 Pearson's r

Johannessen et al. (2011) explain Person's r as a measure of linear correlation between two variables. The correlation coefficient spans from -1 to 1 in value, respectively representing the degree a negative and positive correlation. A value of 0 indicates absolutely no correlation. It this is considered as being a high correlation depends on the research. Although L. Cohen and Holliday (1982) suggests that values from 0.0-0.4 can be classified from very weak to weak, 0.4-0.69 as moderate and 0.7-1 from strong to very strong. The correlation coefficient is computed as shown in equation 4.1, where N denotes the total number of observations, and n the observation number (Johannessen et al., 2011).

$$r = \frac{\sum_{n=1}^{n}(x_n - \overline{x})(y_n - \overline{y})}{N\sigma_x\sigma_y} \tag{4.1}$$

4.5.3 Multiple Linear Regression

General Model and Assumptions

.

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + ... + \beta_k x_{ki} + u_i \tag{4.2}$$

The predicted value of y_i is then.

$$\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_{1i} + \hat{\beta}_2 x_{2i} + ... + \hat{\beta}_k x_{ki}$$

While the residuals are

$$\hat{u}_i = y_i - \hat{y}_i = y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{1i} - \hat{\beta}_2 x_{2i} - ... - \hat{\beta}_k x_{ki}$$

We use ordinary least squares (OLS) to estimate our regression coefficients. This implies that $\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2$ are chosen so that the sum of squared residuals in 4.3 are minimized.

$$\min_{\hat{\beta}_0,\hat{\beta}_1,\hat{\beta}_2,\hat{\beta}_k} \sum_{i=1}^{n}(y_i - \hat{\beta}_0 - \hat{\beta}_{x1i} - \hat{\beta}_2 x_{2i} - ... - \hat{\beta}_k x_{ki})^2 \tag{4.3}$$

Where our OLS assumptions are

$$\text{(i) } E(u_i|\mathbf{x}) = 0 \implies E(u_i) = 0 \;\&\; Cov(u_i, x_{ij}) = 0, \quad j = 1, 2, ..., k$$

$$\text{(ii) } Cov(u_i, u_j|\mathbf{x}) = 0$$

$$\text{(iii) } var(u_i|\mathbf{x}) = \sigma^2$$

(iv) Not perfect multicollinearity

(v) Normally distributed error terms

Our general model can be interpreted as follows. We predict the value of our dependent variable based on the value of our independent variables. The constant $\hat{B}_0$ represents the estimated value of the dependent variable when all independent variable obtains the value 0. The value of our other regression coefficients displays how much the dependent variable will change given a one unit change in its independent variable, given that all other variables are kept the same. A central statistic in this relation is R^2, which, on a scale from 0 (low) to 1 (high), measures the proportion of variability in our dependent variable that can be explained by our models' independent variables (Gareth, Witten, & Hastie, 2017).

An underlying assumption of our model is to have linearity in our parameters. We, therefore, want our variables to be continuous (Owuor, 2001). Consequently, since we have collected ordinal data, we experience some bias when estimating R^2. However, this bias depends on the number of levels used in our Likert-scale. When fewer than four scale points are used, the results will have considerably more bias when estimating R^2, than when four or more scale points are used (Owuor, 2001). Thus, as we use a five-point scale, we consider OLS to serve as an appropriate estimator by treating our ordinal variables as continuous.

For OLS to yield unbiased estimates with the lowest possible variance, we need to ensure that our assumptions hold (Keller, 2012). Assumption (i) risk being violated due to *omitted variable bias* (OVB). This problem occurs when an omitted variable is correlated with an independent variable, and when this omitted variable is also a determinant of our dependent variable (Hanck, Arnold, Gerber, & Schmelzer, 2019). To examine if OVB constitutes a problem, we have included control variables to investigate this specific bias.

Assumption (iii) is tested by evaluating the homogeneity of the variance of our data. For this purpose, three common tests are; *Bartlett's test*, *Levene's test* and a *Fligner-Killeen test* (Surahmat,

2016). All these use the same null and alternate hypothesis as presented below, which we evaluate on a 0.05 significance level (α).

$$H_0 : \sigma_1^2 = \sigma_2^2 = ... = \sigma_k^2$$

$$H_1: \text{Other}$$

While Bartlett's test is dependent on meeting the assumption of normality, the Levene's test does not and is, therefore, more robust in the face of non-normality (Garson, 2012). The Fligner-Killeen test is also suitable for data with non-normal distribution (Surahmat, 2016). As some variables displayed a questionable distribution, we applied all three to verify our results.

Assumption (iv) is examined by computing the *variance inflation factor* (VIF). According to Gareth et al. (2017) value of 1 indicate a complete absence of collinearity among our predictors, while, as a rule of thumb, values exceeding 5 or 10 indicate a problematic amount. The VIF is computed in the following way:

$$VIF(\hat{\beta}_j) = \frac{1}{1 - R^2_{X_j|X_{-j}}}$$

Finally, assumption (ii) and (v) are tested by examining our regression plots. For assumption (ii) we examine the *Residuals vs. Order plot* for suspicious patterns, while for assumption (v) we assess the normal distribution characteristics of our *QQ-plot* and *histogram of residuals*.

Outliers and influential observations

To identify outliers, we use Tukey's method explained by B. Cohen (2008). This method uses a rule of thumb approach to detect outliers. Values that are more than 1.5 times the interquartile range (Q3-Q1) away from the first quartile (Q1), and from the third quartile (Q3), are considered as outliers. I.e., outliers are values that are below $Q1 - 1.5(Q3 - Q1)$ and above $Q3 + 1.5(Q3 - Q1)$. This analysis was further depicted in a *box-and-whisker plot* to make the assessment more manageable.

To identify influential observations we use *Cook's distance* explained by Cook (1977). Cook's D measurement is computed in the following way. It starts by removing one observation from the regression models. After that, it recalculates the regression model and summarizes how much

all the values change. This process is then iterated for all observations. In accordance with Fox (1991) we interpret values above 1 as influential values.

4.6 Ethical Considerations

In this section we address the questions: *What is at stake, and for whom?* Reflecting on these questions can help us understand problems and how to address them in our research effectively (Leith, O'Toole, Haward, & Coffey, 2017)

An ethical discussion was mainly motivated as we are not the primary bearer of our potential misconduct. The reason is NHH's institutional logo that is fronting our survey, which benefits our research by serving as an essential declaration of trust – helping us to secure reliable responses in scale. Therefore, our main concern has been ensuring our respondents' anonymity and the entities they represent. Not only is this crucial for both the institution and participants sake, but also for the research's success as respondents are likely to be less reluctant to share information on behalf of the entity if their interests are sufficiently protected. Consequently, this could yield more responses.

To elaborate on what is at stake, if the entities are identified, this could reveal sensitive information about their business conduct. Some tools may, for instance, be associated with specific business strategies. For the respondent, the risk lies in having their response traced through the use of personal identifiable information (PII) (e.g., occupational title, e-mail). Since our target population consists of entities that are industry leaders in their field, both these concerns may be perceived as even more severe.

There are mainly two ways information could be revealed. Firstly, if someone illegally accesses and share our secured data. This is a concern since we collect and store our participants' data online, which makes our data vulnerable to cybercrime. Secondly, the information could be revealed if the entities in our report are poorly disguising in our data representation. This could be the case if we received too few observations in a specific industry category either before, or after, cleaning our data, which could leave the entities exposed to deductive reasoning.

To prevent these concerns from unfolding, we initiated the following precautions. We merged the exposed industry categories as needed and conducted our analysis at an aggregated level. For the respondents, we mitigated their risk by separating the PII from their submitted response. For the e-mail data query, this was accomplished by redirecting the respondent to an external

anonymous weblink. Lastly, we also believe it is essential to be clear up front on how the data is secured, treated and further presented in our findings, which was thoroughly explained for all participants involved (Appendix A page 148). We believe transparency to be essential, as it enables the user to take more informed decisions and evaluate the risk involved for themselves.

4.7 Section Summary

In our research, we chose a deductive approach. For research question 1, we perform descriptive research, while we for research question 2 perform explanatory research.

Primary data is collected using a survey based strategy. Here, we gather cross-sectional data using an internet-mediated questionnaire. The sample is pulled using Simple random sampling (SRS). Secondary data is retrieved from SNF by signing a data exchange agreement.

We take measures to enhance the reliability of the validity of our data. For our primary data, we aim to improve our reliability using pilot studies and by increasing the level of measurement, which we test using Cronbach's alpha and Omega coefficient. To increase validity, we focus on content validity and face validity by assessing our average congruence percentage (ACP) as well as improving our questionnaire's clarity and appeal. For our secondary data, we analyzed the validity and reliability based on its overall suitability and precise suitability.

Data analysis techniques include descriptive statistics, Pearson's r, and multiple linear regression. OLS assumptions are validated using Bartlett's test, Levene's test, Fligner-Killeen test, variance inflation factor (VIF), and regression plots. Outliers and influential observations are evaluated using Tukey's method, box-and-whisker plot, and Cook's distance.

Finally, the implications of our ethical considerations have led us to focus on preserving our respondents' anonymity in which the issue of personal identifiable information (PII) is a particular concern.

Chapter 5

Empirical findings

This chapter presents our empirical findings. In chapter 5.1 we begin by presenting our initial responses and non-responses from our survey. Next, we elaborate on the steps taken to clean our data in preparation for our further analysis. In chapter 5.2 we present our analysis for research question 1, while chapter 5.3 presents our findings for research question two. Our main findings are then summarised after each of these sections.

5.1 Data Preparation

5.1.1 Non-responses and Response Rate

We received a total of 197 responses. Of these, 99 were incomplete responses, and 98 were complete responses. Given our gross sample at 500, this leaves us with 402 non-responses (Saunders et al., 2009).

Saunders et al. (2009) recommend identifying the reasons behind our non-responses. Hence, we registered and categorized the reasons for why these non-responses occurred as follows. *Unreachable* (64%) are those respondents we found the contact information to but were unable to contact (60%), and respondents we were unable to locate (4%). *Refusal* (35%) are those respondents who refused to be involved in our research or to answer all our questions. Feedback from respondents revealed that the lack of time and resources primarily caused this problem. Finally, *Ineligibility* (1%) are those who did not meet our research requirements.

According to Saunders et al. (2009) this allows us to compute our *total response rate* (TRR) and *active response rate* (ARR) in the following way. TRR = $\frac{Total\ number\ of\ responses}{Gross\ Sample - ineligible} = \frac{98}{500-6} = 19.8.\%$, while our ARR = $\frac{Total\ number\ of\ responses}{Gross\ Sample - unreachable - ineligible} = \frac{98}{500-256-6} = 41\%$.

5.1.2 Data Cleaning

Follow the approach of Toepoel (2016) we perform our data cleaning in three steps: screening, diagnosing, and treatment. Applying a thorough and systematic procedure prevents us in drawing false conclusions from our analysis (Toepoel, 2016).

Screening

For our incomplete responses, we considered variables up to a 79% completion rate as crucial, and therefore, excluded a total of 79 incomplete responses. Next, 11 duplicate responses and one test response were removed. When feasible, we preferred the CFO responses in order to obtain a more homogeneous selection. Moreover, we identified and removed six responses that did not fit with our research criteria. We also removed 12 responses, which all submitted a score below average on our two control questions. Lastly, no flat-liners was identified among our

responses. This screening process left us with 88 remaining responses (68 complete responses and 20 incomplete).

Diagnostics

Twelve of our remaining responses are non-profit organizations. These companies are assumed only to be concerned with cost-reduction, and therefore only included when analyzing our Costing tools. Because of this distinction, we apply diagnostics to each of our groups separately when further trying to identify problematic values. Hence, in group 1, we analyzed 88 responses, while in group 2, we analyzed 76 responses.

Our incomplete responses were further examined as they all missed data on our two control questions. By lacking this data, we did not know how these respondents evaluated the validity of their response without conducting further testing. For both groups, no significant differences were identified when comparing our incomplete responses to our complete responses, except for Value Mapping, ABC, and Zero-Based Budgeting.

Diagnostics was also applied to assess if potential *speeders* constitute a problem. Following the findings of Matjašic, Vehovar, and Manfreda (2018), we defined speeders as respondents who answered faster than 50% than our median response-time ($\approx$ 11 minutes). For group 1 and 2, respectively, four and three such respondents were identified, which had a completion time of four to six minutes. No significant differences were identified.

We also diagnosed outliers and high leverage values. Although, such tests were less applicable in our setting due to our quantitative questions being asked using a Likert-scale whose span of values are predefined and limited. No outliers or high leverage values were identified.

Treatment

For both groups, we decided to include our incomplete responses in our further analysis, as only a minor selection of our tools displayed significant differences. Instead, we conduct a robustness-test in our final analysis to investigate its effect on our outcome.

Furthermore, we considered making imputations to the missing data for these responses. However, imputation is a choice, and we want to preserve our raw data in its authentic form (Toepoel, 2016). This treatment was also not particularly applicable for our incomplete responses due

to the type of questions we asked in our final section, where the problem of missing data occurred.

Moreover, we regrouped our industries categories to align with that being used by data-set from Samfunns- og næringslivsforskning (SNF). We deliberately included the option of being able to study industry-specific effects at an individual level by having our respondents classify their entity among an extensive list of industries. Although, given the number of respondents in each of our minor categories, we considered it suitable to select a broader industry grouping for these together, namely *Other* (see table 5.2). In doing so, we mitigated our respondents' exposure and helped to preserve their anonymity.

In summary, when analyzing Costing tools, we include a total of 88 responses. We hereby refer to this group as NS(1). When analyzing our Pricing tools, Budgeting tools, Profit Analysis tools, and Performance Management tools, we include a total of 76 responses. We hereby refer to this group as NS(2). For each of these groups, table 5.1 display which job titles our respondents occupy, and table 5.2, the proportion of industries.

Table 5.1: Displays the distribution of job titles among our respondents.

Job title	NS(1)	NS(2)
CEO	14 %	16 %
CFO	49 %	44 %
Controller	23 %	25 %
Head of accounting	10 %	11 %
Head of sales	1 %	2 %
Other (please specify)	3 %	2 %
n	73	63

Table 5.2: Displays the distribution of industries among our respondents.

Industry	NS(1)	NS(2)
Manufacturing industries	25 %	29 %
Trade	16 %	17 %
Other	15 %	13 %
General services	10 %	12 %
Construction	9 %	11 %
Energy/Water/Sewage/Util.	9 %	11 %
Public sector/Culture	9 %	0 %
Finance, Insurance	7 %	8 %
n	88	76

5.1.3 Non-response Bias

Non-response bias could potentially make our net sample unrepresentative of our population. Such biases are essential to investigate, and Johannessen et al. (2011) suggest examining this by comparing how the population and samples are distributed on central variables.

Table 5.3 displays the distribution of industry categories for our population and our samples. Here, our net samples' over-representation of manufacturing industries raise some concern. A commonly applied technique to correct for such deviations is to apply a weighted adjustment to make our net sample more representative of the population (Bethlehem, 2009). However, this method assumes that those who did not respond in a category will yield the same answers as those who already belong in this category. By adjusting one category, we also automatically

alter the other categories' relative influence. Given the few responses in some of these industry categories, we decided to exercise this option with great caution and not make any further adjustments.

Altogether, our net sample may be considered as reasonably representative of our population with regards to industry distribution, other than an average deviation in our manufacturing category. Hence, our response bias seems to be low when only considering this central variable alone. This may suggest that non-response bias does not appear to threaten our external validity.

Table 5.3: Analyzing the deviation in industry representation for each sample

Industry	P	GS	NS(1)	NS(2)	P - GS	P - NS(1)	P - NS(2)
Construction	9 %	12 %	9 %	11 %	-3 %	0 %	-2 %
Energy/Water/Sewage/Util.	3 %	4 %	9 %	11 %	-1 %	-6 %	-8 %
Finance, Insurance	4 %	3 %	7 %	8 %	1 %	-3 %	-4 %
General services	13 %	15 %	10 %	12 %	-2 %	3 %	1 %
Manufacturing industries	12 %	12 %	25 %	29 %	0 %	-13 %	-17 %
Oil/Gas/Mining	4 %	3 %	1 %	1 %	1 %	3 %	3 %
Primary industries	1 %	1 %	1 %	1 %	0 %	0 %	0 %
Public sector/Culture	8 %	12 %	9 %	0 %	-4 %	-1 %	8 %
Real Estate, Services	8 %	7 %	0 %	0 %	1 %	8 %	8 %
Research & Development	1 %	1 %	2 %	0 %	0 %	-1 %	1 %
Shipping	2 %	1 %	1 %	1 %	1 %	1 %	1 %
Telecom/IT/Media	6 %	5 %	3 %	4 %	1 %	3 %	2 %
Trade	21 %	16 %	16 %	17 %	5 %	5 %	4 %
Transport, Tourism	9 %	8 %	6 %	5 %	1 %	3 %	4 %
n	987	500	88	76			

5.2 The Use and Utility of Management Accounting Tools

This section presents the results and analysis used to answer research question one. We start by examining our management accounting tools (MATs) popularity, before proceeding to their use, utility, and interrelation. Next, present the reasons why specific tools are not being used. We then display the results for our tools' associated contingencies. Finally, a summary is provided.

5.2.1 The Popularity of Management Accounting Tools

Figure 5.1 display the percentage of respondents who use each tool regardless of the extent to which they use them (at this moment referred to as the tools' popularity). Each color corresponds to a specific category of MATs.

On a tool category level, we make the following observations. Based on the average value for each category, we find that Profit Analysis tools (84%) are the most popular, closely followed by Pricing tools (79%). Our three remaining categories, Costing tools (69%), Budgeting tools (68%), and Performance Management tools (65%), are about equally popular. The most considerable in-group variation is found among Performance Management tools at 64%, while Pricing tools display the least difference with only 7%.

The tools with the highest and lowest popularity are as follows. For Performance Management tools, Benchmarking (91%) has the highest popularity, while Six Sigma (27%) have the lowest. For Budgeting tools, Cash Forecast (91%) have the highest, and Zero based budgets (36%) have the lowest. For profit analysis, Product/service profitability analysis (91%) have the highest, while Breakeven (76%) have the lowest. For Costing tools, Absorption Costing (85 %) have the highest, and Job, Batch, Process or Contract Costing (52%) have the lowest. Lastly, for Pricing tools, Cost plus pricing (82 %) have the highest, while Market-sensitive pricing (75%) have the lowest.

Figure 5.2 display each categories' popularity on an industry level. Each category's value has its axis starting from the center. The axes are arranged radially, with an equal distance between each other, maintaining the same scale for all axes. Grid lines connect from axis-to-axis, with each color representing their own industry. We observe that public sector & Culture and Finance & Insurance differ distinctively when considering their average value in all categories ($\approx$ 40-50%). A similar assessment for our remaining industries displays a considerably higher average

value (≈ 70-95%). Here, each category contains little variation (≈ 15%), except for a modest variation within for the profit analysis tool category (≈ 25%).

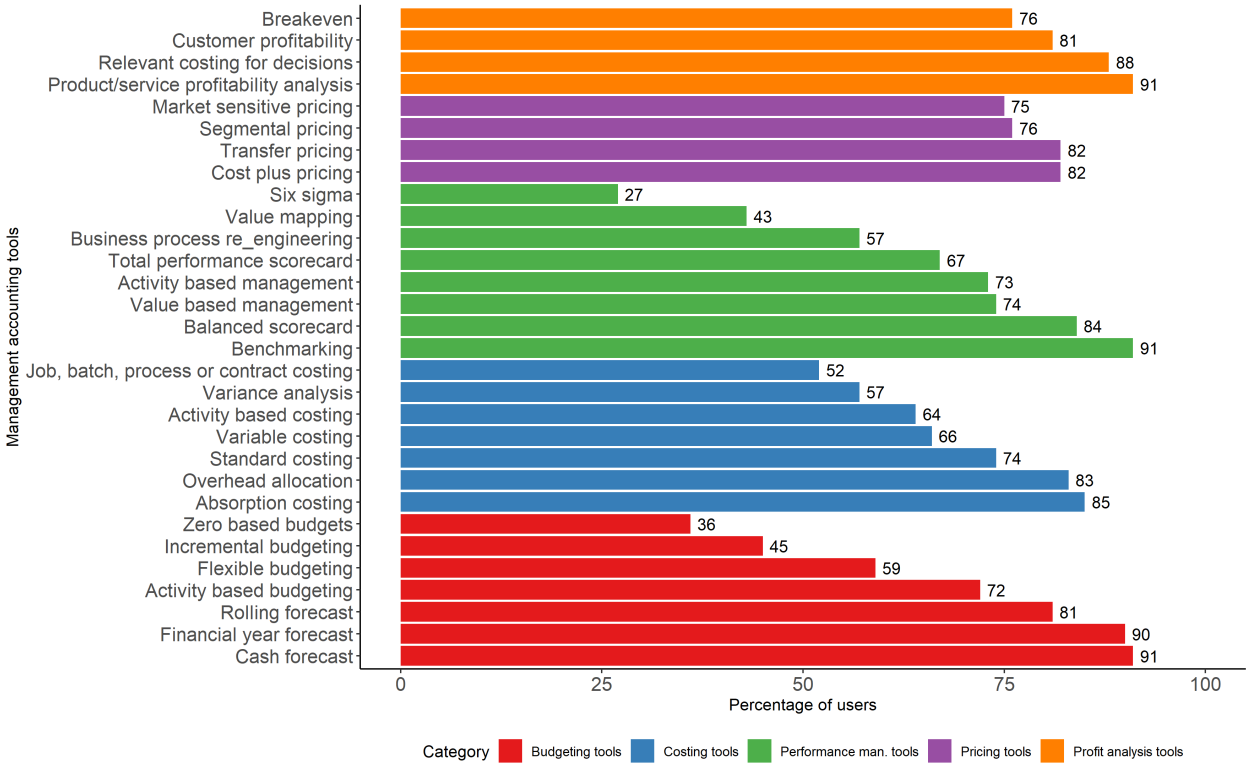

Figure 5.1: Percentage of users for each tool in our survey

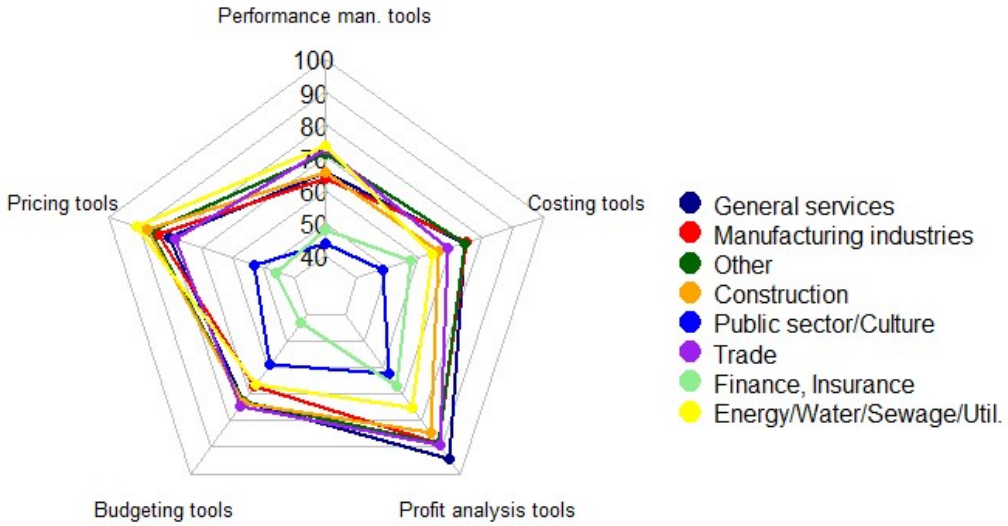

Figure 5.2: Radar chart showing average percentage of users, in each category, for each industry. Industries are represented by color

5.2.2 The Use and Utility of Management Accounting Tools

Table 5.4 display descriptive statistics for our MATs degree usage and utility. On a tool category level, we make the following observations about their usage, utility, and combined value.

The tools with the highest and lowest usage are as follows. For Budgeting tools, Financial Year Forecast (4.17) has the highest usage within this category, and across all categories, while Zero-Based Budgets (2.53) have the lowest. For Pricing tools, Market-sensitive pricing (3.73) have the highest usage, while Transfer Pricing (3.4) has the lowest. For profit analysis, Product/service profitability analysis (3.67) represents the highest usage, while Breakeven (2.79) has the lowest. For Costing tool, Overhead Allocation, Absorption Costing, and Variable Costing (all at 3.52) all equally have the highest usage, with Activity-Based Costing (ABC) (3.29) being the lowest. For Performance Management tools, Benchmarking (3.35) have the highest usage, while Six Sigma (2.46) have the lowest usage within this category and across all categories.

The tools with the highest and lowest utility are as follows. For Budgeting tools, Rolling Forecasts (3.83) has the highest utility within this category, and across all categories, while Zero-Based Budgets (2.56) have the lowest. For profit analysis, Product/service profitability analysis (3.67) have the highest utility, while Breakeven (2.61) has the lowest. For Performance Management tools, Benchmarking (3.52) represents the highest utility, while Six Sigma (2.58) the lowest. For Pricing tools, Market-sensitive pricing (3.42) has the highest utility, and Transfer Pricing (3.11) the lowest. For Costing tools, Absorption Costing (3.37) have the highest utility, while Variance Analysis (3.04) has the lowest utility within this category and across all categories.

The tools with the highest and the lowest average use and utility combined, are as follows. For Budgeting tools, Financial Year Forecast (3.99) has the highest value within this category, and across all categories, while Zero-Based Budgets (2.55) has the lowest. For profit analysis, Product/service profitability analysis (3.67) has the highest, and Breakeven (2.70) the lowest. For Pricing tools, Market-sensitive pricing (3.58) has the highest value, and Transfer Pricing (3.26) has the lowest. For Costing tools, Absorption Costing (3.45) are the highest, and the lowest being Variance Analysis (3.17). For Performance Management tools, Benchmarking (3.44) has the highest value, while Six Sigma (2.52) has the lowest value within this category and across all categories.

Table 5.4: Use and utility for all tools on a scale from 1-5 with associated descriptive statistics. Values exclude entities which do not use the specific tool to any extent. Number in-front of each tool serve as an index for further reference

	Use / utility	Use / utility: st.dev.	Use / utility: skewness	Use / utility: kurtosis
Costing tools				
1- Variance Analysis	3.3 / 3.04	1.02 / 1.01	-0.03 / 0.16	-1.32 / -0.68
2 - Overhead Allocation	3.52 / 3.19	0.97 / 0.94	-0.19 / 0.02	-1.01 / -0.82
3 - Standard Csting	3.35 / 3.31	1.02 / 1	0.05 / -0.45	-1.21 / -0.45
4 - Absorption Costing	3.52 / 3.37	0.95 / 0.93	-0.06 / -0.19	-0.95 / -0.61
5 - Job, Batch, Process or Contract Costing	3.41 / 3.13	0.98 / 1.09	-0.18 / -0.15	-1.15 / -0.87
6 - Variable Costing	3.52 / 3.31	1.05 / 0.96	-0.32 / -0.28	-1.21 / -0.37
7 - Activity-Based Costing	3.29 / 3.18	0.99 / 1.08	0.20 / 0.07	-1.05 / -0.93
Pricing tools				
8 - Cost-Plus Pricing	3.56 / 3.06	0.87 / 0.93	-0.17 / -0.11	-0.69 / -0.54
9 - Market Sensitive Pricing	3.73 / 3.42	1.06 / 0.99	-0.37 / -0.16	-1.11 / -0.78
10 - Transfer Pricing	3.4 / 3.11	1.06 / 1	0.08 / -0.14	-1.25 / -0.52
11 - Segmental Pricing	3.42 / 3.27	1.05 / 1.07	0.14 / -0.32	-1.2 / -0.62
Budgeting tools				
12 - Financial Year Forecast	4.16 / 3.82	0.81 / 0.81	-0.59 / -0.66	-0.48 / 0.84
13 - Rolling Forecast	3.69 / 3.83	1.04 / 1.01	-0.28 / -1.12	-1.11 / 1.23
14 - Cash Forecast	3.73 / 3.67	0.93 / 0.88	-0.38 / -0.75	-0.7 / 0.72
15 - Incremental Budgeting	2.85 / 2.9	0.92 / 0.9	0.86 / 0.39	-0.16 / -0.31
16 - Zero based Budgets	2.53 / 2.56	0.88 / 1.05	1.56 / 0.25	1.48 / -0.7
17 - Flexible Budgeting	2.69 / 2.63	0.7 / 0.97	0.48 / -0.12	-0.94 / -1.03
18 - Activity-Based Budgeting	3.56 / 3.24	1.03 / 1.01	-0.10 / -0.11	-1.16 / -0.75
Profit analysis tools				
19 - Product/Service Profitability Analysis	3.67 / 3.67	0.94 / 0.94	-0.32 / -0.6	-0.79 / 0.19
20 - Relevant Costing for Decisions	3.27 / 3.13	0.95 / 1	0.16 / -0.33	-1 / -0.25
21 - Customer Profitability	3.51 / 3.62	0.95 / 0.9	-0.17 / -0.59	-0.97 / -0.04
22 - Breakeven	2.79 / 2.61	0.95 / 1.01	0.95 / 0.21	-0.18 / -0.26
Performance management tools				
23 - Balanced Scorecard	3.22 / 3.01	0.82 / 0.99	0.04 / -0.03	-0.78 / -0.61
24 - Business Process Re-engineering	2.66 / 2.58	0.77 / 0.95	0.9 / 0.48	0.05 / 0.02
25 - Activity-Based Management	3.06 / 2.73	0.87 / 1.01	0.31 / -0.01	-0.83 / -0.6
26 - Total Performance Scorecard	3.2 / 2.98	0.94 / 1.03	0.32 / -0.06	-0.85 / -0.78
27 - Value Based Management	2.95 / 3.05	0.93 / 1.02	0.55 / -0.18	-0.75 / -0.51
28 - Six Sigma	2.46 / 2.58	0.66 / 0.83	1.02 / 0.4	-0.21 / -0.89
29 - Value Mapping	2.47 / 2.76	0.65 / 0.63	0.97 / 0.21	-0.24 / -0.75
30 - Benchmarking	3.35 / 3.52	0.97 / 0.95	0.17 / -0.16	-0.98 / -0.59

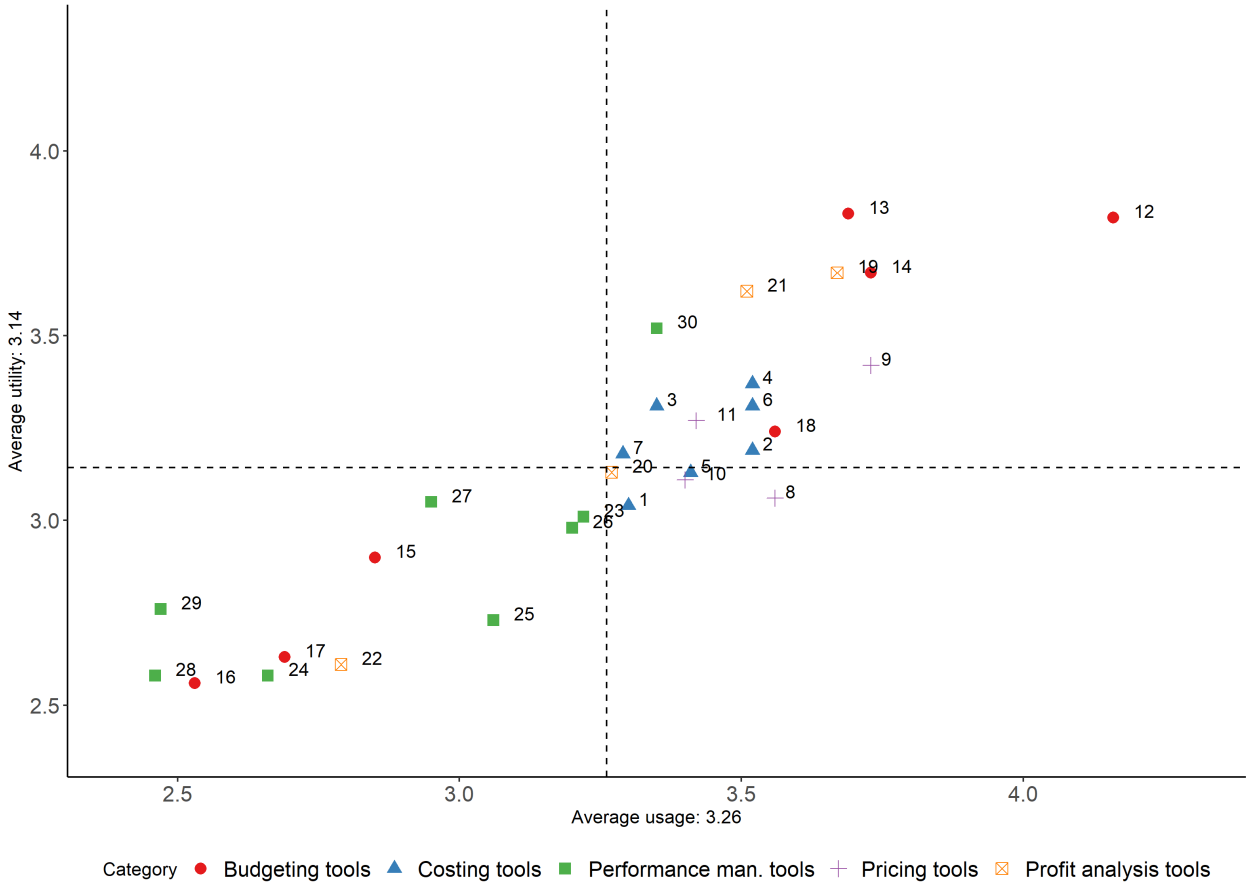

Figure 5.3: Use and utility for all tools classified and colored on a category level. Dotted lines equal average. Values are without entities not using the tool. See table 5.4 for number references.

Figure 5.3 further depicts the values from table 5.4 by showing the degree of usage and utility on a category level. Moving from the upper right corner and counter-clockwise, we respectively got the first, second, third, and fourth quadrant. The first quadrant has usage and utility above average. The second has a usage below average and utility above average. The third has usage and utility below average. The fourth has a usage above average and a utility below average.

We locate our tool categories in the following quadrants. Costing tools are mainly in the first quadrant. Performance Management tools are mainly in the third quadrant. Pricing tools are equally in the first- and fourth quadrant. Budgeting tools and Profit Analysis tools have about an even distribution in the first- and third quadrant.

Figure 5.4 display the usage and utility for each category of tools on an industry level.

We locate our tool categories in the following quadrants given our different industries. Profit Analysis tools are mainly in the first and second quadrant. Pricing tools are mainly in the first

quadrant. Performance Management tools are solely in the third quadrant. Costing tools are mainly in the first- and second quadrant and Budgeting tools have an even distributed in the first and second quadrant.

We locate our industries in the following quadrants given our different categories. Public sector/culture the different tool categories are mainly in the third quadrant, and Other are mainly in the first quadrant. For general, manufacturing, and trade, a majority is in the first quadrant. Energy/Water/Sewage/Util and Finance, a majority is in the second quadrant. For Construction, there are no distinct patterns to report.

The industries that have the highest use of each category are as follows. Other, use Budgeting tools and Pricing tools the most. Manufacturing, use Costing tools the most. Trade, use Performance Management tools the most, and General services use Profit Analysis tools the most. In contrast, Finance & insurance use Budgeting tools the least, while the Public sector & Culture use all remaining categories the least.

The industries that have the highest utility of each category are as follows. Construction has the highest utility from Budgeting tools and Costing tools. Trade has the highest utility from Performance Management tools. General services have the highest utility from Pricing tools and Profit Analysis tools. In contrast, Finance insurance has the lowest utility budgeting tool and Costing tools, while the public sector has the lowest utility from Performance Management tools, Pricing tools, and Profit Analysis tools.

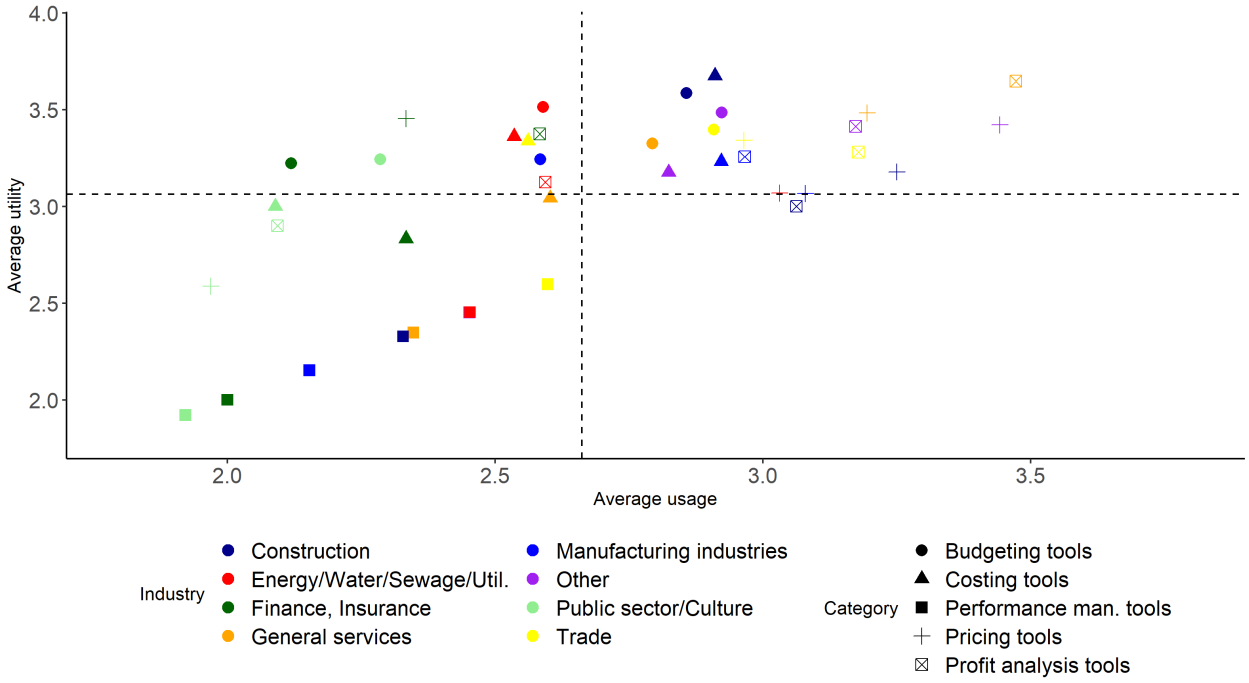

Figure 5.4: Use and utility for all tools classified by category level and colored by industry. Dotted lines equals average. Values are without entities not using the tool.

5.2.3 The Interrelation Between Tools

Figure 5.5 display the correlation between our MATs. A blue color indicates a positive correlation, while a red color indicates a negative correlation.

The strongest positive correlation is between Product/service profitability analysis and Customer Profitability (≈ 0.8). There is also a strong positive correlation between Cash Forecasts and Financial Year Forecasts (≈ 0.7). On the opposite side, there is a strong negative correlation between Zero-Based Budgets and Financial Year Forecasts (≈ 0.6). The rest of the tools that are positively and negatively correlated only represents a modest correlation in their own direction ($\approx$ 0.3-0.6).

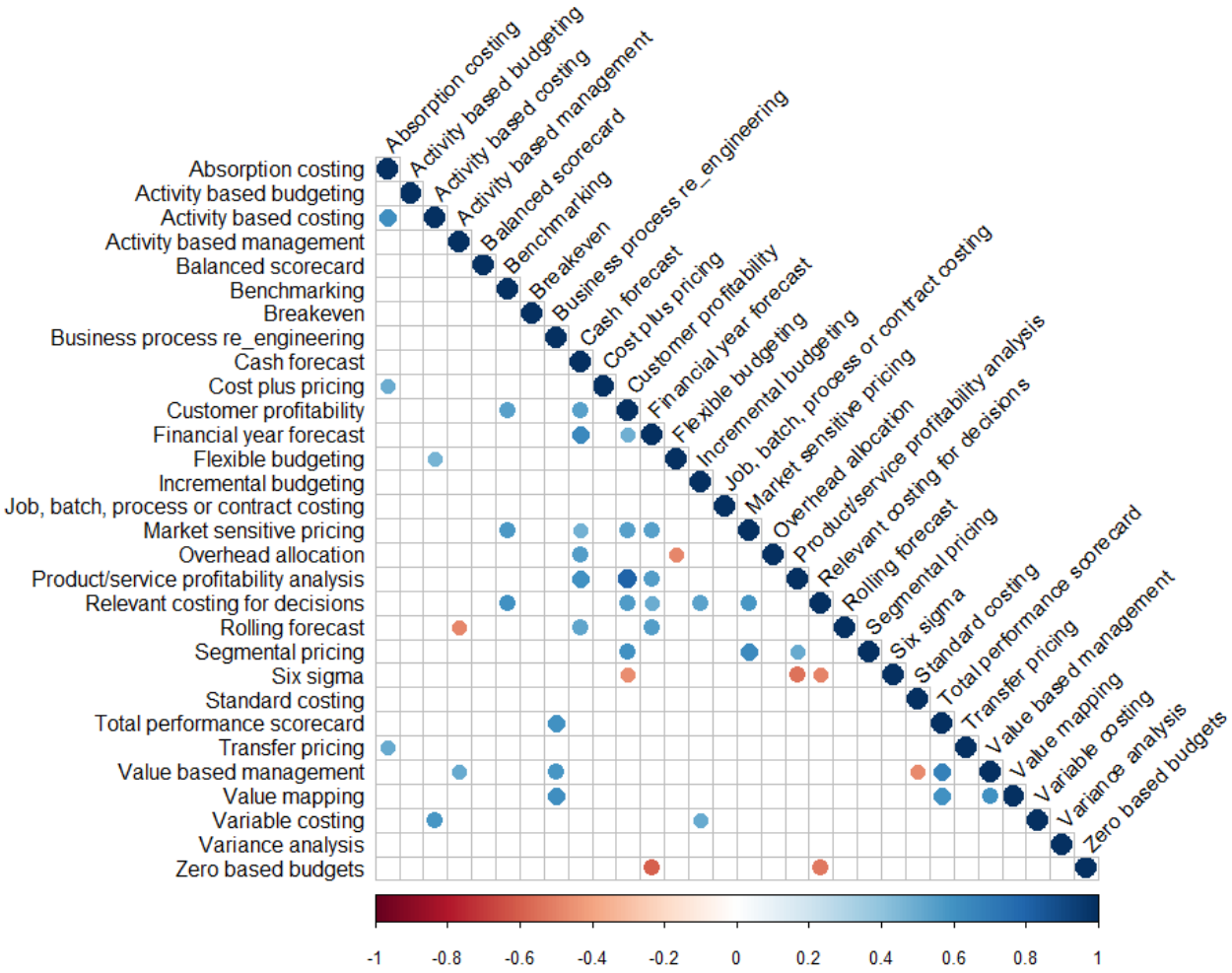

Figure 5.5: Pearson correlation plot between all tools based on usage. Significant at 1% level are present in the figure, non-significant coefficients are blank. Data used are described as NS(2) in table 5.2.

5.2.4 Unused Tools

Table 5.5: Number of respondents choosing each argument for why tools are not used. Respondents had the option to select multiple choices for each tool.

	Too time demanding	Too resource demanding	Not applicable for our industry	Not enough knowledge	It has not been considered	Other	Do not know
Absorption costing	0	0	6	0	3	0	2
Activity based budgeting	1	2	5	2	6	2	2
Activity based costing	2	5	2	3	7	5	4
Activity based management	1	2	2	3	8	0	5
Balanced scorecard	0	2	2	1	6	3	0
Benchmarking	0	2	0	0	4	1	1
Breakeven	0	1	5	1	9	2	3
Business process re-engineering	1	5	5	5	11	1	7
Cash forecast	0	0	3	0	0	4	0
Cost plus pricing	0	1	6	2	5	0	0
Customer profitability	1	2	9	1	1	0	3
Financial year forecast	1	0	1	1	0	3	1
Flexible budgeting	1	2	5	7	9	2	5
Incremental budgeting	3	0	4	12	16	2	6
Job, batch, process or contract costing	0	1	17	4	8	0	5
Market sensitive pricing	0	1	6	1	7	2	3
Overhead allocation	0	1	4	1	2	1	3
Product/service profitability analysis	1	1	3	0	0	2	0
Relevant costing for decisions	1	1	4	1	2	0	2
Rolling forecast	0	2	1	1	4	4	3
Segmental pricing	0	1	6	2	7	0	2
Six sigma	0	0	3	16	19	3	14
Standard costing	0	0	10	1	5	1	2
Total performance scorecard	0	3	1	3	14	0	4
Transfer pricing	1	1	4	1	3	2	1
Value based management	0	0	1	7	9	1	4
Value mapping	1	2	3	14	16	1	8
Variable costing	0	3	9	2	4	2	4
Variance analysis	0	0	9	4	12	1	6
Zero based budgets	2	2	7	12	16	3	8

Table 5.5 display an aggregated overview of the reasons our participants do not use specific tools for their entity. Three reasons are, by far the most distinct. Most commonly, the tools have not been considered used. Within this group, Six Sigma (19), Zero-Based Budgets (16), Value Mapping (16), and Incremental Budgeting (16) receive the highest values. Second, the entity does not have enough knowledge to apply the specific tool. Here, Six Sigma (16), Value Mapping (14), Zero-Based Budgets (12), and Incremental Budgeting (12) represent the highest frequencies. Third, the tool does not apply to their entity's industry in which Job, Batch, Process or Contract Costing (17) is by far the most prominent tool.

5.2.5 Management Accounting Tools and Contingencies

In table 5.6, we have computed the Pearson correlation between use and utility for each individual tool against entity size. From these correlations we observe that the internally focused Budgeting tools[1] are all negatively correlated with size. The opposite is true for forecast Budgeting tools[2]. On the other hand, none of these coefficients are significant, and we can therefore not conclude with certainty on these results as final, only as weak indications.

In the column representing entity size's correlation with use, we see that the following MATs' respective coefficients are significant positive correlated; Benchmarking, Customer Profitability Analysis, Relevant Costing for Decisions, Total Performance Scorecard, and Transfer Pricing. We also see that Absorption Costing has a significant positive correlation for utility, while Rolling Forecast in fact have a negative correlation. Furthermore, Transfer Pricing is the only tool with significant positive correlation on both use and utility through entity size.

In figure 5.6, we have presented the number of tools and size for all of our respondents. In this figure, which have a log-transformed y-axis, we observe a that entities in the finance industry are significantly larger than other entities, in addition to them using fewer tools. From the figure, we do not find indications that entities use more tools when entity size increase. In figure 5.7, we have presented the same data, only now with an absolute y-axis, and without outliers for entity size, which mainly consist of entities in the finance industry. From the figure, we see that the entities using fewer tools than average are also smaller in size. This broadens the initial results from figure 5.6, simply due to the finance entities being significantly larger. For entities using more tools than average, we find entities both larger and smaller than average, with no indication of the industry having an effect on which quadrant entities are placed in. It seems that entities may increase their number of tools when increasing in size, yet this is not true for all entities.

[1] Incremental Budgeting, Flexible Budgeting, and Zero-Based Budgeting.
[2] Rolling Forecast, Cash Forecast, and Financial Year Forecast.

*Table 5.6: Pearson correlation between size and use/utility. p.values < 0.1: *, p.values < 0.5: **, p.values < 0.01: ****

	Use	Use p.values	Utility	Utility p.values
Absorption costing	0.1237	0.304	0.2272*	0.081
Activity based budgeting	-0.0949	0.431	-0.1206	0.404
Activity based costing	0.1232	0.306	0.1218	0.420
Activity based management	0.0738	0.541	-0.1726	0.212
Balanced scorecard	-0.0124	0.918	0.0082	0.950
Benchmarking	0.2309*	0.053	0.1927	0.121
Breakeven	0.087	0.471	0.0495	0.709
Business process re_engineering	-0.0501	0.678	-0.0241	0.883
Cash forecast	0.0124	0.918	0.0371	0.766
Cost plus pricing	-0.132	0.272	-0.0523	0.689
Customer profitability	0.2676**	0.024	0.1493	0.255
Financial year forecast	0.0144	0.905	0.0313	0.805
Flexible budgeting	-0.048	0.691	-0.0236	0.880
Incremental budgeting	-0.0571	0.636	0.016	0.929
Job, batch, process or contract costing	-0.0643	0.594	-0.1861	0.257
Market sensitive pricing	0.1473	0.220	0.0687	0.618
Overhead allocation	0.0644	0.594	0.0453	0.731
Product/service profitability analysis	0.1816	0.130	-0.0901	0.472
Relevant costing for decisions	0.299**	0.011	0.1588	0.222
Rolling forecast	0.0506	0.675	-0.3379***	0.010
Segmental pricing	-0.0955	0.428	-0.1391	0.307
Six sigma	-0.032	0.791	0.3648	0.114
Standard costing	-0.111	0.357	-0.1898	0.169
Total performance scorecard	0.2218*	0.063	0.1473	0.302
Transfer pricing	0.3238***	0.006	0.344***	0.007
Value based management	0.0267	0.825	0.1531	0.269
Value mapping	-0.0198	0.870	0.3038*	0.091
Variable costing	-0.0857	0.477	-0.0488	0.736
Variance analysis	-0.094	0.435	0.1051	0.502
Zero based budgets	-0.0402	0.739	0.1734	0.397

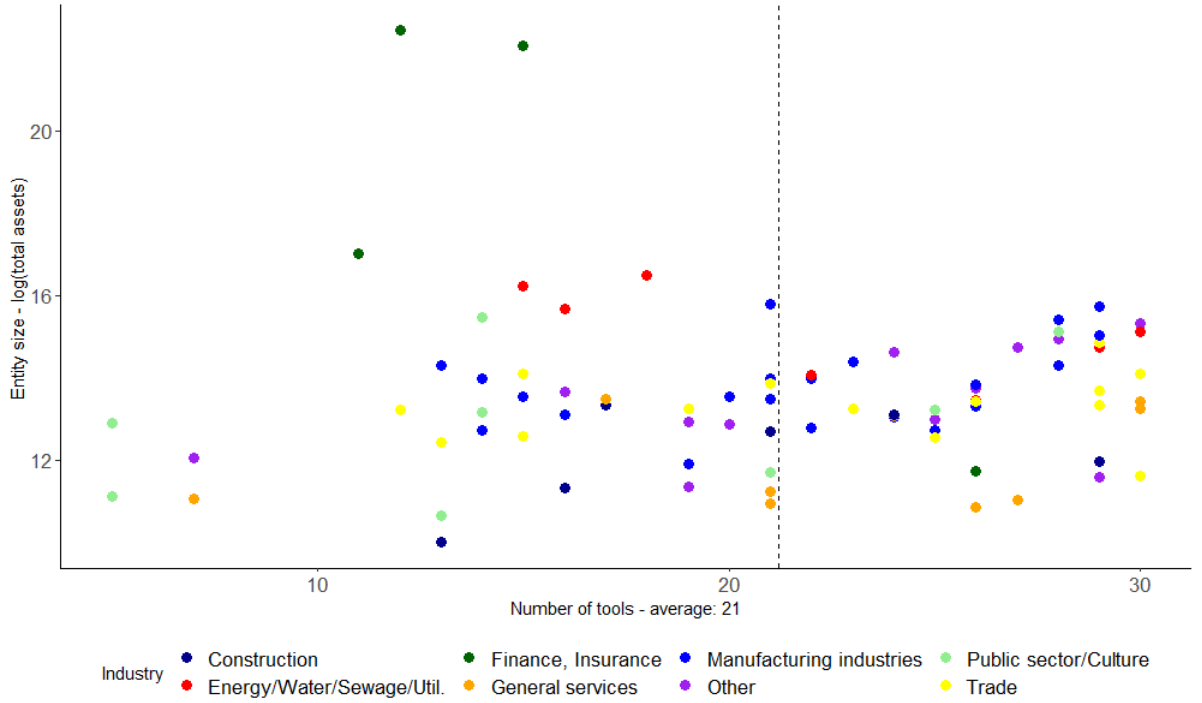

Figure 5.6: Number of tools and size of all our respondents. Size on a log-scale. Dotted line represents average number of tools for all entities.

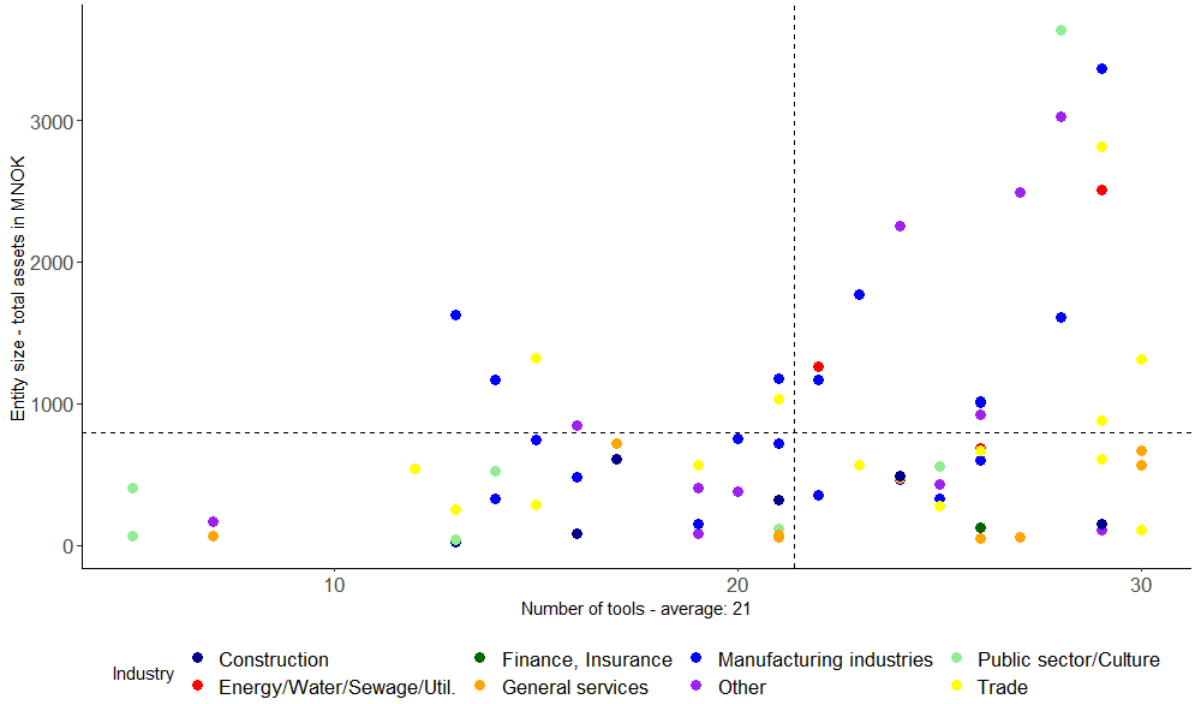

Figure 5.7: Number of tools and size of all our respondents. Outliers for size have been removed. Dotted lines represent average values for all entities.

In the following table, 5.7, we have presented the output of linear regressions with the number of tools as dependent variables and entity size and industry as independent variables. We have chosen to include log[3] transformed variable on the dependent as well as the independent variable, due to uncertainty in the ordinary least squares (OLS) assumptions.

From model 1, 2, 4, and 5, we find clear indications of size explaining the number of tools used, where all coefficients are significant on the 1% level. Model 1 state that when observing an increase in size with one percent, we expect to see an increase in the number of tools of about 0,02 tools. Model 2 indicates an increase in 2,8 tools when increasing entity size with one unit[4]. From model 4, we expect an increase at 0,159 for log(number of tools) when increasing entity size with one unit[5], which represent an increase in number of tools at about 1,17. Through model 5, we see a significant effect on the elasticity of the number of tools on 0,115, indicating a 0,115% increase in the number of tools used when increasing entity size with 1%.

For model 3 and 6, we see that the finance industry and the public sector have significant negative coefficients. All industry variables are interpreted as dummy variables, meaning that model 3 implies that an entity in the finance industry use approximately 6,5 fewer tools than other entities, and 6.3 for the public sector. In figure 5.2, we saw that the finance industry and the public sector used tools far less than the remaining industries, thus supporting the findings of these regressions.

Even though the size has a significant impact on the number of tools, the coefficients cannot be said to be economic significance. In other words, the findings support a significant correlation between size and the number of tools, yet this is just an incremental impact. Furthermore, these models give an adjusted R^2 between 0,094 and 0,119, meaning that a significant amount of variation is explained outside of these models. Through figure 5.6 and 5.7, we also saw that there are several entities not placed in quadrant 1 and 4[6], which supports this finding. In conclusion, entity size do impact the number of tools, yet this is just an incremental impact, and a significant amount of variation is explained outside this model.

[3] Where log is interpreted as the natural log transformation.

[4] One unit being 1 BNOK.

[5] An increase in c units would mean an increase at $e^{c\beta}$, where β is the regression coefficient, and e is the constant basis for natural logarithm.

[6] 1 being the bottom left, 4 being the upper right.

Table 5.7: OLS regression for number of tools as dependent variable, size (MNOK) and industry as independent variables. Model 4-5 have log transformation in the dependent variable. The industry variable is defined as a factor variable, while size and number of tools are numeric values. For models with entity size, outliers have been removed.

	Dependent variable:					
	Number of tools			log(Number of tools)		
	OLS			*OLS*		
	(1)	(2)	(3)	(4)	(5)	(6)
log(Total assets (BNOK))	1.879***				0.115***	
	(0.626)				(0.038)	
Total assets (BNOK)		2.853***		0.159***		
		(0.889)		(0.055)		
Industry: Energy/Water/Sewage/Util.			−0.250			−0.008
			(3.196)			(0.186)
Industry: Finance, Insurance			−6.542*			−0.368*
			(3.452)			(0.201)
Industry: General services			0.681			−0.004
			(3.106)			(0.181)
Industry: Manufacturing industries			0.080			0.012
			(2.639)			(0.153)
Industry: Other			1.125			0.030
			(2.872)			(0.167)
Industry: Public sector/Culture			−6.250*			−0.466**
			(3.196)			(0.186)
Industry: Trade			0.696			0.021
			(2.833)			(0.165)
Constant	22.872***	19.121***	21.875***	2.873***	3.090***	3.048***
	(0.886)	(1.015)	(2.260)	(0.063)	(0.054)	(0.131)
Observations	70	70	88	70	70	88
R^2	0.117	0.131	0.146	0.107	0.117	0.171
Adjusted R^2	0.104	0.119	0.071	0.094	0.104	0.098
Residual Std. Error	6.150	6.099	6.392	0.380	0.378	0.372
	(df = 68)	(df = 68)	(df = 80)	(df = 68)	(df = 68)	(df = 80)
F Statistic	9.017***	10.292***	1.950*	8.184***	9.008***	2.358**
	(df = 1; 68)	(df = 1; 68)	(df = 7; 80)	(df = 1; 68)	(df = 1; 68)	(df = 7; 80)

Note: *p<0.1; **p<0.05; ***p<0.01

In the following table, we present the correlation coefficients between the number of tools used and the profitability measures presented in chapter 3. We see here one significant negative correlation for return on revenue (ROR), yet this is not supported for the remaining measures. In summary, we cannot conclude on the number of tools impacting profitability. This may be a result of the finance industry and the public sector, which use on average less tools than other industries. On the other hand, when excluding these entities, we find no indications for another conclusion than represented in the table below.

Table 5.8: Pearson correlation between number of tools and profitability measures.

	Number of tools	p.value: number of tools
Resource advantage	-0.07	0.520
Margin advantage	-0.03	0.820
ATR advantage	-0.1	0.370
ROR	-0.2*	0.080
ROE	-0.19	0.100
ROA	-0.08	0.470
ATR	-0.1	0.350

5.2.6 Section Summary

Table 5.9: Displaying the five top and bottom tools ranked according to popularity. Numbers in parenthesis represent their ranking overall.

Tool	Category	Popularity	Use&Utility	Use	Utility
Top five					
Benchmarking	Performance man. tools	91 (1)	3.44 (8)	3.35 (15)	3.52 (6)
Cash forecast	Budgeting tools	91 (1)	3.70 (3)	3.73 (2)	3.67 (3)
Product/service profitability analysis	Profit analysis tools	91 (1)	3.67 (4)	3.67 (5)	3.67 (4)
Financial year forecast	Budgeting tools	90 (4)	3.99 (1)	4.16 (1)	3.82 (2)
Relevant costing for decisions	Profit analysis tools	88 (5)	3.20 (18)	3.27 (19)	3.13 (16)
Bottom five					
Job, batch, process or contract costing	Costing tools	52 (26)	3.27 (15)	3.41 (13)	3.13 (15)
Incremental budgeting	Budgeting tools	45 (27)	2.88 (24)	2.85 (24)	2.90 (23)
Value mapping	Performance man. tools	43 (28)	2.62 (28)	2.47 (29)	2.76 (24)
Zero based budgets	Budgeting tools	36 (29)	2.55 (29)	2.53 (28)	2.56 (30)
Six sigma	Performance man. tools	27 (30)	2.52 (30)	2.46 (30)	2.58 (29)

Table 5.10: Displaying the five top and bottom tools ranked according to each tools' combined average value of Use & Utility. Numbers in parenthesis represent their ranking overall.

Tool	Category	Use&Utility	Popularity	Use	Utility
Top five					
Financial year forecast	Budgeting tools	3.99 (1)	90 (4)	4.16 (1)	3.82 (2)
Rolling forecast	Budgeting tools	3.76 (2)	81 (11)	3.69 (4)	3.83 (1)
Cash forecast	Budgeting tools	3.70 (3)	91 (1)	3.73 (2)	3.67 (3)
Product/service profitability analysis	Profit analysis tools	3.67 (4)	91 (2)	3.67 (5)	3.67 (4)
Market sensitive pricing	Pricing tools	3.58 (5)	75 (15)	3.73 (3)	3.42 (7)
Bottom five					
Flexible budgeting	Budgeting tools	2.66 (26)	59 (23)	2.69 (26)	2.63 (26)
Business process re-engineering	Performance man. tools	2.62 (27)	57 (25)	2.66 (27)	2.58 (28)
Value mapping	Performance man. tools	2.62 (28)	43 (28)	2.47 (29)	2.76 (24)
Zero based budgets	Budgeting tools	2.55 (29)	36 (29)	2.53 (28)	2.56 (30)
Six sigma	Performance man. tools	2.52 (30)	27 (30)	2.46 (30)	2.58 (29)

Table 5.11: Displaying the most popular category for each industry and corresponding use and utility. Number of tools are for the industry as a whole.

Industry	Category	Popularity	Use	Utility	Number of tools
Construction	Pricing	88	3.54	3.16	22
Energy/Water/Sewage/Util.	Pricing	91	3.27	3.10	22
Finance, Insurance	Profit	67	3.40	3.34	15
General services	Profit	94	3.61	3.63	23
Manufacturing industries	Profit	89	3.19	3.23	22
Other	Profit	88	3.45	3.41	23
Public sector/Culture	Profit	62	2.56	2.69	16
Trade	Profit	89	3.42	3.26	23

Table 5.12: Displaying the least popular category for each industry and corresponding use and utility. Number of tools are for the industry as a whole.

Industry	Category	Popularity	Use	Utility	Number of tools
Construction	Performance	66	2.87	2.87	22
Energy/Water/Sewage/Util.	Costing	64	3.36	3.38	22
Finance, Insurance	Budgeting	43	3.79	3.37	15
General services	Performance	65	2.90	2.90	23
Manufacturing industries	Performance	64	2.76	2.76	22
Other	Performance	71	2.94	2.94	23
Public sector/Culture	Performance	44	3.10	3.10	16
Trade	Costing	69	3.24	3.32	23

Table 5.13: Tools with significant correlation between use/utility and entity size. See table 5.6 for results for all tools.

	Use	Use p.values	Utility	Utility p.values
Absorption Costing	0.1237	0.304	0.2272*	0.081
Benchmarking	0.2309*	0.053	0.1927	0.121
Customer Profitability	0.2676**	0.024	0.1493	0.255
Relevant Costing for Decisions	0.299**	0.011	0.1588	0.222
Rolling Forecast	0.0506	0.675	-0.3379***	0.010
Total Performance Scorecard	0.2218*	0.063	0.1473	0.302
Transfer Pricing	0.3238***	0.006	0.344***	0.007
Value Mapping	-0.0198	0.870	0.3038*	0.091

5.3 Management Accounting Tools and Profitability

This section presents the analysis used to answer research question two. Here, we hypothesize that the specific tool in question is significantly correlated with profitability. We thereby examine the results for the connection between MATs and profitability measured in financial data. Finally, a section summary of our analysis is provided.

5.3.1 Costing Tools

In the following tables 5.14 and 5.15, we present our findings for Costing tools. In general, we see that the margin advantage-model returns an adjusted R^2 with negative value. This is interpreted as having no explanatory power, see model 2 in table 5.14. Looking at the F-test, both model 1 and 2 in the first table, representing resource and margin advantage, are not significant. As an implication, we conclude that these two models are not better fits than having no variables. We will use the results from these models on individual independent variables, but be careful not to overrate findings based on these.

For job, batch, process, or contract costing, we find a significant positive correlation for all models except for asset turnover ratio (ATR) advantage and ATR. For margin advantage, we find a significant correlation on the 10% level, while the above models are significant on the 1% level for this tool. For the Pearson correlation table, see table 5.16, we only see a significant correlation for resource advantage and return on assets (ROA), yet all the remaining measures are positive. We accept the hypothesis of "Job, Batch, Process or Contract Costing" being correlated with profitability, and conclude that it is positively correlated with resource and margin advantage, as well as ROR, return on equity (ROE) and ROA.

The margin advantage is defined in equation 3.1 on page 37 as the difference between ROR and return on revenue industry mean (ROR_I), times ATR. Thus, we are not surprised to see both a margin advantage and a positive correlation with ROR. Both of these are interpreted as a cost-efficiency advantages. Furthermore, we assume that the resource advantage is due to the margin advantage, following equation 3.1, where resource advantage stems from either margin or ATR advantage. In addition, we interpret the positive correlation on ROE and ROA as indications of overall correlation with profitability. We do not find any significant result on ATR, thus concluding that this tool gives no revenue advantage[7].

[7] As ATR is defined by revenue, see equation 3.4 on page 38.

We also find a significant negative coefficient for Standard Costing in the ROE-model, yet this only applies to this measure. We also find a significant positive relation from the Pearson correlation in table 5.16 between Standard Costing and margin advantage, which contradicts the findings from the OLS models. This may be a result of different measures of profitability, but we only see an insignificant negative coefficient for ATR, which questions the findings from the ROE model. Due to contradicting results from different models, we do not accept nor reject the hypothesis of Standard Costing being correlated with profitability, not being able to conclude on the hypothesis for Standard Costing.

From table 5.15 we see a significant correlation for both Overhead Allocation (positive) and Variable Costing (negative) on ROE. Neither of these is supported having any effect on the financial measures through the Pearson correlation. For these results, the uncertainty around the findings makes it impossible to either reject or accept the hypothesis that they are being correlated with profitability, as we also saw for Standard Costing.

For the Costing tools not mentioned in the paragraphs above, we reject the hypothesis of them being correlated with profitability. This is based on our models not returning significant coefficients or correlations.

Table 5.14: Regression output from costing tools - relative measures.

	Dependent variable:		
	Resource advantage	Margin advantage	ATR advantage
	OLS	*OLS*	*OLS*
	(1)	(2)	(3)
log(total assets)	-0.017^{**}	0.007	-0.013^{***}
	(0.007)	(0.007)	(0.004)
Variance analysis	−0.006	−0.001	0.001
	(0.008)	(0.007)	(0.003)
Overhead allocation	0.005	−0.003	−0.002
	(0.008)	(0.007)	(0.004)
Standard costing	0.003	0.008	0.001
	(0.008)	(0.008)	(0.003)
Absorption costing	0.003	0.005	0.0004
	(0.008)	(0.008)	(0.004)
Job batch process or contract costing	0.027^{***}	0.016^{*}	0.001
	(0.009)	(0.009)	(0.004)
Variable costing	−0.010	−0.007	0.004
	(0.008)	(0.007)	(0.004)
Activity based costing	0.0003	−0.001	−0.003
	(0.010)	(0.009)	(0.005)
Constant	0.178^{*}	−0.092	0.140^{***}
	(0.093)	(0.089)	(0.050)
Observations	67	65	61
R^2	0.302	0.182	0.489
Adjusted R^2	0.115	−0.047	0.334
Residual Std. Error	0.073 (df = 52)	0.070 (df = 50)	0.030 (df = 46)
F Statistic	1.611 (df = 14; 52)	0.795 (df = 14; 50)	3.149^{***} (df = 14; 46)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 5.15: Regression output from costing tools - absolute measures.

	Dependent variable:			
	ROR	ROE	ROA	ATR
	OLS	*OLS*	*OLS*	*OLS*
	(1)	(2)	(3)	(4)
log(total assets)	0.007	−0.052*	−0.012*	−0.274***
	(0.006)	(0.027)	(0.006)	(0.073)
Variance analysis	−0.004	−0.023	−0.006	−0.065
	(0.005)	(0.024)	(0.007)	(0.088)
Overhead allocation	−0.002	0.043*	0.005	0.006
	(0.005)	(0.025)	(0.007)	(0.094)
Standard costing	0.003	−0.050*	0.003	−0.048
	(0.005)	(0.028)	(0.008)	(0.089)
Absorption costing	0.006	0.058**	0.0002	−0.037
	(0.006)	(0.029)	(0.008)	(0.091)
Job batch process or contract costing	0.018***	0.102***	0.029***	0.143
	(0.006)	(0.029)	(0.009)	(0.105)
Variable costing	−0.010	−0.039	−0.012*	−0.047
	(0.006)	(0.026)	(0.007)	(0.093)
Activity based costing	0.001	−0.003	0.001	0.063
	(0.008)	(0.035)	(0.009)	(0.107)
Constant	−0.053	0.791**	0.226***	5.360***
	(0.071)	(0.380)	(0.080)	(0.949)
Observations	61	58	67	68
R^2	0.363	0.385	0.307	0.503
Adjusted R^2	0.169	0.185	0.120	0.371
Residual Std. Error	0.045 (df = 46)	0.223 (df = 43)	0.070 (df = 52)	0.845 (df = 53)
F Statistic	1.870* (df = 14; 46)	1.922* (df = 14; 43)	1.643* (df = 14; 52)	3.828*** (df = 14; 53)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.16: Pearson correlation between costing tools and measures of profitability.

	Resource advantage	Margin advantage	ATR advantage	ROR	ROE	ROA	ATR
Variance analysis	-0.01	0.03	-0.07	-0.10	-0.05	-0.03	-0.04
Overhead allocation	-0.02	0.04	-0.09	-0.04	0.24*	0.00	-0.04
Standard costing	0.18	0.22*	-0.07	0.18	0.00	0.18	-0.01
Absorption costing	0.04	0.12	-0.13	0.22*	-0.04	0.03	-0.26**
Job, batch, process or contract costing	0.23*	0.13	0.17	0.17	-0.01	0.2*	0.05
Variable costing	-0.04	-0.01	-0.05	-0.07	-0.08	-0.08	0.02
Activity based costing	-0.01	0.06	-0.12	0.00	0.27**	-0.02	-0.15

5.3.2 Pricing Tools

For all models, except for model 4 in table 5.18, we do not find any significant coefficient from the F-test, which is also represented in overall low adjusted R^2. For all models, we find no significant coefficient for any individual tool-variables, thus indicating rejection of the hypothesis of these being correlated with profitability.

The Pearson correlation in table 5.19, there is a significant positive value for Cost-Plus Pricing for all but ATR advantage and ROR. For Transfer Pricing, we find a significant positive Pearson correlation through margin advantage and ROR, but a negative correlation with ATR advantage. As we saw in chapter 3, resource advantage is given by margin and ATR advantage, which may explain why there is a positive correlation for margin advantage, a negative with approximately the same value for ATR advantage, and none for resource advantage.

In order to gain insight into understanding why the OLS models gave us no evidence on significant coefficients, we also ran the models for Pricing tools with both control variables, industry, and size, alone, as well as without any control variables. This yielded no different results as before. Furthermore, none of our assumption tests are violated in the presented models, and we conclude on trusting the results from these models. With the contradicting results from the Pearson correlation in mind, we conclude on not being able to accept or reject the hypothesis of either Pricing tools being correlated with profitability.

Table 5.17: Regression output from pricing tools - relative measures.

	Dependent variable:		
	Resource advantage	Margin advantage	ATR advantage
	OLS	*OLS*	*OLS*
	(1)	(2)	(3)
log(total assets)	-0.020^{***}	0.001	-0.014^{***}
	(0.007)	(0.007)	(0.004)
Cost plus pricing	0.008	0.004	−0.001
	(0.007)	(0.006)	(0.003)
Market sensitive pricing	0.006	0.012	0.0002
	(0.008)	(0.008)	(0.003)
Transfer pricing	0.005	0.007	−0.001
	(0.007)	(0.007)	(0.003)
Segmental pricing	0.010	−0.002	0.004
	(0.008)	(0.007)	(0.003)
Constant	0.203^{**}	−0.038	0.151^{***}
	(0.094)	(0.088)	(0.049)
Observations	67	65	61
R^2	0.240	0.148	0.493
Adjusted R^2	0.088	−0.028	0.379
Residual Std. Error	0.074 (df = 55)	0.069 (df = 53)	0.029 (df = 49)
F Statistic	1.576 (df = 11; 55)	0.840 (df = 11; 53)	4.330^{***} (df = 11; 49)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5.18: Regression output from pricing tools - absolute measures.

	Dependent variable:			
	ROR	ROE	ROA	ATR
	OLS	*OLS*	*OLS*	*OLS*
	(1)	(2)	(3)	(4)
log(total assets)	0.004	−0.061*	−0.016**	−0.275***
	(0.006)	(0.031)	(0.007)	(0.076)
Cost plus pricing	0.003	0.030	0.005	0.008
	(0.004)	(0.023)	(0.007)	(0.072)
Market sensitive pricing	0.001	−0.004	0.007	0.006
	(0.005)	(0.028)	(0.008)	(0.086)
Transfer pricing	0.006	0.022	0.005	−0.051
	(0.005)	(0.024)	(0.007)	(0.079)
Segmental pricing	−0.0004	0.038	0.007	0.114
	(0.005)	(0.027)	(0.008)	(0.095)
Constant	−0.022	0.955**	0.255***	5.307***
	(0.076)	(0.417)	(0.088)	(0.966)
Observations	61	58	67	68
R^2	0.221	0.213	0.182	0.496
Adjusted R^2	0.046	0.025	0.018	0.397
Residual Std. Error	0.049 (df = 49)	0.244 (df = 46)	0.074 (df = 55)	0.828 (df = 56)
F Statistic	1.263 (df = 11; 49)	1.132 (df = 11; 46)	1.109 (df = 11; 55)	5.003*** (df = 11; 56)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.19: Pearson correlation between pricing tools and measures of profitability.

	Resource advantage	Margin advantage	ATR advantage	ROR	ROE	ROA	ATR
Cost plus pricing	0.25**	0.21*	0.07	0.02	0.02	0.21*	0.07
Market sensitive pricing	0.17	0.17	0	0.2*	0.07	0.15	0.04
Transfer pricing	0.07	0.21*	-0.22*	0.31**	0.31**	0.06	-0.23*
Segmental pricing	0.23*	0.11	0.2	-0.03	-0.01	0.14	0.24**

5.3.3 Budgeting Tools

For Budgeting tools, we see a significant explanatory power for model 3 in table 5.20 and model 4 in 5.21, representing ATR advantage and ATR as dependent variables. Looking at the individual variables, we find only Rolling Forecast being significant positive correlated with resource advantage and ROR. As we saw in section 5.3.1, there is a connection between resource advantage and ROR, thus being careful as interpreting these as two independent results. For the Pearson correlation, we find a positive correlation between this tool and all measures of profitability. Yet, only ROE is significant. We conclude that Rolling Forecast has a significantly positive correlation to profitability, through a resource advantage and ROR, yet we do emphasize the uncertainty due to lack of significant evidence from other models.

For the Pearson correlation coefficient, we see that Financial Year Forecast has a negative correlation with ATR advantage, Incremental Budgeting has a positive effect on margin advantage, and that Cash Forecast has a positive correlation with ROE. We do not have evidence for these tools being correlated with profitability, and due to the uncertainty conclude on not being able to reject or accept the hypothesis of these being correlated with profitability. For the remaining tools, we reject the hypothesis of them being significantly correlated with profitability, through neither coefficient being significant in our models.

Table 5.20: Regression output from budgeting tools - relative measures.

	Dependent variable:		
	Resource advantage	Margin advantage	ATR advantage
	OLS	*OLS*	*OLS*
	(1)	(2)	(3)
log(total assets)	−0.021**	0.002	−0.013***
	(0.008)	(0.007)	(0.004)
Financial year forecast	0.003	0.011	−0.0002
	(0.007)	(0.007)	(0.003)
Rolling forecast	0.015**	0.003	−0.001
	(0.007)	(0.007)	(0.003)
Cash forecast	−0.006	−0.004	−0.001
	(0.008)	(0.007)	(0.003)
Incremental budgeting	0.015	0.014	−0.008
	(0.015)	(0.014)	(0.005)
Zero based budgets	−0.006	0.011	−0.0001
	(0.018)	(0.017)	(0.008)
Flexible budgeting	−0.006	0.002	0.003
	(0.017)	(0.016)	(0.007)
Activity based budgeting	0.001	−0.005	0.003
	(0.009)	(0.008)	(0.004)
Constant	0.213**	−0.041	0.136**
	(0.098)	(0.091)	(0.054)
Observations	67	65	61
R^2	0.234	0.169	0.524
Adjusted R^2	0.028	−0.064	0.379
Residual Std. Error	0.077 (df = 52)	0.071 (df = 50)	0.029 (df = 46)
F Statistic	1.137 (df = 14; 52)	0.726 (df = 14; 50)	3.620*** (df = 14; 46)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5.21: Regression output from budgeting tools - absolute measures.

	Dependent variable:			
	ROR	ROE	ROA	ATR
	OLS	*OLS*	*OLS*	*OLS*
	(1)	(2)	(3)	(4)
log(total assets)	0.006	−0.060	−0.014**	−0.263***
	(0.007)	(0.036)	(0.007)	(0.075)
Financial year forecast	0.004	−0.013	0.007	−0.065
	(0.005)	(0.026)	(0.007)	(0.075)
Rolling forecast	0.008*	0.025	0.010	−0.024
	(0.005)	(0.026)	(0.007)	(0.080)
Cash forecast	−0.006	0.018	−0.002	0.060
	(0.005)	(0.026)	(0.008)	(0.085)
Incremental budgeting	0.007	0.054	0.003	−0.179
	(0.010)	(0.054)	(0.015)	(0.149)
Zero based budgets	0.007	0.018	0.003	−0.065
	(0.012)	(0.073)	(0.018)	(0.202)
Flexible budgeting	0.004	−0.012	−0.001	0.097
	(0.011)	(0.060)	(0.017)	(0.187)
Activity based budgeting	−0.002	0.008	−0.002	0.047
	(0.007)	(0.036)	(0.009)	(0.095)
Constant	−0.054	0.915*	0.237***	5.262***
	(0.084)	(0.470)	(0.088)	(0.946)
Observations	61	58	67	68
R^2	0.281	0.190	0.183	0.507
Adjusted R^2	0.062	−0.073	−0.037	0.377
Residual Std. Error	0.048 (df = 46)	0.256 (df = 43)	0.076 (df = 52)	0.841 (df = 53)
F Statistic	1.283 (df = 14; 46)	0.723 (df = 14; 43)	0.833 (df = 14; 52)	3.890*** (df = 14; 53)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5.22: Pearson correlation between budgeting tools and measures of profitability.

	Resource advantage	Margin advantage	ATR advantage	ROR	ROE	ROA	ATR
Financial year forecast	0.02	0.19	-0.27**	0.02	0.20	0.10	-0.14
Rolling forecast	0.12	0.10	0.04	0.05	0.23*	0.16	0.12
Cash forecast	0.01	0.10	-0.16	0.02	0.21*	0.05	-0.17
Incremental budgeting	0.16	0.24*	-0.13	0.02	0.04	0.13	-0.11
Zero based budgets	0.01	0.03	-0.03	0.04	-0.02	-0.03	-0.09
Flexible budgeting	0.03	0.01	0.03	0.06	-0.05	-0.02	-0.04
Activity based budgeting	-0.07	0.00	-0.11	0	-0.08	-0.08	-0.11

5.3.4 Profit Analysis Tools

For the Profit Analysis tools, see table 5.23 and 5.24, we see that Customer Profitability has a positive significant correlation on ATR advantage and ATR. This result is also supported by the findings from Pearson correlation for ROE in table 5.25. Due to both dependent variables being linked, we do not interpret these as two independent results and conclude that Customer Profitability has a significant positive correlation with profitability, yet with some uncertainty.

For Relevant Costing for Decisions, we find a significant positive correlation for ATR advantage in table 5.23, but this is not supported by any of the remaining OLS models, nor the Pearson correlation coefficients. Due to this, we conclude on not being able to either reject or accept the hypothesis of this tool being associated with profitability.

For the remaining tools, Breakeven, and product/service profitability analysis, we reject the hypothesis of them being correlated with profitability. This is due to no significant correlation from the OLS models, nor the Pearson correlation coefficients.

Within the Profit Analysis tools, through the OLS models, we see that Relevant Costing for Decisions and Customer Profitability has respectively, a significant negative and positive coefficient on ATR advantage. By looking at the results of the other models, we find no support for these dependent variables being correlated with profitability for relevant costing for decision. For Customer Profitability we do find a significant correlation in model 4 in table 5.24.

We also find that only models using ATR advantage and ATR as dependent variables have significant explanatory power. Model 3 in table 5.23 and model 4 in 5.24 are linked, due to ATR advantage being computed through ATR and ROR, see equation 3.1 on page 37. Following this, we are careful about interpreting these as two independent findings from our models, increas-

ing the uncertainty of our conclusion. Furthermore, the Pearson correlation support Customer Profitability having a significantly positive correlation with profitability measured as ROE. We also see this tool having a positive correlation with all measures, yet none of these are significant.

Table 5.23: Regression output from profit analysis tools - relative measures.

	Dependent variable:		
	Resource advantage	Margin advantage	ATR advantage
	OLS	*OLS*	*OLS*
	(1)	(2)	(3)
log(total assets)	-0.021^{***}	0.003	-0.012^{***}
	(0.007)	(0.007)	(0.004)
Product/service profitability analysis	0.001	0.005	-0.004
	(0.008)	(0.007)	(0.003)
Relevant costing for decisions	0.005	0.014	-0.007^{*}
	(0.010)	(0.009)	(0.004)
Customer profitability	0.008	-0.007	0.007^{**}
	(0.009)	(0.008)	(0.003)
Breakeven	-0.0001	0.005	0.001
	(0.012)	(0.011)	(0.005)
Constant	0.235^{**}	-0.040	0.140^{***}
	(0.095)	(0.087)	(0.048)
Observations	67	65	61
R^2	0.184	0.134	0.541
Adjusted R^2	0.021	-0.046	0.438
Residual Std. Error	0.077 (df = 55)	0.070 (df = 53)	0.027 (df = 49)
F Statistic	1.127 (df = 11; 55)	0.742 (df = 11; 53)	5.254^{***} (df = 11; 49)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5.24: Regression output from profit analysis tools - absolute measures.

	Dependent variable:			
	ROR	ROE	ROA	ATR
	OLS	*OLS*	*OLS*	*OLS*
	(1)	(2)	(3)	(4)
log(total assets)	0.006	−0.054*	−0.016**	−0.284***
	(0.006)	(0.032)	(0.007)	(0.073)
Product/service profitability analysis	0.004	−0.003	0.001	−0.064
	(0.005)	(0.028)	(0.008)	(0.083)
Relevant costing for decisions	0.0004	−0.012	0.004	−0.163
	(0.008)	(0.035)	(0.010)	(0.105)
Customer profitability	−0.004	0.037	0.009	0.215**
	(0.006)	(0.031)	(0.009)	(0.090)
Breakeven	0.004	−0.001	−0.002	0.0004
	(0.009)	(0.040)	(0.011)	(0.120)
Constant	−0.040	0.978**	0.276***	5.506***
	(0.076)	(0.428)	(0.088)	(0.917)
Observations	61	58	67	68
R^2	0.192	0.152	0.148	0.533
Adjusted R^2	0.010	−0.051	−0.023	0.441
Residual Std. Error	0.050 (df = 49)	0.254 (df = 46)	0.075 (df = 55)	0.797 (df = 56)
F Statistic	1.058 (df = 11; 49)	0.747 (df = 11; 46)	0.867 (df = 11; 55)	5.808*** (df = 11; 56)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.25: Pearson correlation between profit analysis tools and measures of profitability.

	Resource advantage	Margin advantage	ATR advantage	ROR	ROE	ROA	ATR
Product/service profitability analysis	0.04	0.06	-0.04	-0.01	0.26**	0	-0.06
Relevant costing for decisions	0.02	0.14	-0.18	0.08	0.2	0.02	-0.12
Customer profitability	0.05	0.02	0.06	0.05	0.28**	0.03	0
Breakeven	-0.01	0.05	-0.09	-0.16	0.18	-0.02	-0.12

5.3.5 Performance Management Tools

For Performance Management tools, we see a significant effect on profitability for multiple tools and models, see table 5.26 and 5.27. This has also an effect on the adjusted R^2, yielding only model 2, margin advantage, in table 5.26 a non-significant coefficient through the F-test. In fact, we have explanatory power as high as 0.408 and 0.529, respectively for ATR advantage and ATR.

Balanced Scorecard (BSC) has a significant positive coefficient in the OLS model for resource advantage. This is also supported by the tool having a significant coefficient on ROR and ROE, yet resource advantage and ROR have to be interpreted to some extent as one result. Following our results, we expect to see that entities using BSC have a 9,2% higher ROE for each step on the use scale. In addition to this being a statistically significant value, one may argue that this is a strong economic significant value. An increase in 9,2% is unquestionable a strong impact, but should not be expected for individual entities when increasing the use of BSC, due to the result of not being a causal effect. Through the Pearson correlation, on the other hand, we find no support for the hypothesis of BSC being correlated with any measure of profitability. Yet, we conclude that BSC have a significant positive effect on both resource advantage and ROR, with some uncertainty due to lack of support through the Pearson correlation coefficient.

For Benchmarking, we find a significant positive correlation for both resource and margin advantage, as well as for ROA. This is also supported by the Pearson correlation, where we find a significant positive correlation for resource and margin advantage, as well as ROR and ROA. We also see that the correlation coefficient with ATR advantage is negative, which contradicts the other results to some degree. Yet, this is not a significant correlation. We conclude on Benchmarking having a significant positive correlation with profitability. The positive impact on resource advantage and on ROR can be interpreted as a cost-efficiency through using Benchmarking, see further elaboration on this in chapter 6. We conclude on Benchmarking being positively associated with profitability through cost-efficiency.

For Value-Based Management, we see a significant positive coefficient for resource advantage, ROE and ROA. When looking at the Pearson correlation, we find no support for these findings, where no correlation coefficient is significant, yet all are positive. We conclude on Value-Based Management having a significant positive correlation on profitability, but emphasize that these results are to some degree uncertain.

For Business Process Re-engineering, Total Performance Scorecard, and Six Sigma, we find con-

tradicting results, or not satisfactory results for any final conclusion. We do not conclude on either accepting or rejecting the profitability-hypothesis related to these tools.

For Value Mapping, we see that this has been excluded in our model using ROR as the dependent variable. This is partly due to the lower percentage of users of this tool. When controlling for the assumptions of the OLS, some observations have been removed, due to these being outliers or heavily influencing our results. This has led to observations being dependent[8] for Value Mapping and the remaining variable tools. We have, therefore chosen to exclude Value Mapping from this model. For the remaining models, we see that Value Mapping has an overall negative significant correlation with profitability. This is not supported by the Pearson correlation, where no coefficients are significant. In section 5.2.3, figure 5.5, we saw that Value Mapping is significantly correlated positively with both Total Performance Scorecard and Business Process Re-engineering, yet we have no indication of dependent variables through the variance inflation factors (VIF) factor, see outcomes from tests in the appendix.

[8] In fact, perfect aliases.

Table 5.26: Regression output from performance management tools - relative measures.

	Dependent variable:		
	Resource advantage	Margin advantage	ATR advantage
	OLS	*OLS*	*OLS*
	(1)	(2)	(3)
log(total assets)	-0.023^{***}	-0.001	-0.013^{***}
	(0.007)	(0.007)	(0.004)
Balanced scorecard	0.030^{***}	0.018	0.004
	(0.010)	(0.011)	(0.004)
Business process re engineering	-0.007	-0.024^{*}	0.008
	(0.014)	(0.014)	(0.008)
Activity based management	-0.007	0.006	-0.006
	(0.011)	(0.011)	(0.005)
Total performance scorecard	-0.011	-0.023^{*}	0.001
	(0.013)	(0.012)	(0.007)
Value based management	0.031^{*}	0.020	0.005
	(0.017)	(0.016)	(0.007)
Value mapping	-0.067^{**}	-0.009	-0.031^{*}
	(0.031)	(0.030)	(0.015)
Benchmarking	0.017^{**}	0.017^{**}	-0.0001
	(0.007)	(0.007)	(0.003)
Six sigma	-0.034	-0.020	-0.005
	(0.023)	(0.022)	(0.009)
Constant	0.242^{***}	0.001	0.132^{**}
	(0.088)	(0.086)	(0.050)
Observations	67	65	61
R^2	0.399	0.279	0.556
Adjusted R^2	0.222	0.058	0.408
Residual Std. Error	0.069 (df = 51)	0.066 (df = 49)	0.028 (df = 45)
F Statistic	2.255^{**} (df = 15; 51)	1.262 (df = 15; 49)	3.761^{***} (df = 15; 45)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5.27: Regression output from performance management tools - absolute measures.

	Dependent variable:			
	ROR	ROE	ROA	ATR
	OLS	*OLS*	*OLS*	*OLS*
	(1)	(2)	(3)	(4)
log(total assets)	0.003	−0.041	−0.019***	−0.280***
	(0.006)	(0.028)	(0.006)	(0.067)
Balanced scorecard	0.022***	0.092***	0.017	0.014
	(0.007)	(0.033)	(0.012)	(0.111)
Business process re engineering	−0.013	0.065	−0.008	0.243
	(0.010)	(0.045)	(0.015)	(0.151)
Activity based management	0.0002	0.020	−0.005	−0.150
	(0.008)	(0.037)	(0.011)	(0.107)
Total performance scorecard	−0.011	0.003	−0.006	0.228*
	(0.010)	(0.046)	(0.013)	(0.131)
Value based management	0.012	0.112**	0.039**	0.089
	(0.012)	(0.053)	(0.017)	(0.165)
Value mapping		−0.338***	−0.073**	−1.205***
		(0.100)	(0.031)	(0.324)
Benchmarking	0.007	0.009	0.016**	0.055
	(0.005)	(0.024)	(0.007)	(0.073)
Six sigma	−0.014	−0.163**	−0.032	−0.160
	(0.016)	(0.071)	(0.023)	(0.239)
Constant	−0.0003	0.683*	0.301***	5.253***
	(0.073)	(0.379)	(0.082)	(0.859)
Observations	61	58	67	68
R^2	0.351	0.451	0.342	0.634
Adjusted R^2	0.154	0.255	0.148	0.529
Residual Std. Error	0.046 (df = 46)	0.214 (df = 42)	0.069 (df = 51)	0.731 (df = 52)
F Statistic	1.778* (df = 14; 46)	2.302** (df = 15; 42)	1.765* (df = 15; 51)	6.015*** (df = 15; 52)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5.28: Pearson correlation between performance management tools and measures of profitability.

	Resource advantage	Margin advantage	ATR advantage	ROR	ROE	ROA	ATR
Balanced scorecard	0.15	0.13	0.04	0.01	0.05	0.12	-0.11
Business process re_engineering	0.05	-0.09	0.23*	-0.08	-0.03	0.01	0.02
Activity based management	0.04	0.18	-0.23*	0.02	0.23*	0.08	-0.23*
Total performance scorecard	-0.05	-0.05	0	0.02	0.4***	0	-0.06
Value based management	0.18	0.18	0.01	0.1	0.15	0.19	-0.13
Six sigma	0	0.05	-0.08	0.05	-0.04	-0.05	-0.15
Value mapping	-0.08	0	-0.14	-0.2	-0.03	-0.09	-0.14
Benchmarking	0.26**	0.29**	-0.04	0.24*	0.2	0.21*	-0.05

5.3.6 Section Summary

Table 5.29: Summary of our regression results arranged by tool category.

Tool	Conclusion	Relative measures	Absolute measures
Costing tools			
Variance analysis	Rejected	None	None
Overhead allocation	No conclusion		
Standard costing	No conclusion		
Absorption costing	Rejected	None	None
Job, batch, process, or contract costing	Accepted - positive	Resource, margin	ROR, ROE, ROA
Variable costing	No conclusion		
Activity based costing	Rejected	None	None
Pricing tools			
Cost plus pricing	No conclusion		
Market sensitive	No conclusion		
Transfer pricing	No conclusion		
Segmental pricing	No conclusion		
Budgeting tools			
Financial year forecast	No conclusion		
Rolling forecast	Accepted - positive	Resource	ROR
Cash forecast	No conclusion		
Incremental budgeting	No conclusion		
Zero based budgets	Rejected	None	None
Flexible budgeting	Rejected	None	None
Activity based budgeting	Rejected	None	None
Profit analysis tools			
Product/service profitability analysis	Rejected	None	None
Relevant costing for decisions	No conclusion		
Customer profitability	Accepted - positive	ATR	ATR
Breakeven	Rejected	None	None
Performance management tools			
Balanced scorecard	Accepted - positive	Resource	ROR, ROE
Business process re-engineering	No conclusion		
Activity based management	Rejected	None	None
Total performance scorecard	No conclusion		
Value based management	Accepted - positive	Resource	ROE, ROA
Value mapping	No conclusion		
Benchmarking	Accepted - positive	Resource, margin	ROA
Six sigma	No conclusion		

Chapter 6

Discussion and Implications

In this chapter, we discuss the findings presented in chapter 5 related to each of our two research questions. In section 6.1, we start by discussing the categories that are used by industries and the in-group differences we find within these categories. We then extend our discussion to the use and utility of management accounting tools (MATs). Here, we devote a particular focus to the tools we find to be associated with profitability. Next, we discuss what the design of accounting systems might depend on, and if we can explain why entities design their systems as they do. In chapter 6.2 we discuss some of our tools association with profitability. Finally, we present a summary of our discussion.

6.1 The Use and Utility of Management Accounting Tools

When discussing the popularity of our tool categories, we make frequent use of table 5.9, 5.10, and 5.12. Table 5.9 displays the five top and bottom tools ranked according to popularity. Table 5.10 displays the five top and bottom tools ranked according to each tools' combined average value of use and utility. Table 5.11 displays the most popular category for each industry. Finally, table 5.12 displays the least popular category for each industry.

We make the reader aware that when discussing findings related to our industries we do this with exceptional care given our limited responses. For this reason, we only discuss our findings on category level and not on a tool level as well[1]. Also, we do not make firm conclusions, but instead display tendencies that we appear to have uncovered for these industries.

6.1.1 The Management Accounting Tools Categories

Of the tool categories that are the most popular in each industry (table 5.11) we observe a clear dominance of profit analysis tools, which is represented in six of eight industry categories. For the two remaining industries, Pricing tools are the most popular category. Furthermore, of the tool categories that are the least popular in each industry (table 5.12) we observe a clear dominance of performance management tools, which is present in five of eight industries. For the three remaining industries, Costing and Budgeting tools are the most popular category.

Regarding the categories that dominate the industries in the top and bottom, we observe that, in the case of profit analysis tools, there is relatively similar popularity between General Service, Manufacturing, Trade and Other (88%−94%). However, for Public Sector and Finance & Insurance, the popularity is considerably lower (62%−67%). In the case of Performance management tools, we observe a significant variation in popularity, varying from $44\% - 71\%$.

It is tempting to attribute these popularity differences to the characteristics of the respective industries. However, our limited data does not grant the opportunity to draw such conclusions. Although, it is interesting to observe that one group of tools dominate the least and most popular category. This could indicate that entities across most industries are aligned in terms of which categories that are the most and least popular to them. Consequently, what we infer from these observations are the tendency most industries have towards favoring profit analysis tools

[1] Although, for the interested reader an overview of the tools popularity on a industry level is provided in appendix B

disfavoring Performance Management Tools.

An interesting observation is that the tool category which is the most and least popular are not coherently represented among the five top and bottom popular tools (table 5.9 and 5.10). Instead, in the top five, we observe that Budgeting and Profit analysis tools represent two tools each, with performance management tools representing the last. Similarly, in the bottom five, budgeting tools and performance management tools represent two tools each, with costing tools representing the last. This incoherence implies that even though some categories are more and less popular than others, there are still tools that are more and less popular than the category itself.

Investigating in-group differences

Concerning the tools' popularity (table 5.1), one could expect that the uneven number of tools in each category could explain why some categories are more present in the top and bottom although this does not appear to be the case. Budgeting tools, Costing tools, and Performance management tools, namely have about twice as many tools as Pricing and Profit analysis tools. Despite this, performance management tools are only represented once in the top five, and Profit analysis tools are represented twice.

With regards to in-group differences, Performance management tools and Budgeting tools displays the most considerable variation in popularity. This could imply that the value obtained from using tools within these categories are generally less compared to those categories only displaying a minor variation. Alternatively, it could also mean that the entities need fewer tools from those categories to satisfy the same objective, thereby making some tools within these categories relatively more popular. The large in-group variation could have occurred as there generally may be more tools to choose from when also considering tools outside our presented selection, as a larger pool of tools could scatter the popularity of all tools within their category. If so, this could imply that categories with large in-group variation, in fact, are more popular in terms of proportion. Finally, it could be only natural that we have these in-group differences, for some categories, as the entities may be satisfied with the number of tools they use. What partially supports this interpretation, is the fact that entities on average only use 21 tools from our given selection of 30 tools (Table 5.11)

That being said, the uneven number of tools in each category makes it less valid to make deductions that derive from comparing our categories without further ado. A more valid comparison

could be to assess the in-group difference by comparing the top four tools in each category, as this number corresponds to the category with the least number of tools.

When making such a comparison, we observe that the popularity of profit analysis tools is relativity similar to performance management tools and budgeting tools. In this case, costing tools represent the most substantial in-group variation, while pricing tools still stands apart with its relatively low in-group variation. Combined with its overall high popularity, this could imply that more value generally is added by applying pricing tools compared to those of other categories. A reason for the low in-group variation could be that the companies using pricing tools need to apply more tools to fulfill the same objective. Alternatively, a reason for this occurrence may be that there are generally fewer tools to choose from when also considering those outside our presented selection, as a smaller pool of tools, could increase the popularity of all tools within their category. If so, this could imply that categories with low in-group variation, in fact, are less popular in terms of proportion. Finally, the low in-group variation could indicate a low complexity for the tools within this category – making them simpler and, thus, possibly more popular to use given that they adequately fulfill the objective.

As we cannot extend our findings beyond the scope of our research, we can only describe our findings for the categories which our selection of tools represent. Although, our presented selection of tools aims to include a wide range of popular tools, which could take in favor of mitigating the discrepancies to some extent. What additionally supports this claim is that our participants seem to lack few tools given their response to this question. There could, however, potentially be many reasons as to why there are so few tools reported here. Some participants may, for instance, not know the specific name of the tools that their entity use. More so, this is likely to be the case if the tools have been adapted internally as this would make it more difficult to classify them according to a definition. We, therefore, should not make any assumptions that we have presented our respondents with an exhaustive list of tools which is used by all entities.

6.1.2 The Popularity, Use and Utility of Management Accounting Tools

In table 5.9 we observe the five most popular tools. These tools have a relatively low spread in terms of popularity (only 3%), while the spread of their corresponding average use and utility combined is significantly higher (24.7%). This gap is surprising, as one would, to a larger extent, expect that the tools which are the most popular also have a corresponding degree of usage and utility. In fact, from table 5.10 we only identify three of five tools to be among the most popular

tools as well. This observation implies that the most popular tools are not necessarily the once that have the highest degree of use and utility.

The discrepancy between the popularity and use and utility may represent an opportunity for the entities, as the tools that are the most popular do not necessarily have a corresponding level of use and utility and vice versa. This incoherence may suggest that some entities can be better off by adopting alternative tools that fulfill the same objective.

That being said, having high popularity and a low corresponding degree of usage and utility does not necessarily indicate a problematic relationship. For instance, it could imply that the character of these tool requires a less degree of usage compared to other tools, and, thus, have a utility that is perceived as equally low. Likewise, it could imply that the character of these tool causes the utility to be low, and thereby, also have equally low usage. An example of the latter could be that the tool's complexity is low. Hence, it may be easy and, thus, popular to use. Although, its low complexity may yield a limited utility, and thereby also an equally low usage.

Assuming that low popularity and a high corresponding degree of use and utility represent an opportunity for entities, two tools are especially relevant to be considered adopted. These are Market-sensitive pricing and Rolling Forecast. From 5.10, we observe that Market-sensitive pricing has the fifth highest average use and utility combined, but is only average in terms of popularity (15). The most common reason for not using this tool is that it did not apply to the respondents' industry (6) and that it has not been considered used (7) (table 6.1). Moreover, Rolling Forecast only ranks eleven in popularity, but is the second highest in terms of average use and utility combined. Interestingly, the most common reasons given for not using it, are that it has not been considered (4), and do not know (3), and other (4). Given that the assumption holds, the reasons associated with not using these tools implies that the adoption of these tools should be considered.

When examining the five least popular tools (table 5.9), we observe that there is generally more coherence between popularity and the use and utility, compared to the five most popular tools. Clear reasons as to why these unpopular tools are not being used are that the entities do not have enough knowledge and that the tool has not been considered used. Also, for Six Sigma, there is a high frequency (14) reporting that they do not know why their entity does not use this tool.

When assessing the five tools with the lowest average use and utility combined, they display a near perfect coherence with the popularity. This differ compared to the top of the table when

evaluating the same factors. What makes this interesting is what it could imply. One interpretation could be that entities using the tools at the bottom find it easier to disregard tools that have little perceived value. Consequently, this would imply that entities maintain using tools at the top of the table even though it does not have a coherent value. This interpretation could mean that if an entity uses a tool that is considered to be highly popular, it does not necessarily imply that this tool yields the highest value compared to other suitable alternatives.

Tools associated with profitability

Table 6.1: Displaying the popularity, use, and utility for tools that have an expected, and proven, association with profitability. The tools are ranked by popularity. Brackets display their ranking overall

Tool	Category	Popularity	Use&Utility	Use	Utility	Conclusion
Benchmarking	Performance man. tools	91 (3)	3.44 (8)	3.35 (15)	3.52 (6)	Accepted - positive
Balanced scorecard	Performance man. tools	84 (7)	3.12 (20)	3.22 (20)	3.01 (21)	Accepted - positive
Rolling forecast	Budgeting tools	81 (11)	3.76 (2)	3.69 (4)	3.83 (1)	Accepted - positive
Customer profitability	Profit analysis tools	81 (12)	3.57 (6)	3.51 (11)	3.62 (5)	Accepted - positive
Value based management	Performance man. tools	74 (17)	3.00 (22)	2.95 (23)	3.05 (19)	Accepted - positive
Activity based costing	Costing tools	64 (22)	3.24 (17)	3.29 (18)	3.18 (14)	Rejected
Job. batch. process or contract costing	Costing tools	52 (26)	3.27 (15)	3.41 (13)	3.13 (15)	Accepted - positive

Finally, we address the tools have a proven association with profitability. Among the five most popular tool, we only find Benchmarking to have a positive association with profitability. Furthermore, among the top five tools in terms of average use and utility combined, we only observe Rolling Forecasts to be present. These are particularly interesting observations, as we would expect that tools that are the most popular, or those with a high average degree of use and utility combined, to be more closely associated with profitability. At the same time, this could imply that there are other factors than profitability that make entities wanting to adopt these tools.

From table 6.1 we observe the following tools associated with profitability, which have a surprisingly low degree of usage overall; Job, Batch, Process or Contract costing (13), Benchmarking (15), Balanced Scorecard (20) and Value-Based management (23). To the degree that usage can be interpreted as effort, this may indicate that entities using these tools can, with relatively little effort, achieve a positive association with profitability. This could suggest that entities potentially can benefit more from using these tools to a higher degree. As previously discussed, it could also be that relative to other tools these are tools that, by design, neither should nor need to be applied as extensive to achieve its desired effect.

Furthermore, we also observe the following tools with a surprisingly low utility overall; Job, Batch, Process or Contract costing (15), Value-Based management (19) and Balanced Scorecard (21). Given that these tools have a positive association with profitability, one would expect them also to have a higher utility. This may suggest that the entities are not fully aware of the effect they receive from using these tools. Alternatively, they may be aware, but take into account other considerations than profitability as a reason for why they use them.

We also observe the following tools with surprisingly low popularity overall; Value-Based management (17), and Job, batch, and process or contract costing (26). This may suggest that entities can gain a comparative advantage of using these tools. When studying the reasons for why these tools are not being used, we find the following. Regarding Value-Based management, the reasons are that it has not been considered used (9) and that they do not have enough knowledge (7). For Job, batch, and process or contract costing, the most common reasons are that it does not apply to their entities' industry (17). Also, they do not have enough knowledge (4), the tool has not been considered used (8), and they do not know they do not use the tool (5). Reasons stating that the tools do not apply to our industry, and those classified as Other, are reasons that make it less attractive to start using these tools for the entities. At the same time, reasons stating that the entity does not have enough knowledge and that it has not been considered used may suggest that entities can potentially benefit from investigating if they could start using the tool. For our research, this implies that entities should consider using Value-Based management. Job, batch, and process or contract costing should also be considered used, but it is susceptible to not apply to their industry.

6.1.3 Designing Management Accounting Systems

Earlier in this section, we discussed that entities tend to choose MATs regardless of what we found in regards to profitability, meaning that entities may have other reasons for their choice in MATs. We will, in this subsection, look into how entity size, external environment, and structure may affect the design of accounting systems, and discuss this in the light of previous literature. In this subsection, we discuss the findings from section 5.2.5.

Following Draft and MacIntosh's (1978) theory about technology capital as a major contingency in designing the accounting system, we would expect to see that complex tools are positive correlated with entity size. In addition, we also expect to find that larger entities use more tools than smaller entities. The argument for this is that larger entities have more resource, more capital,

and thus also larger potential for increasing the number of tools, and also the complexity in their accounting systems. In addition, larger entities are more complex, and may have divisions with different needs, and thus also need more tools.

When it comes to the number of tools, we found that specific industries; the finance and Public Sector, are negative correlated with the number of tools, but also that entity size explains the number of tools used when accounting for outliers in these industries. This may be interpreted as support for the framework of Draft and MacIntosh (1978). On the other hand, the number of tools did not have any impact on profitability. This is somewhat unexpected, as we would expect to see that entities increase the number of tools in order to increase sources for information, and thus improve decision making and profitability. In addition to this causal relation, we would also expect a result from profitable entities having more resources, thus enabling them to increase the number of tools, which also would be appear as significant positive correlations. On the contrary, we found that the number of tools have no impact on profitability. One may interpret this as quality in tools being more important than quantity. It may also be that the entities already use a high number of tools, and that our model do not catch the benefit from going from below average up to average number of tools, simply due to our distribution of respondents, which we also discussed in a statistical view in section 5.2.5.

One of the key recommendations from Wallander's (1999) book is to keep it simple, focusing on quality rather than quantity. Draft and MacIntosh (1978) state that larger entities should use more tools, in addition to focus on quality. Our findings support Wallander's hypothesis to some extent, and questions the hypothesis of Draft and MacIntosh, where there is no certain positive impact on profitability through using a high number of tools. On the other hand, we can not say that using a higher number of tools is negative through our findings; thus, it may be true for some entities, and not for others. One reason for these findings may be that entities already are using a high number of tools, on average, 21 tools. Increasing the number of tools beyond this may not give an increase in benefits through more information. Our respondents vary from using five tools up to 30 tools. It may be that in reality, using 1-4 tools is negative for profitability, while the increase from 5 up to 30 is less beneficiary for each increased step, thus indicating a concave return from using more tools. Our data would not necessarily catch this effect, simply due to not having enough respondents using that few tools, in addition to using linear regression.

For use and utility, we found that some tools are significantly correlated with entity size. Yet, only a small portion of our 30 tools were found to have a significant correlation with entity size

in regards to use. Following the arguments above, we would expect to see a tendency that advanced tools were positive correlated with entity size. The use of Total Performance Scorecard and transfer pricing have a significant positive correlation with size, while this is not the case for Activity-Based Costing (ABC) and Business Process Re-engineering[2], often seen as complex and advanced tools.

Bjørnenak (2013a) specifically reported that Balanced Scorecard (BSC) and ABC are significantly correlated with entity size. What we find is a positive correlation for ABC, and in fact a negative correlation for BSC, although, none of these correlations are significant. Where Bjørnenak studied only banks, we are looking at several industries, which may affect our results. In table B.1, we see that ABC is used less than average by entities in the finance industry, which again are typically associated with larger entity size, see figure 5.6 on page 78. For BSC, we see in table B.5, that there is no significant difference in the percentage of users in the finance industry against other industries. These results mean that we can not conclude that Bjørnenak's findings in the banking industry is transferable to other industries.

Researchers have argued that the use of traditional budgeting tools is mainly dependent on the structure and degree of uncertainty the entity experience in its environment (Bruns & Waterhouse, 1971; Neely et al., 2003). From our data, we find no final support for this. The internally focused budgeting tools are all used to the approximately same degree of entities in all industries, although entities in all industries are less satisfied with these tools compared to other tools. As discussed earlier, this might be a result of possible biased or non-representative survey responses for the budgeting tools. For the forecasting budgeting tools, on the other hand, we see a clear tendency that industries in the Public Sector use these tools far less than other industries, see table B.3 in the appendix on page 150. Following the arguments of Kennedy and Affleck-Graves (2001) that the Public Sector is seen as non-profit, and in stable environments, we interpret these results as support for L. A. Gordon and Narayanan (1984). A more stable environment lead to ex-post information-based tools. On the other hand, we are cautious in concluding that this is true for all tools.

We also find support for the three dimensional framework proposed by L. A. Gordon and Narayanan (1984) for the part focusing on internal versus external information. Benchmarking, an external information based tool, is used far less in the Public Sector than in other sectors. This is also the case for market-sensitive pricing and Segmental Pricing. One of the key ideas of BSC is the focus on non-financial information. Following the three dimensional framework, entities in un-

[2]Tools that literature state as complex, or that our respondents have deemed too resource demanding or time demanding.

certain environments tend to choose tools with more non-financial measures. This is supported through BSC being used least by the Public Sector. One reason for this might be that uncertain environments lead to the management wanting more information, and should also be seen as linked with the two other framework dimensions, external information, and ex-ante information. Even though we find support for their framework, it is also worth mentioning that we find tendencies that this framework does not explain and that our research design is not primarily focusing on this framework.

6.2 Management Accounting Tools and Profitability

6.2.1 Costing Tools

Job, Batch, Process or Contract costing

Among the costing tools, we found that Job, Batch, Process or Contract costing has both a positive cost-efficiency effect and a positive revenue effect. Following this, we expect to find that entities using this tool has higher return on revenue (ROR), return on equity (ROE) and return on assets (ROA). In fact, this is the tool with the highest number of models indicating acceptance of our hypothesis. The users of this tool do not report having a significantly higher degree of utility, and they are not using this tool significantly more than other tools.

To some extent, these are unexpected results. The literature does not focus heavily on Job, Batch, Process or Contract costing as a specific tool, and we would also expect to see that a tool with clear indications of positive association with profitability would have higher than average degree of utility. One reason for this lack of focus may be that this is not seen as one tool, but rather as a technique, or even several techniques. Following this, each entity may use the technique differently, and thus not be an appropriate tool for literature. As for the average score on utility, this may a result of entities feeling that this tool is resource or time demanding, reducing their subjective evaluation of utility, yet this is not proven from our survey in table 5.5. Another reason for this difference may be that entities are not able to see which tool that increases profitability, or even how they might do so. We argue that this is due to the high uncertainty regarding causal effects. Even though we find that Job, Batch, Process or Contract costing is associated with profitability, this is not necessarily the same as saying that entities should expect increased profits when implementing this tool.

Activity-Based Costing

In chapter 5, we find no support for ABC being associated with profitability, either positive or negative. This is somewhat an unexpected result. Through the arguments of R. Cooper and Kaplan (1992) we would expect to see that ABC yields a cost-efficient advantage, due to more relevant cost measures. The idea behind ABC is to increase the relevance of cost measures, thus increasing profits through cost.

One reason for this unexpected result is that research on ABC may be impacted by research design and method. Where both Kennedy and Affleck-Graves (2001) and L. A. Gordon and Silvester (1999) used firm value as dependent variable, we followed Cagwin and Bouwman's (2002) approach, and used internal financial measures. It is then interesting to see that our conclusion is not the same as (Cagwin & Bouwman, 2002), but closer to the findings of L. A. Gordon and Silvester.

Even though the result was unexpected, it did not contradict the previous literature in the sense of ABC decreasing profitability. This may be interpreted as indications of ABC not having any impact on profitability, or it may be interpreted as uncertainty due to ABC being a complex and advanced tool to implement. One implication of this complexity is that entities not using ABC properly may not receive the benefits from the tool. One area of ABC where this might be the case is the cost of unused capacity. If entities do not take this into considerations, ABC will lose many of its benefits. Entities may even find themselves in a *death spiral*, also called a *downward demand spiral*, where products are repeatedly eliminated due to cost allocation on volume rather than their root causes. In this case, we might even find that ABC is associated negative with profitability, thus impacting our results.

6.2.2 Pricing Tools

For pricing tools, we were not able to conclude on any tool having a significant impact on profitability through our models. In general, this is due to the statistical uncertainty regarding our results, but may also be interpreted as actual results among entities. The entities included in our survey operate in different industries, thus making each specific tool more or less relevant. For the Public Sector, market-sensitive pricing might not be an appropriate tool, while the finance industry might benefit from using Segmental Pricing. Following this, the results may be interpreted as these tools not having a significant impact on profitability between industries, yet there might be impacts on profitability within the specific industries, which our models are not

focusing on. To summarize, our results do not reject the hypotheses of these tools being associated with profitability; thus, we can not conclude on any effect, positive or negative.

6.2.3 Budgeting Tools

From chapter 5 we do not find support for the Budgeting Bureaucratic Complex proposed by Wallander (1995). Neither of Incremental Budgeting, Flexible Budgeting, or zero-based budgeting have a significant effect on profitability from our analyses, ref section 5.3.1. The respondents from our survey are less satisfied with these tools than any other tools, where they on average 44%[3] report having poor or terrible[4] utility from these tools. Yet, these are used by a relative high percentage of our respondents, ref figure 5.1 on page 67. Libby and Lindsay (2010) found that the beyond budgeting movement may be over-generalized in its assumptions. We find a significantly higher number of dissatisfied entities than their findings. Bjørnenak (2013a) reported that Norwegian banks were overall highly satisfied with budgets. Looking at only the finance industry, we see that these budgeting tools score higher than average for all industries on utility. This may indicate support of Bjørnenak's findings, but due to a few users of these tools in the finance industry, we can not conclude on the finance industry alone with certainty for these tools.

The entities that do not use the budgeting tools in question seem not to have answered any specific reason for why these are not used. Following Hope and Fraser (2003) and Neely et al. (2003) we would expect respondents to answer that these tools were either too time demanding, or too resource demanding. Our results support no such conclusion. One reason may be that the users that do not use budgets have not experienced these issues, and are therefore not able to answer with confidence that they either are too time demanding or resource demanding. Another reason may be that budgeting actually has none of these weaknesses, thus following Libby and Lindsay (2010), yet the low utility does not support this to the full extent.

In table 5.6, we have computed the Pearson correlation between values for use and utility against entity size. For Incremental Budgeting, Flexible Budgeting, and zero-based budgeting, we find negative correlations for all tools. Neither of these correlations is significant on the 10% level, and we can not conclude on size explaining either use or utility.

For Rolling Forecast, we actually see a significant negative correlation between size and utility

[3] Incremental Budgeting: 36%, Flexible Budgeting: 44%, zero-based budgeting: 50%

[4] On the following scale: terrible - poor - average - good- excellent.

on the 1% level. As we saw in chapter 5, Rolling Forecast is associated with positive profitability. Even so, larger entities tend to be less satisfied with Rolling Forecasts. One reason for this might be the complexity of these large entities, thus not being applicable to use Rolling Forecast as it is meant to be used.

One problem with our results is that we might not have representative data for budgeting tools. When looking at the number of entities using the budgeting tools[5] we find different results than previous research, to such a degree that we have to question our results. For the finance industry these budgeting tools are used by 17-33% of our respondents, ref table B.3 on page 150, while Bjørnenak (2013a) reports 89% users. This may be interpreted as highly contradicting results, but may also be an indication of biased data. One reason for this difference might be our choice in terms, where the specific tools may not be known by respondents, or that they, in fact, use budgets, but feel that these terms do not cover their process. We also see that respondents answer that they do not have enough knowledge of these tools, thus not being implemented, see table 5.5. Budgets are often well studied, and since we mainly have CFOs as respondents, which arguably know budgets, we question the validity of our data regarding Incremental Budgeting, zero-based budget, and Flexible Budgeting.

To summarize, we find no support for the Budgeting Bureaucratic Complex proposed by Wallander (1995), later developed by the beyond budgeting movement. The movement has been criticized for being too over-generalizing for the average firm, not considering that entities adapt to uncertainty and how often entities revise their budgets (Libby & Lindsay, 2010). We do not support this argument to the full extent, mainly due to uncertainty in our data. What we do find is that budgets tend to score low in utility, and are used by few entities, yet these have no clear reason for not using budgets.

6.2.4 Profit Analysis Tools

Within the profit analysis tools, we conclude with some uncertainty that Customer Profitability Analysis has a positive impact on profitability. We rejected the hypothesis of the specific tools being associated with profitability for two tools, Product/Service Profitability Analysis and Breakeven, while we were not able to conclude on this hypothesis for Relevant Costing for Decisions.

[5] Focusing only on Incremental Budgeting, zero-based budgeting and Flexible Budgeting.

Customer Profitability Analysis

For Customer Profitability Analysis, we found a positive advantage through asset turnover ratio (ATR) for entities using this tool. In an economic view, this may be interpreted as a revenue advantage, where entities using the tool are expected to receive a higher asset turnover ratio. Yet, due to the uncertainty in the result, we can not say that this is what we expect to find in the population.

Both the uncertainty and the indication of positive impact are not unexpected results. Customer Profitability Analysis has been the focus of academia in decades, where literature seems to agree that the tool has a positive impact on profitability. Even so, the literature lacks empirical evidence through quantitative analysis, with some exceptions. One reason for this may be the fact that Customer Profitability Analysis yields uncertainty in the results, and that results are affected through the measure of profitability, in addition to the research method and design. One reason for this may be that Customer profitability is dependent on measuring the cost of customers, and thus increasing the number of ways to perform this analysis. In chapter 5 we found that Customer Profitability Analysis is positive correlated with several tools, see figure 5.5. This may be interpreted as Customer Profitability Analysis is highly dependent on other tools, and even that our result may be explained through these tools also have a positive impact on ATR, yet neither of these is concluded having a significant impact on ATR. Another implication may be that for Customer Profitability Analysis having a positive impact on profitability, it has to be bundled together with other specific tools, which may differ between industries.

6.2.5 Performance Management Tools

For performance management tools, we find that three tools have a significant positive impact on profitability. Comparing this category to the other four categories, it is unexpected to see that several tools have this significant impact, where our results tend to reject more hypotheses than accept for each category. One interpretation of this may be that management is better of focusing on measuring performance than costing, pricing, budgeting, or profit. On the other hand, we do not have enough tools in each category to conclude that this is the case for the population of MATs, just that this represents an indication.

Benchmarking

Benchmarking is by definition used to compare own performance to a gold standard, and therefore we expect to find that entities using this tool are more cost-efficient than others. What we find is that Benchmarking has a positive impact on both resource and margin advantage, which are closely tied together. Through a margin advantage, entities do experience higher ROR than the industry average; thus our conclusion is that Benchmarking is fulfilling its promises and that it indeed does have a positive impact on profitability through cost-efficiency.

In table 5.6, we see that the use of Benchmarking is significantly positively correlated with the size of the entity. This is somewhat expected, as larger entities may see this tool as necessary, but also use Benchmarking for several purposes. This correlation may also impact our results in regards to profitability. The fact that Benchmarking is correlated with entity size may also mean that the impact on cost-efficiency comes from this correlation, rather than Benchmarking having this impact on its own. Following this argument to the full extent, smaller entities cannot expect an increase in profitability through using Benchmarking, as it is the size that impact cost-efficiency, and not the tool itself. On the other hand, our regression models have been fitted to overcome the problems with dependent variables; thus, the correlation between size and Benchmarking should not be a direct problem.

Following the correlation plot in figure 5.5 on page 74, we also saw that Benchmarking has a significant positive correlation with Customer Profitability Analysis, which also find that this tool is correlated with size. This may in fact explain way both of these tools are correlated with profitability, and with each other. One might argue that larger entities also are more cost-efficient, and therefor is associated with cost advantages against smaller entities. Following that larger entities use Benchmarking and Customer Profitability Analysis more than other, these tools will also be associated with profitability. On the other hand, we have included size as a control variable in our regressions, and find no significant correlation between Benchmarking and size, to the extent of violated generalized least squares (GLS) assumptions. Even so, we make it clear that the correlation with profitability for Benchmarking, and Customer Profitability Analysis, may be due to unobserved factors outside our model.

Balanced scorecard

Our findings state that BSC have a significant impact on profitability through a resource advantage, ROR, and ROE. The results are expected, yet we would expect to find that BSC impacted

either margin or ATR advantage, in addition to resource advantage. What we do find is that BSC impact only resource advantage, meaning that we can not conclude on BSC having either an advantage through cost-efficiency or higher revenues.

Our findings contribute to previous research by not being specified to one specific version of BSC, yet this also increases the uncertainty of our results. BSC has been argued as being a highly dynamic tool, often used different between entities and industries. As a result, BSC may have an impact on profitability in one entity, and not in others, only due to how management implement and use this tool. This may, in fact, strengthen our conclusion, where we do not take these implications into account in our models. If entities use BSC different, entities using unfavorable versions may impact our results. What we do find, on the other hand, is that BSC has a positive impact on profitability, regardless of versions used. On the other hand, entities should not expect to increase profitability by simply implementing BSC. This is both due to the multiple different versions, but also due to our findings not stating any causal effects on profitability.

6.3 Section Summary

First, we discussed our tool categories. Categories considered to be the most and least popular for the majority of industries displayed a significant variation in popularity between industries. Despite the temptation to attribute these popularity differences to the characteristics of the particular industries, our data did not grant this opportunity. An interesting observation is that the tool categories that are the most and least popular overall are not coherently represented among the five top and bottom popular tools. This implies that there are tools in other categories that are more and less popular than the category itself. Concerning the tools' popularity, one would expect that the uneven number of tools in each category could explain why some categories are more present in the top and bottom. Although, this does not appear to be the case. With regards to in-group differences, Performance management tools and Budgeting tools displays the most considerable variation in popularity. Pricing tools represents the least variation, also when only comparing the top four tools to another. Although, it is uncertain what this could further entail.

Second, we discussed our tools popularity, use, and utility. We observed that the most popular tools were not necessarily those with the highest degree of use and utility. We discussed that this discrepancy may represent an opportunity for the entities, but also that this does not necessarily indicate a problematic relationship. Although, if assuming that low popularity and a high corre-

sponding degree of use and utility represent an opportunity for entities, then Market-sensitive pricing and Rolling Forecast were especially relevant to be considered adopted. Furthermore, we saw that two common reasons why five most unpopular tools are not being used are that the entities do not have enough knowledge about the tool and that it has not been considered used. Moreover, when assessing the five tools with the lowest average use and utility combined, they display a near perfect coherence with their popularity. This differed compared to those at the top of the table when evaluating the same factors. An interpretation was that entities using the tools at the bottom find it easier to disregard tools that they perceived to have low value in terms of use and utility.

Third, we discussed the tools displaying a positive association with profitability. Here, we only find Benchmarking to be among the five most popular tools. Likewise, we only found Rolling Forecast among the top five in terms of average use and utility combined. This was somewhat surprising, and could imply that there are other factors than profitability that make entities wanting to adopt the tools that are on each of these top five lists.

Furthermore, for tools associated with profitability, we discussed the potential implications of their popularity, use, and utility. For tools with a surprisingly low degree of usage, this could suggest that entities can benefit more from using these tools to a higher degree. For tools with a surprisingly low utility, this may suggest that the entities are not fully aware of the effect they receive from using these tools. For the tools with surprisingly low popularity, this may suggest that entities can gain a comparative advantage of using these tools.

Fourth, we had a deeper discussion about the tools association with profitability on a more theoretical level. Most of the tools from our theory section yield results that are expected according to literature. However, some categories and tools gave unexpected results. We discussed that ABC might not be related to profitability due to outside factors that need to be present for this tool to be beneficial. It may also be due to ABC being a complex and advanced tool; thus, many entities may lose their benefits by using the wrong versions. The reason Pricing tools returned significant correlations, may be because these are relevant in specific industries and situations. The tools' hypotheses were invalidated due to high uncertainty. For Budgeting tools, we find no support for the Budgeting Bureaucratic Complex. This might be due to entities overcoming the weaknesses of budgeting, implying that the assumptions of the Beyond Budgeting movement are overrated. Although, respondents report budgeting tools to have utility below average, implying complications with the budgeting process. For the Profit analysis tools, we discussed why Customer Profitability Analysis returned what seems to be a revenue advantage. Some of

these tools are positively correlated with tools of other categories, such as Benchmarking, which may explain the relation to profitability. One issue with Customer Profitability is that it relies on other measures, and that also exists in various versions. Lastly, we argued that Benchmarking is correlated with entity size, as larger entities seem to use this tool in different situations. The correlation with entity size may also explain its relation with profitability, and with other tools such as Customer Profitability Analysis.

Chapter 7

Conclusion

7.1 Findings Summary

In this thesis, we sought to answer the following two research questions

1. What are the use and utility of management accounting tools in large Norwegian entities today?
2. How are management accounting tools associated with profitability in large Norwegian entities?

7.1.1 Research Question 1 - Use and Utility

For our first research question we have examined the popularity, use and utility of our management accounting tools (MATs) and tool categories. With regards to these factors, our categories were also studied by industry. Furthermore, we analysed the interrelation between tools based on their usage. Finally, we studied the reasons for why specific tools were not used. For our industries, we have only displayed which tendencies we seem to have uncovered, as our limited number of responses render us inconclusive. Our results are thereby summarised as follows.

Profit analysis tools is the most popular category across most industries and rank highest in terms of use and utility. Performance management tools is the least popular category in the majority of our industries and is the only category ranking below average in use and utility. For categories above average; Pricing tools ranks first in use, but third in utility. Costing tools ranks second in use, but fourth in utility. Budgeting tools ranks third in use and second in utility.

It would seem that our tool categories have the highest and lowest use and utility in the following industries. Profit analysis tools have the highest use and utility in General services. Performance management tools have the highest use and utility in Trade. Pricing tools have the highest usage in Other, but the highest utility in General services. Costing tools have the highest usage in Manufacturing, but the highest utility in Construction. Budgeting tools have the highest usage in Other, but the highest utility in Construction. In contrast, Budgeting tools have the lowest use and utility in Finance & insurance. Costing tools have the lowest use in Finance & insurance but have the lowest utility in Public sector & Culture. All remaining categories have the lowest use and utility in Public sector & Culture.

Within each category, the following tools have the highest popularity, use, and utility. For Profit Analysis tools, Product service profitability analysis, and Breakeven respectively have the highest and lowest popularity, use, and utility. For Pricing tools, Cost plus pricing is the most popular tool, while the least popular is Market-sensitive pricing. Although, Market-sensitive pricing has both the highest use and utility, while transfer pricing has both the lowest use and utility. For Costing tools, Absorption costing has the highest popularity utility and use. Although, it is used equally as much as Overhead allocation and Variable costing. The least popular tool within this category is Job, Batch, Process, or Contract Costing. Furthermore, Activity-based calculation has the lowest use, and Variance analysis has the lowest utility within this category. For Budgeting tools, Cash forecasts are the most popular, Financial year forecast has the highest use, Rolling forecasts has the highest utility, while Zero-based budgets have the lowest popularity, use, and utility. For Performance Management tools, Benchmarking has the highest popularity, use, and utility, while Six sigma has the lowest popularity, use, and utility.

Regardless of which category the tools belong to the following tools have the highest popularity, use, and utility. The five most popular tools are Benchmarking, Cash forecast, Product/service profitability analysis, Financial year forecasts, and Relevant costing for decisions. The five least popular tools Job, batch, process, or contract costing Incremental budgeting Value mapping Zero based budgets Six sigma. The five most used tool are Financial year forecast, Cash forecast, Market sensitive pricing, Rolling forecast, and Product/service profitability analysis.

The five least used tools are Flexible budgeting, Business process re-engineering, Zero based budgets, Value mapping, and Six sigma. The five tools with the highest utility are Rolling forecast, Financial year forecast, Cash forecast, Product/service profitability analysis, and Customer profitability. The five tools with the lowest utility are Flexible budgeting, Breakeven, Business process re-engineering, Six sigma, and Zero based budgets. With regards to popularity, use, and utility, only Cash forecast, Product/service profitability analysis, and Financial year forecast are represented across the top five results. Likewise, only Zero based budgets and Six sigma are represented across the five bottom results.

In terms of correlated usage, we find a strong positive correlation is between Product/service profitability analysis and Customer profitability, and between Cash forecasts and Financial year forecasts. In contrast, a moderate negative correlation is found between Zero-based budgets and Financial year forecasts.

The three most common reasons listed by entities for not using our specific tools are, by order, that the tools have not been considered, that they do not have enough knowledge, and that tool is inapplicable to their industry. The proportion of which each of these reasons applies to the different tools tends to be correlated with the tools' popularity.

7.1.2 Research Question 2 - Profitability

For the second research question, we measured profitability using seven different measures; four absolute values, and three relative values. The argument behind this is threefold. First, our data consists of entities from multiple industries; thus, some absolute measures may not represent a relevant measure for specific industries. Second, entities aim to outperform their competitors on a daily basis; thus, relative measures may also say something about advantages, not just profitability. Third, we have chosen to include MATs from several different categories, which all impact different parts of the entity. Following this, we would not expect to see an advantage in cost-efficiency through a revenue-increasing tool, and vice versa, thus several measures are needed.

Through ordinary least squares (OLS) regressions, we concluded on the following 15 tools, where six are considered having a significant positive relation with profitability, and nine do not indicate such relation. The hypothesis for the remaining tools has no conclusion, due to uncertainty or contradicting results.

Table 7.1: Summary of our regression results. Tools with no conclusion are not represented in this table.

Tool	Advantages	Absolute measures
Hypothesis accepted		
Balanced Scorecard	Resource	ROR, ROE
Benchmarking	Resource, margin	ROA
Customer Profitability Analysis	ATR	ATR
Job, Batch, Process, or Contract Costing	Resource, margin	ROR, ROE, ROA
Rolling Forecast	Resource	ROR
Value Based Management	Resource	ROE, ROA
Hypothesis rejected		
Absorption Costing	None	None
Activity-Based Budgeting	None	None
Activity-Based Costing	None	None
Activity-Based Management	None	None
Breakeven	None	None
Flexible Budgeting	None	None
Product/Service Profitability Analysis	None	None
Variance Analysis	None	None
Zero-Based Budgets	None	None

For Costing tools, we found that Activity-Based Costing (ABC) had no significant connection with profitability. This result was somewhat unexpected, as this does not follow previous research to the full extent. On the other hand, some researchers conclude that ABC in fact, only are profitable when specific factors are present, which may explain our findings.

Overall, we find that none of the Pricing tools have a significant impact on profitability due to no significant results from our models. We conclude that this is due to our respondents operating in different industries, thus making the specific Pricing tools irrelevant for several entities. In this case, tools that may be profitable for some industries, may not be so for others, and thus not used. Pricing tools may have a significant impact on entities in the specific industries, yet among large Norwegian entities across industries, we conclude that neither have a significant impact on profitability.

In regards to the Budgeting Bureaucratic Complex, we find no support for this in our findings. Neither of the traditional Budgeting tools yielded significant negative correlations with profitability measures. Besides, we find no significant correlation on use and utility through entity size, meaning that budgets are used to the same extent in all entities, regardless of size, in addition to size not explaining the level of satisfaction. Our findings support previous literature stating that the beyond budgeting movement may be too over-generalizing and that entities seem to overcome the weaknesses of the budgeting process. On the other hand, budgets seem

to score lower on utility than other tools, either indicating that academia has affected managements' view on budgets, or that budgets yield little value to the entity.

Among the Profit Analysis tools, we found that only Customer Profitability Analysis has a significant impact on profitability, with positive coefficients. We conclude that using this tool is associated with a revenue advantage. On the other hand, Customer Profitability Analysis is correlated with several tools, in addition to entity size, which may explain the results from our regression models. This result may indicate that Customer Profitability Analysis has to be bundled with other tools in order to yield benefits, or that it is associated with profitability simply through larger entities using the tool more.

For Performance Management tools, we find that both Benchmarking and Balanced Scorecard (BSC) have a significant positive impact on profitability. As for Customer Profitability analysis, Benchmarking is correlated positively with entity size, meaning that larger entities use Benchmarking more than smaller entities. As a result, Benchmarking may be associated with profitability through this correlation, or other unobserved variables also correlated with both size and profitability. Even so, we conclude that Benchmarking is associated with profitability, yet we emphasize the uncertainty regarding causal effects.

Furthermore, we found a significant positive relation between BSC and profitability through several measures. This is an expected result, yet BSC has a tendency to be used different among industries and entities. As a result, we do not conclude that entities should expect an increase in profitability simply through implementing BSC, but that using the right version might be more important than just using BSC.

In general, our findings are not strong enough to conclude on any causal effects. Even though we find significant correlations through both OLS regression and Pearson's correlation coefficient, this is not the same as a cause and effect relation. We emphasize, therefore, that entities using the tools mentioned above are expected to perform better than others, yet implementing these tools may not necessarily increase profitability.

7.2 Further Implications

The discrepancy between the moderately popular tools, with an associated high degree of use and utility, may represent an opportunity for some entities. Adopting tools with such characteristics may serve as an competitive advantage. Two such tools are Market-sensitive pricing and

Rolling forecast. The common reasons for not adopting these tool suggest a potential for those who would consider it.

Entities who do not use any of our tools could benefit financially by applying Benchmarking, Balanced Scorecard, Rolling forecasts, Customer profitability, Value-Based management, Activity-based management, and Job, batch or process costing.

These entities could expect an unusually high utility by adopting Rolling forecasts, Customer profitability analysis, and Benchmarking. Of these, they could expect Rolling forecast to be used the most, and Benchmarking to have the highest utility per degree of usage. For entities who look to obtain a competitive financial edge may especially consider adopting Value-Based management given its low popularity. Also, Job, batch, and process or contract costing should be considered used, but is more susceptible to being inapplicable for specific industries.

Entities already using Job, Batch, Process or Contract Costing, Benchmarking, Balanced scorecard, and Value-Based management may benefit from investigating if they could be used more extensively. Also, those already using Job, Batch, Process or Contract Costing, Value-Based management, and Balanced scorecard could benefit from investigating if they receive the fully intended effect of using these tools.

7.3 Shortcomings

Through the research presented in this thesis, we have restricted our research questions to some extent. This has both been necessary in order to limit the scope of this thesis, and gain a relevant research topic. Regardless of research design and method, there will always be some restrictions to both findings and approach.

First of all, this thesis is based upon data that are collected through a questionnaire survey distributed to multiple individuals. We have chosen to use a Likert scale with five options. In reality, the actual answers and respondent's subjective view on questions are much more nuanced and complex than what we can measure through five options. This may also make respondents answer "Do not know" in cases where they are conflicted between two options. Thus; respondents might feel that they are answering the least wrong answer rather than the exact answer. Besides, one might question the intervals of the options; if the distances between each option are equal — especially when using OLS regression, where this might be a violated assumption. In addition to this, all options are up for interpretation from the respondents, and may therefore be inter-

preted different. Furthermore, surveys may lose important and relevant information through respondents not being able to explain and arguing for their answers. Our survey focused on questions with limited shortcomings in this regard. First of all, we attached specific statements to each option, deviated from using questions which might need further elaboration, and aimed to retrieve normally distributed variables through the formulation of questions. Furthermore, we have also gone through a substantial data cleaning process in order to search for outliers, fake data, biased results, and other problems arising through using a survey questionnaire.

Second, we have computed an active response rate[1] at 41%, and a total response rate at 19,8%. A questionnaire survey focusing mainly on management in large Norwegian entities, indicate the risk of quickly becoming unrepresentative for the population through self-selection. One might argue that respondents that are interested in our survey, also are those with higher knowledge on the research topic, thus indicating self-selection biases. We find that our survey data is considered reasonably representative of the population with regards to industry distribution, except for one moderate deviation for the manufacturing industry. The implication of this, is that average values for all industries may tend to lean more against the value for manufacturing entities, than for the population.

Third, this thesis is based on cross-sectional data, not including the time dimension for individuals. Including a time dimension would increase the information retrieved from the data, and may also make easier to investigate causal relations. As an implications, managers reading this thesis should not expect increased profitability simply through implementing the tools with positive relations to profitability. Although, they might be interpreted as indications of such effects for further research. Another implications, is that this thesis measure profitability based on average values over several years. Thus, our results may be affected through these years being non-representative for other years. In this case, our results would not be generalizing for other time periods.

Fourth, the findings presented through this thesis may indicate a problem with unobserved variables, where some tools are correlated with entity size and with each other, which again may be correlated with unobserved variables. This may be surpassed through other regression techniques, such as difference-in-difference, but this requires longitudinal data. Variables that correlated strongly with the dependent, and to some degree, the independent variable should be considered included. Even so, unobserved variables are just that, unobserved, and may in many cases not be possible to include. We could have included proxy measures for these unobserved

[1] See page 60 for computations.

variables, and so decrease the problems to some extent. We have chosen to include entity size and industry as control variables, often shown to work in some way as proxies. Especially the findings regarding profitability should be read with some scepticism; outside factors might explain the relations, or the lack of relations, between tools and profitability.

7.4 Further research

We recommend that further research focus on identifying variables that have to be present to prove a clearer relationship between specific MATs and an increase profitability. Primarily, we have shown that ABC may only be profitable when specific factors are present in the entity. Focusing more on the factors aligned for optimal use of tools may be a valuable contribution to the research on this topic. Consequently, this may decrease the problems with unobserved variables and facilitate more robust conclusion to be drawn.

Another topic would be focusing on causal effects, trying to find empirical evidence for a cause-and-effect relation. This research can be done either through studying use and utility over time, creating the basis for longitudinal data. In this case, one might use previously collected data, or have a time span longer than what is considered normal for a master thesis.

As this thesis is based on a time-specific survey, we have not discussed how our results may be affected through time. It might be that entities do not experience benefits in an implementation phase and that it takes, e.g., several years in order to see the effects. In additions, entities might need time to alter tools to fit their needs, thus taking years before the tool is perfectly fitted their entity. It may also be that entities experience benefits in the first years and that the benefits decrease due to slack or using tools different than the initial idea. The effect of phases and time have been focused on in the literature to some extent[2], but further research is necessary.

We found that some tools have a significant positive impact on profitability. For these tools, further research has to be performed in order to make any final conclusion on benefits actually received from implementing and using these tools. As an example, a research topic may be how these are used, and how the different version of these tools impact their relations with profitability.

In the view of trends and fashion, one possible further research is how MATs are communicated by academia, entities, and professional providers. We found for some tools that respondents

[2] See e.g., the proposed virus perspective (Røvik, 2011; Johanson & Madsen, 2018).

tend to be satisfied with their tools, regardless of our findings of the relations these tools have with profitability. This result must either be due to uncertainty regarding our findings, or that management value tools regardless of their benefits. Investigating how MATs are communicated, both internally and externally, might shed some light to these findings. It may also be that management are mentally locked to tools they already use, thus deceiving themselves to think that they experience benefits from the tools they are using.

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Appendix A

Additional Information

Nr.	Question	Reason for inclusion
Introduction		
1	What is the name of your entity?	Included to help identify and remove redundant responses. Also, the entity name provided by the respondent here replace the "[name of entity]"-bracket to achieve a personalizing effect.
2	In which industrial category does your entity operate?	Included for the option of studying industry-specific differences.
Section 1		
3	To what extent does [name of entity] use these *costing tools*?	Included to determine what tools the entity use, and to which extent they use them.
5	To what extent does [name of entity] use these *pricing tools*?	
6	To what extent does [name of entity] use these *budgeting tools*?	
7	To what extent does [name of entity] use these *profit analysis tools*?	
8	To what extent does [name of entity] use these *performance management tools*?	
Section 2		
9	Which level of utility does [name of entity] experience from using these tools?	The tools' utility helps us to better analyze their association with profitability. Also, we want to compare the tools' degree of utility to their degree of usage.
10		
Section 3		
11	When did [name of entity] implement these tools?	When analyzing our tool' connection to profitability we need to take into consideration that we only have financial data up to the year 2015. Knowing about the tool's time of implementation help us align our datasets, and thus analyze our data accurately, as well as knowing which tools the entities use today.

Section 4		
12	We have now presented the pricing and costing tools that [name of entity] does not use, or use to a little extent. What are the reasons that [name of entity] do not use these tools? Please note that you are now able to give multiple answers to each question.	Included to gain insights on the reasons for why certain tools are not being used.
13	We have now presented the budget, profit analysis, and performance measurement tools that [name of entity] does not use, or use to a little extent. What are the reasons that [name of entity] do not use these tools? Please note that you are now able to give multiple answers to each question.	
Background information		
14	How eligible did you feel to answer the questions in this survey?	The answer provided can help us eliminate uninformed responses.
15	How well do you feel that the answers you submitted in this survey represent your entity's true reality?	
16	What is your job title?	The job title provides us with a central characteristic of our respondents. It may also infer how suited some respondent were to answer our survey.
17	Did you miss any management accounting tools that are currently used by [name of entity]?	Can help us identify popular tools that we might have missed outside our presented selection of management accounting tools.
18	Do you wish to receive a report of our findings? To ensure total anonymity, please follow this link and submit your email: https://nhh.eu.qualtrics.com/jfe/form/SV_0Hs0dTT298EgHIh	Used to incentivize participation. Willing participants receive a finalized report by e-mail, which is kept separate from their response due to anonymity.
19	Do you have any last comments or remarks?	May provide useful insights that may supplement our analysis.

Table A.1: Translation of MATs

Nr.	English	Norwegian	References
	Costing tools	**Kostnadsestimering**	
1	Absorption costing	Selvkost	(Skaug & Aagenæs, 2010)
2	Activity based costing (ABC)	Aktivitetsbasert kalkulasjon (ABC)	(Bjørnenak, 2013b)
3	Job, batch, process or contract costing	Job, batch, process or contract costing	
4	Overhead allocation	Overhead allocation	
5	Standard costing	Standardkost	(O. B. Hansen, 2006)
6	Variable costing	Bidragsmetoden	(Skaug & Aagenæs, 2010)
7	Variance analysis	Avviksanalyse	(Skaug & Aagenæs, 2010)
	Pricing tools	**Prising**	
8	Cost-plus pricing	Kost-pluss prising	(Eikrem, 2005)
9	Market sensitive pricing	Market sensitive pricing	
10	Segmental pricing	Prissegmentering	(Silkoset, 2010)
11	Transfer pricing	Internprising	(Skaug & Aagenæs, 2010)
	Budgeting tools	**Budsjettering**	
12	Activity based budgeting	Aktivitetsbasert budsjettering	(Skaug & Aagenæs, 2010)
13	Cash forecast	Likviditetsprognoser	(NorgesBank, 2015)
14	Financial year forecast	Financial year forecast	
15	Flexible budgeting	Fleksibel budsjettering	(Johanson & Madsen, 2013)
16	Incremental budgeting	Inkrementell budsjettering	(Lederkilden, 2018)
17	Rolling forecast	Rullerende prognoser	(Andreassen & Bjørnenak, 2018)
18	Zero based budgets	Zero based budgets	
	Profit analysis tools	**Lønnsomhetsanalyse**	
19	Breakeven	Nullpunktsanalyse	(Skaug & Aagenæs, 2010)
20	Customer profitability	Kundelønnsomhetsanalyse	(Hoff, 2016)
21	Product/service profitability analysis	Lønnsomhetsanalyse på produkt-/servicenivå	(Hoff, 2016)
22	Relevant costing for decisions	Beslutningsrelevante kostander	(Hoff & Helbæk, 2016)
	Performance management tools	**Prestasjonsanalyse**	
23	Activity based management	Aktivitetsbasert ledelse	(O. B. Hansen, 2006)
24	Balanced scorecard	Balansert målstyring	(Skaug & Aagenæs, 2010)
25	Benchmarking	Benchmarking	
26	Business process re-engineering	Prosessorganisering	(Moltu, 2003)
27	Six sigma	Six sigma	
28	Total performance scorecard	Total performance scorecard	
29	Value based management	Verdibasert ledelse	(Hoff, 2016)
30	Value mapping	Value mapping	

Bjørn Daniel Johanson
Helleveien 30
5045 BERGEN

Vår dato: 01.06.2018 Vår ref: 60756 / 4 / EPA Deres dato: Deres ref:

Vurdering fra NSD Personvernombudet for forskning § 31

Personvernombudet for forskning viser til meldeskjema mottatt 12.05.2018 for prosjektet:

60756	*An analysis of management tools' significance for large Norwegian entities in a profit perspective*
Behandlingsansvarlig	*Norges Handelshøyskole, ved institusjonens øverste leder*
Daglig ansvarlig	*Bjørn Daniel Johanson*
Student	*John Olav Berg*

Vurdering

Etter gjennomgang av opplysningene i meldeskjemaet og øvrig dokumentasjon finner vi at prosjektet er meldepliktig og at personopplysningene som blir samlet inn i dette prosjektet er regulert av personopplysningsloven § 31. På den neste siden er vår vurdering av prosjektopplegget slik det er meldt til oss. Du kan nå gå i gang med å behandle personopplysninger.

Vilkår for vår anbefaling

Vår anbefaling forutsetter at du gjennomfører prosjektet i tråd med:

- opplysningene gitt i meldeskjemaet og øvrig dokumentasjon
- vår prosjektvurdering, se side 2
- eventuell korrespondanse med oss

Vi forutsetter at du ikke innhenter sensitive personopplysninger.

Meld fra hvis du gjør vesentlige endringer i prosjektet

Dersom prosjektet endrer seg, kan det være nødvendig å sende inn endringsmelding. På våre nettsider finner du svar på hvilke endringer du må melde, samt endringsskjema.

Opplysninger om prosjektet blir lagt ut på våre nettsider og i Meldingsarkivet

Vi har lagt ut opplysninger om prosjektet på nettsidene våre. Alle våre institusjoner har også tilgang til egne prosjekter i Meldingsarkivet.

Vi tar kontakt om status for behandling av personopplysninger ved prosjektslutt

Informasjonsskriv

Bergen, 2018

Forespørsel om deltakelse i forskningsprosjekt om styringsverktøy

Bakgrunn og formål
Denne studien er en del av masterutredningen ved Norges Handelshøyskole (NHH). Formålet er å undersøke den økonomiske effekten av ulike styringsverktøy som brukes i store norske foretak. Svarene som ditt selskap avgir i spørreskjema vil videre bli analysert opp mot regnskapsdata som er innhentet og bearbeidet av Samfunns- og næringslivsforskning (SNF) ved NHH. Når rapporten er ferdigstilt vil dere kunne få resultatene tilsendt. Ettersom deres selskap tilfredsstiller våre spesifikke krav til deltagelse, er *ditt bidrag svært verdifullt for oss!*

Hva innebærer deltakelse i studien?
Gitt styringsverktøyene som benyttes av deres selskap, innebærer deltagelse å svare på spørsmål om:

1. Bruksgraden
2. Nytteverdien
3. Implementeringstidspunkt
4. Årsaken til at enkelte verktøy ikke benyttes

Vi anslår at spørreundersøkelsen vil ta omtrent **9 - 12 minutter** å gjennomføre.

Hva skjer med informasjonen om deg?
Alle opplysninger vil bli behandlet konfidensielt. Det er kun prosjektgruppen som har adgang til dataene, som innebærer oppgavens medforfattere, veileder og daglig prosjektansvarlig. Dataene vil lagres og beskyttes av spørreskjematjenesten *qualtrics* under datainnsamlingens omfang, og videre sikkerhetslagres av *Google cloud plattform* under oppgavens utredelse. Dataene anonymiseres i publikasjoner ved at analysene utføres på et aggregert nivå.

Dataene anonymiseres innen prosjektslutt: 20.12.2018

Frivillig deltakelse
Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysningene om deg bli anonymisert.

Dersom du har spørsmål om studien, ta kontakt en av våre medforfattere i prosjektgruppen og vi vil besvare din henvendelse snart vi har rådighet.

Studien er meldt til personvernombudet for forsking, NSD – Norsk senter for forskningsdata (ref: 60756)

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Appendix B

Tables and Graphs

Table B.1: Summarize of percentage users in all industries for costing tools, as well as for the entire sample.

	General services	Manufacturing industries	Other	Construction	Public sector/ culture	Trade	Finance, insurance	Energy/Water/. Sewage/util.	All industries
Variance analysis	78%	73%	62%	38%	25%	57%	33%	50%	57%
Overhead allocation	89%	86%	92%	75%	62%	86%	83%	75%	83%
Standard costing	78%	91%	85%	75%	50%	64%	67%	50%	74%
Absorption costing	89%	86%	85%	88%	75%	79%	83%	100%	85%
Job, batch, process or contract costing	56%	55%	62%	38%	38%	57%	33%	62%	52%
Variable costing	67%	73%	69%	62%	38%	79%	50%	62%	66%
Activity based costing	67%	64%	69%	88%	50%	64%	50%	50%	64%

Table B.2: Summarize of percentage users in all industries for pricing tools, as well as for the entire sample.

	General services	Manufacturing industries	Other	Construction	Public sector/ culture	Trade	Finance, insurance	Energy/Water/. Sewage/util.	All industries
Cost plus pricing	78%	91%	92%	100%	50%	86%	17%	100%	82%
Market sensitive pricing	89%	77%	85%	88%	50%	71%	50%	75%	75%
Transfer pricing	67%	95%	85%	75%	62%	79%	67%	100%	82%
Segmental pricing	89%	73%	85%	88%	50%	79%	50%	88%	76%

Table B.3: Summarize of percentage users in all industries for budgeting tools, as well as for the entire sample.

	General services	Manufacturing industries	Other	Construction	Public sector/ culture	Trade	Finance, insurance	Energy/Water/. Sewage/util.	All industries
Financial year forecast	89%	91%	92%	88%	62%	100%	83%	100%	90%
Rolling forecast	100%	86%	92%	75%	75%	79%	50%	62%	81%
Cash forecast	89%	100%	85%	88%	75%	93%	83%	100%	91%
Incremental budgeting	67%	41%	46%	38%	38%	71%	17%	25%	45%
Zero based budgets	22%	36%	31%	62%	25%	50%	17%	38%	36%
Flexible budgeting	78%	45%	77%	75%	50%	57%	33%	62%	59%
Activity based budgeting	67%	68%	85%	88%	88%	71%	17%	75%	72%

Table B.4: Summarize of percentage users in all industries for profit analysis tools, as well as for the entire sample.

	General services	Manufacturing industries	Other	Construction	Public sector/ culture	Trade	Finance, insurance	Energy/Water/. Sewage/util.	All industries
Product/service profitability analysis	100%	95%	92%	88%	62%	100%	83%	88%	91%
Relevant costing for decisions	89%	91%	92%	88%	100%	86%	67%	75%	88%
Customer profitability	100%	86%	85%	75%	62%	86%	67%	62%	81%
Breakeven	89%	82%	85%	88%	25%	86%	50%	75%	76%

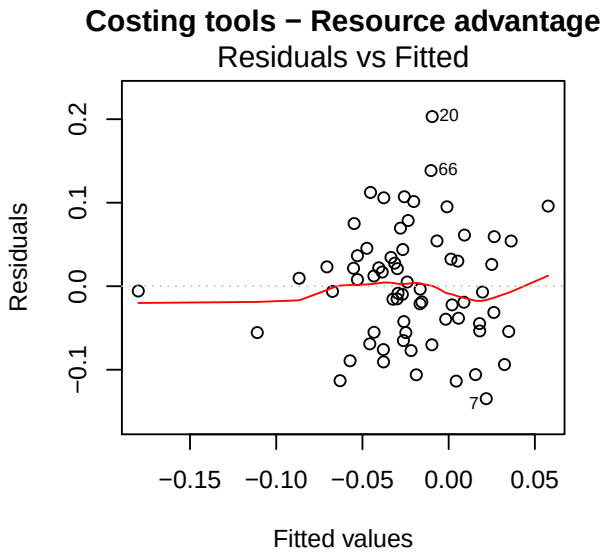
Table B.5: Summarize of percentage users in all industries for performance management tools, as well as for the entire sample.

	General services	Manufacturing industries	Other	Construction	Public sector/ culture	Trade	Finance, insurance	Energy/Water/. Sewage/util.	All industries
Balanced scorecard	78%	91%	92%	88%	62%	71%	83%	100%	84%
Business process re-engineering	44%	45%	69%	75%	25%	71%	33%	88%	57%
Activity based management	67%	73%	77%	88%	38%	86%	67%	75%	73%
Total performance scorecard	78%	68%	69%	62%	38%	79%	50%	75%	67%
Value based management	89%	73%	77%	75%	62%	93%	33%	62%	74%
Six sigma	22%	27%	46%	12%	25%	21%	17%	38%	27%
Value mapping	56%	41%	54%	25%	25%	57%	17%	50%	43%
Benchmarking	89%	91%	85%	100%	75%	100%	83%	100%	91%

Appendix C

Test Output OLS-Models

C.0.1 OLS-Models for Costing Tools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Residuals vs Fitted
Residuals
Fitted values
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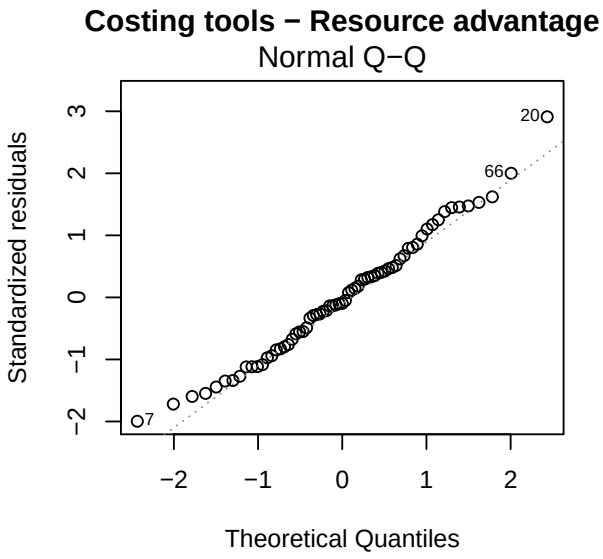
66
7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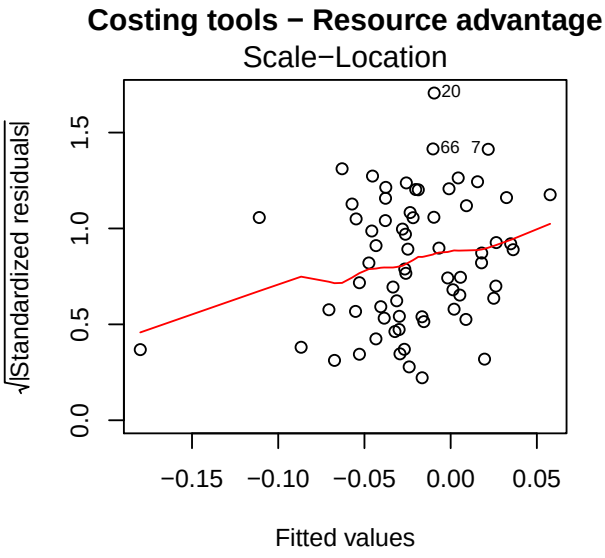
Normal Q−Q
Standardized residuals
Theoretical Quantiles
20
66
7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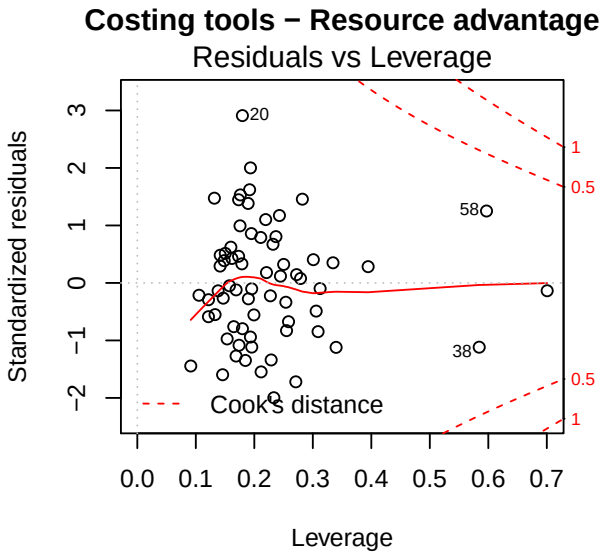
Scale−Location
√|Standardized residuals|
Fitted values
20
66
7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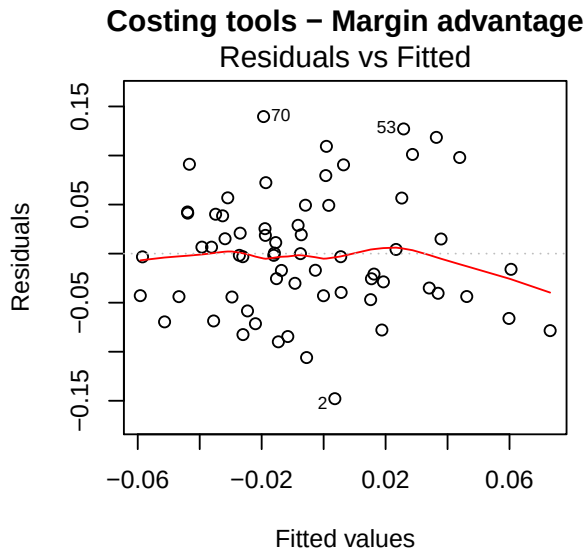
Standardized residuals
Leverage
Cook's distance
20
58
38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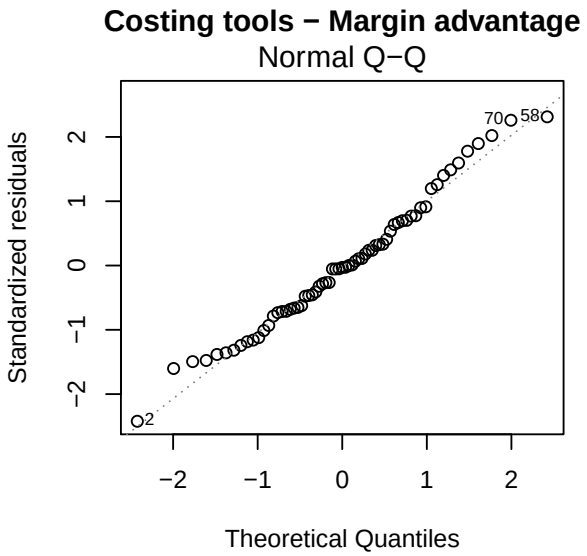
Costing tools − Margin advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
70
58
2
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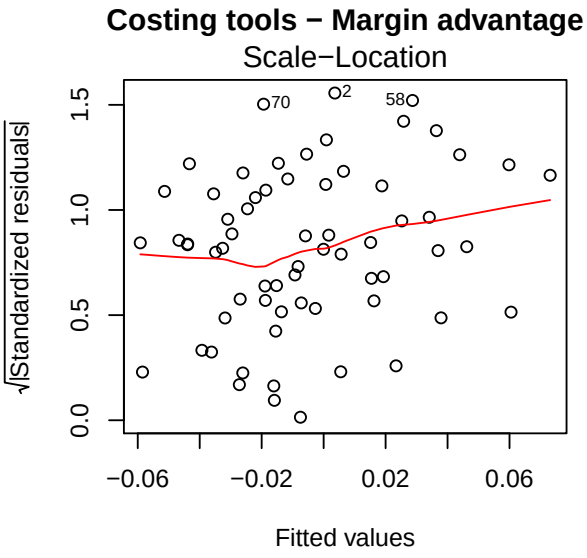
0
1
2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Scale−Location
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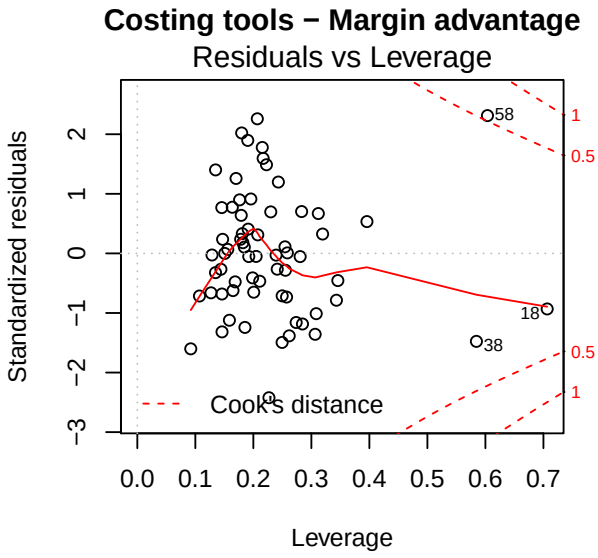
0.06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Standardized residuals
Leverage
Cook's distance
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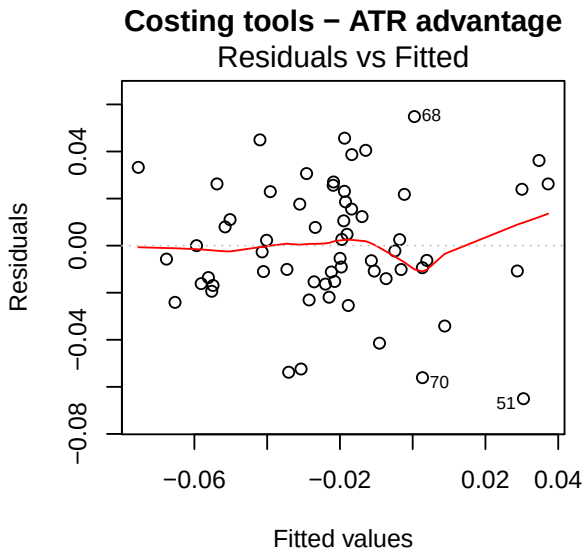
Costing tools − ATR advantage
Residuals vs Fitted
Residuals
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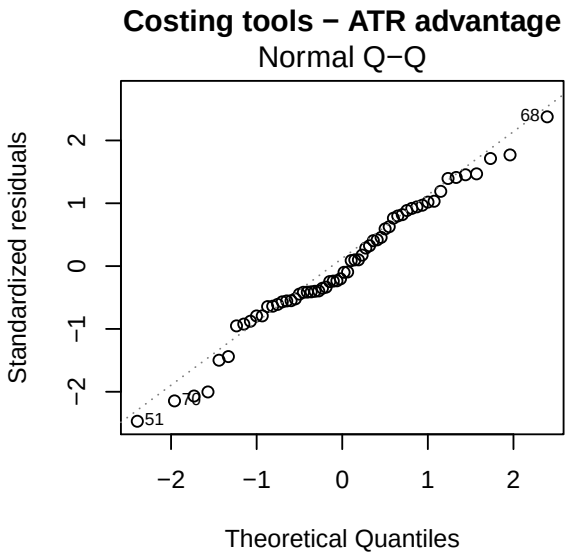
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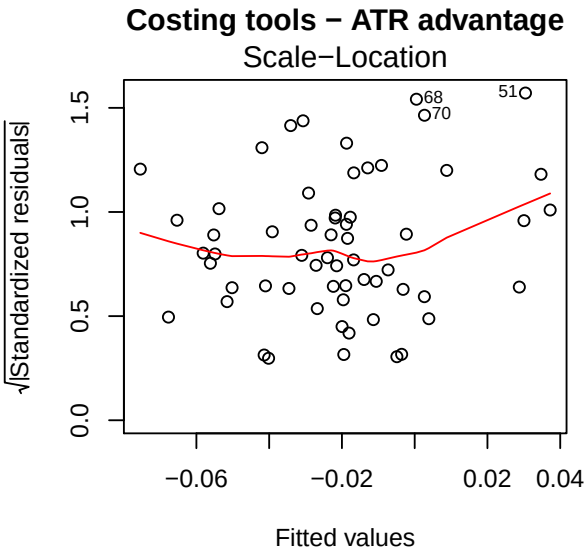
1
2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Scale−Location
√|Standardized residuals|
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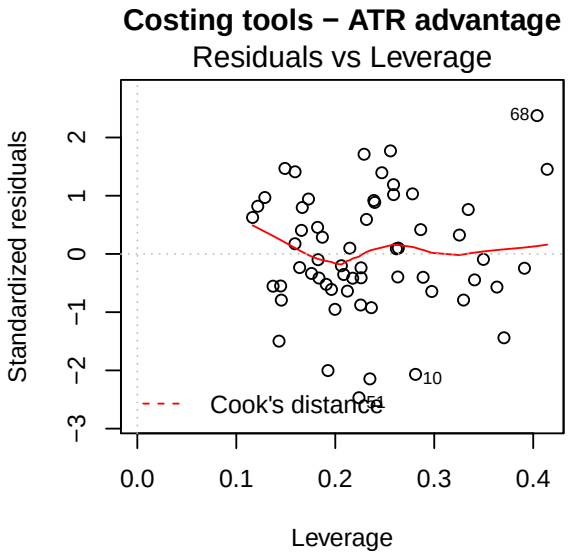
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Leverage
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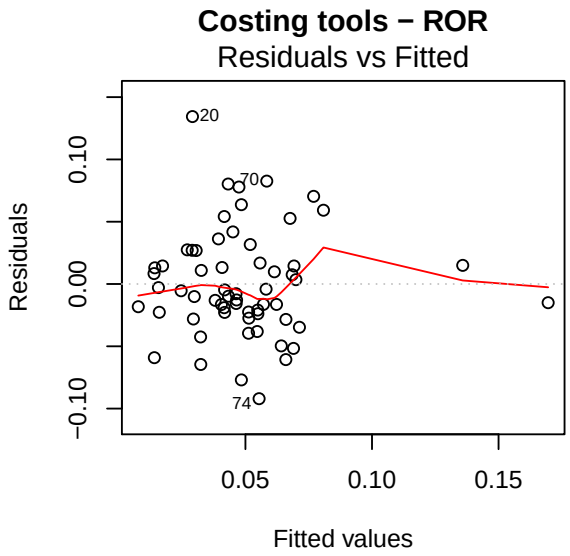
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Residuals
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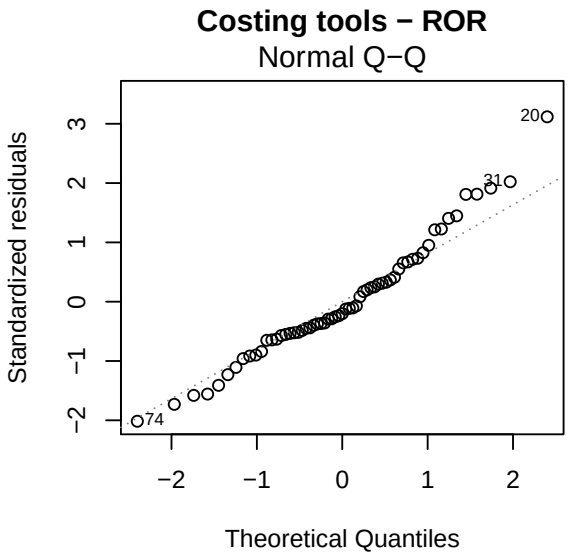
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Standardized residuals
Theoretical Quantiles
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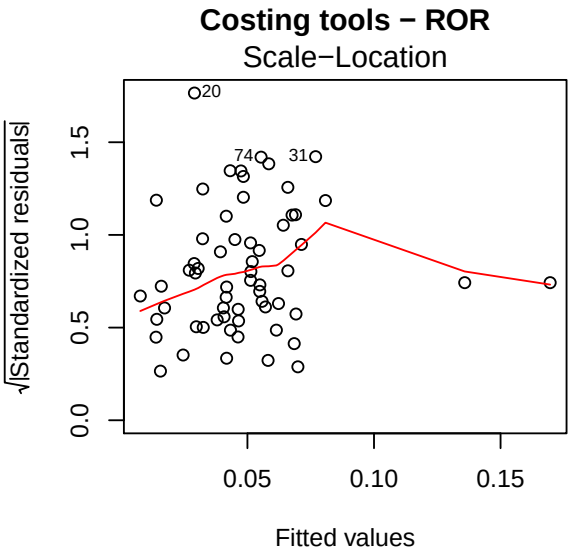
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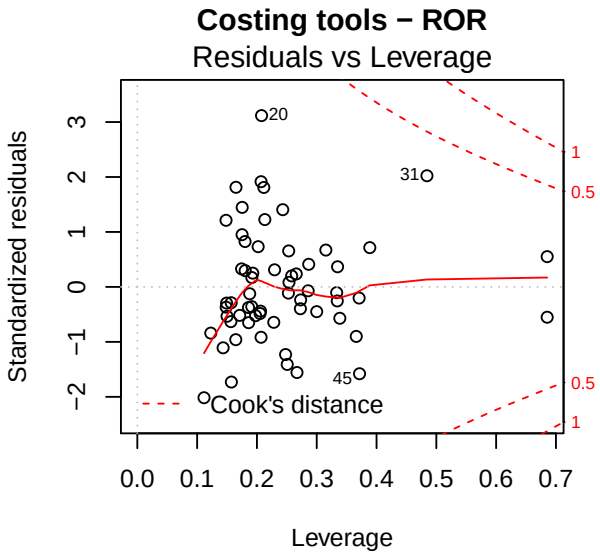
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Cook's distance
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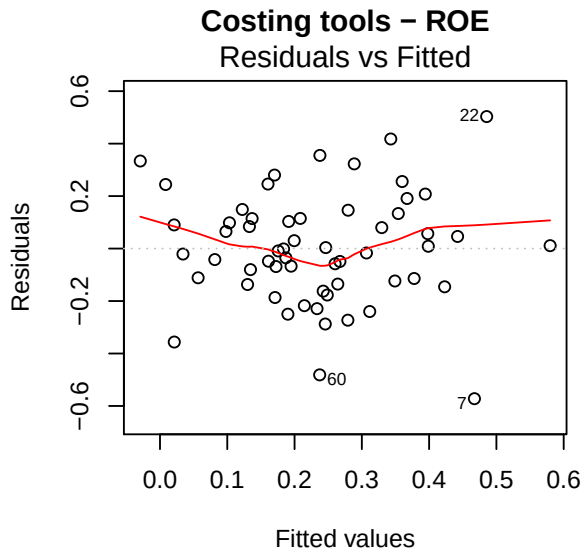
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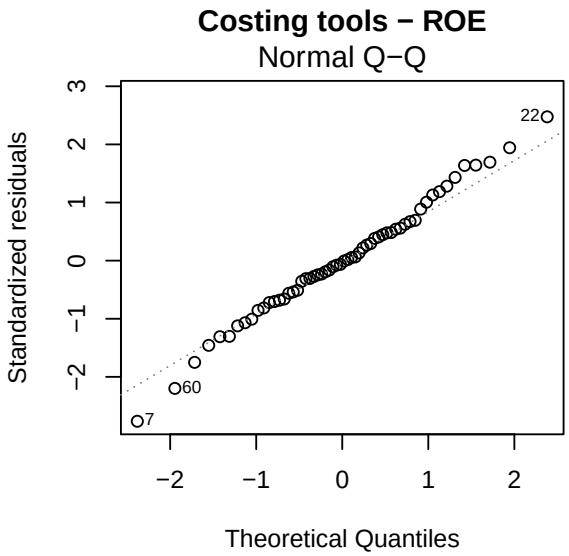
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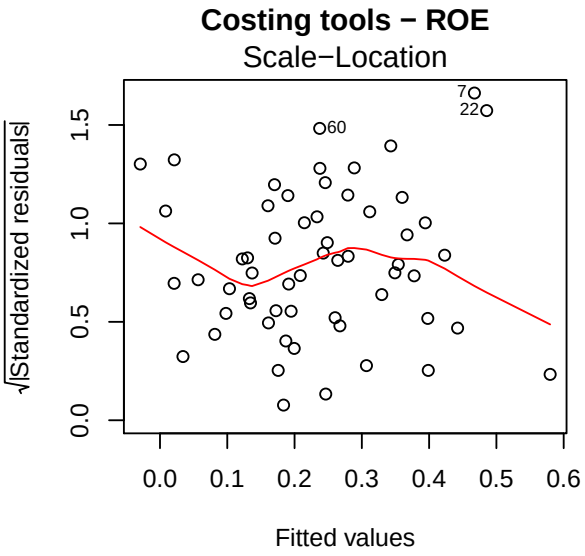
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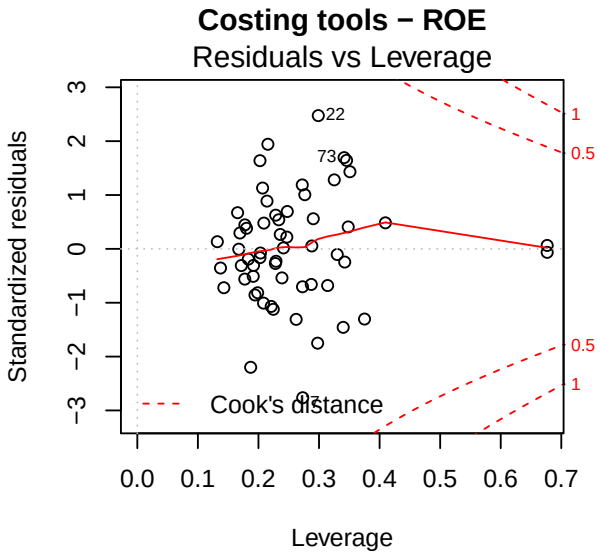
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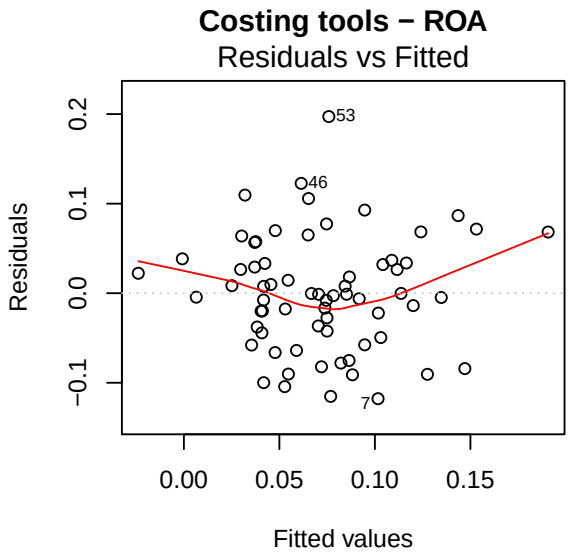
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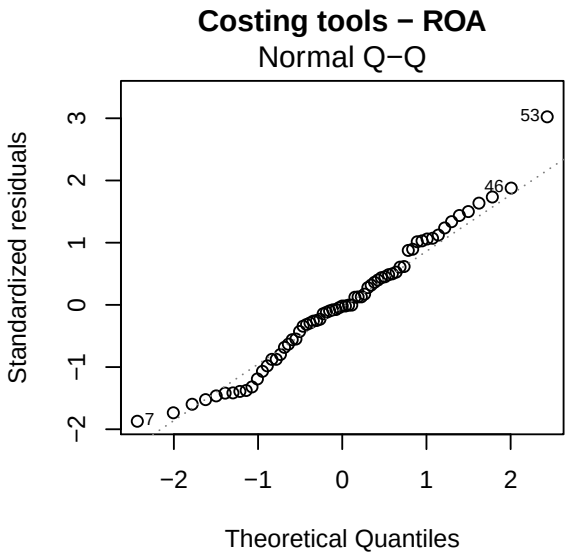
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Standardized residuals
Theoretical Quantiles
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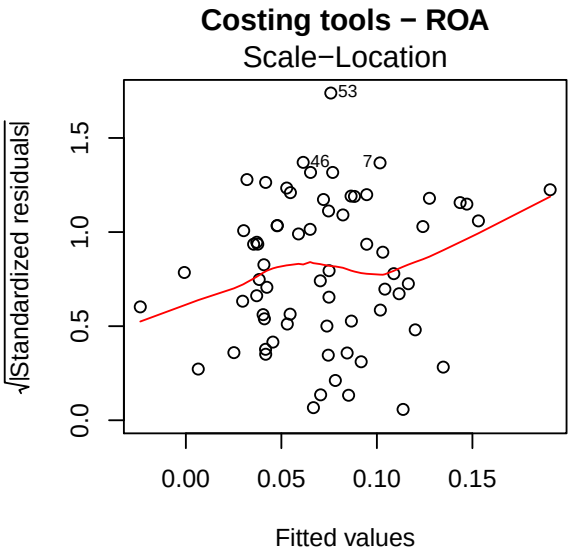
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Scale−Location
√|Standardized residuals|
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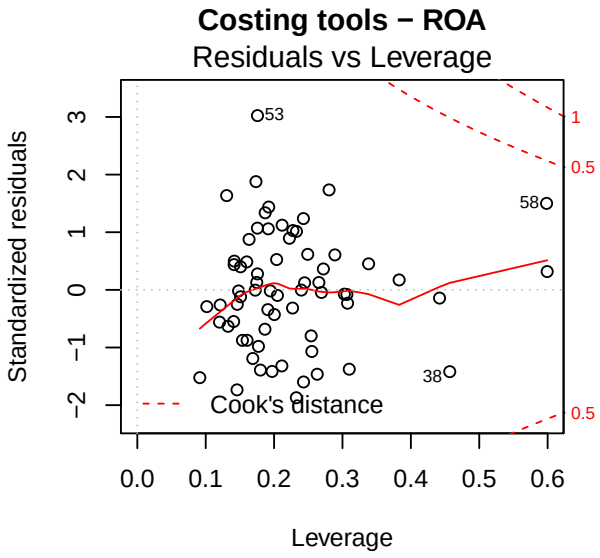
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Standardized residuals
Leverage
Cook's distance
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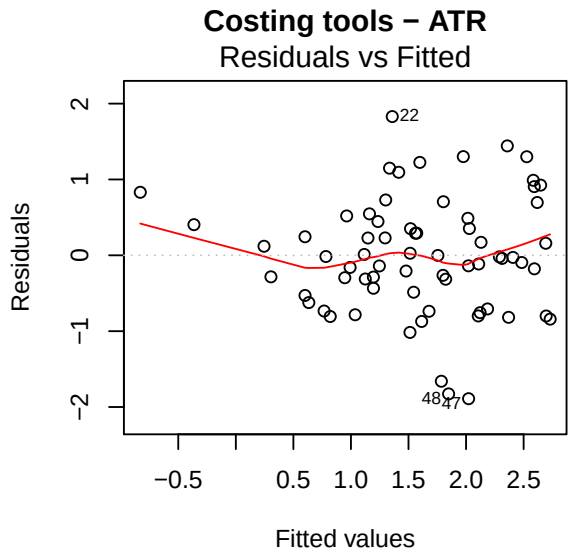
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Residuals
Fitted values
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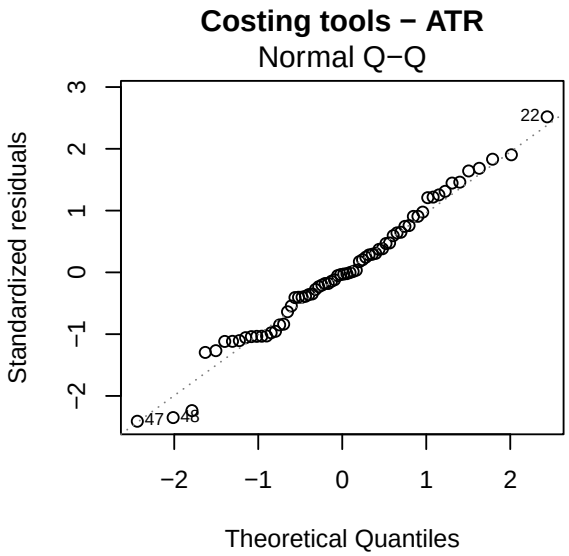
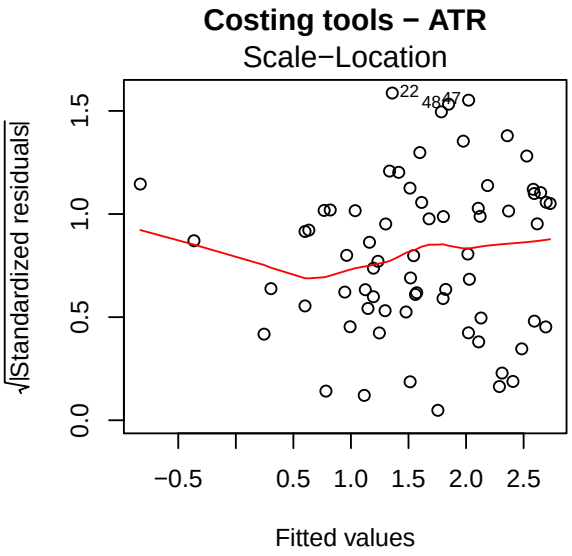
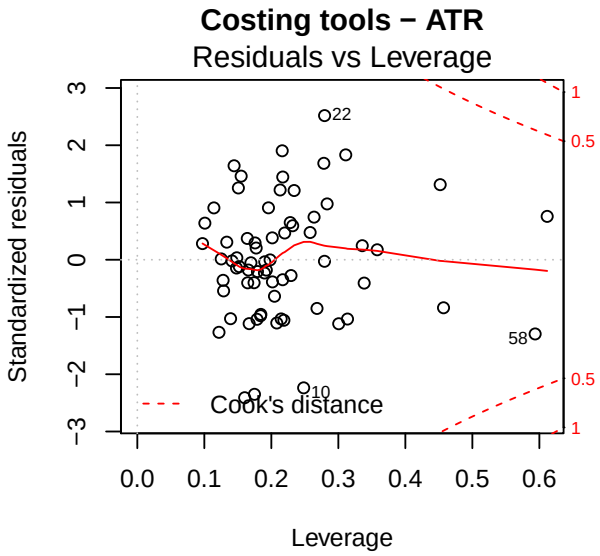
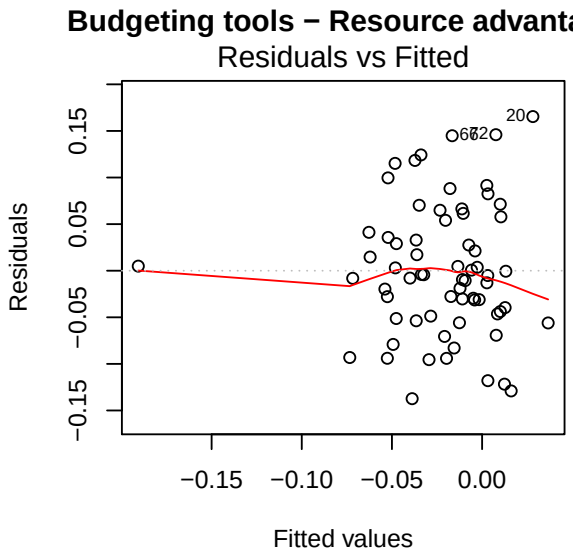
48
47

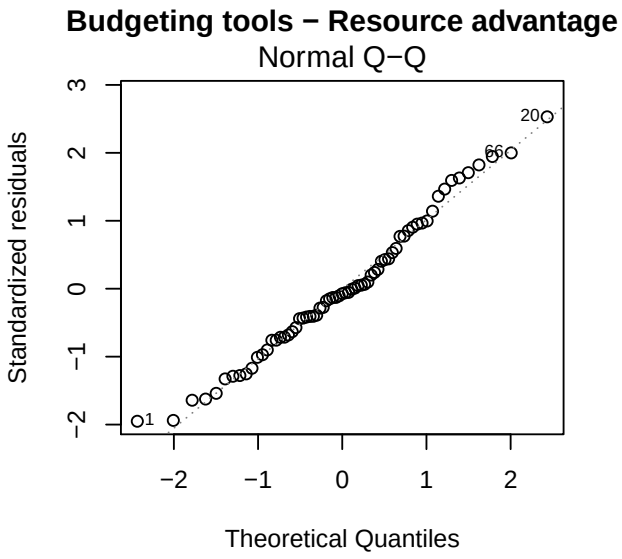

Costing tools − ATR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
47
48

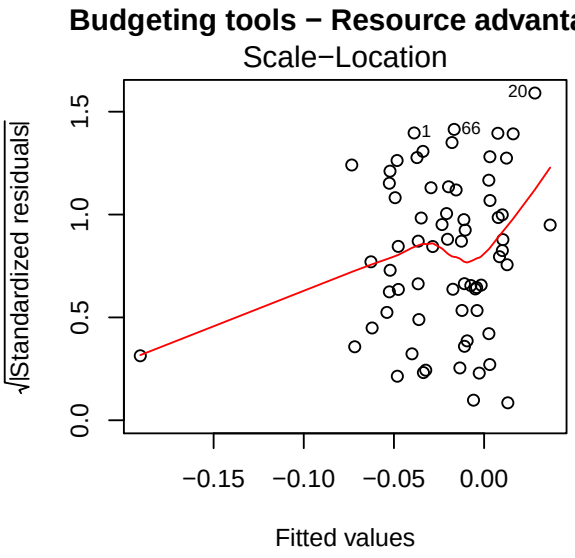

Costing tools − ATR
Scale−Location
√|Standardized residuals|
Fitted values
22
48
47

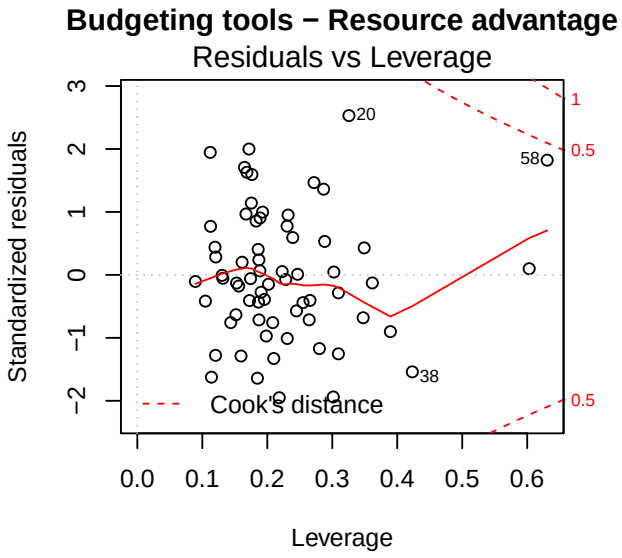

Costing tools − ATR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
58
10

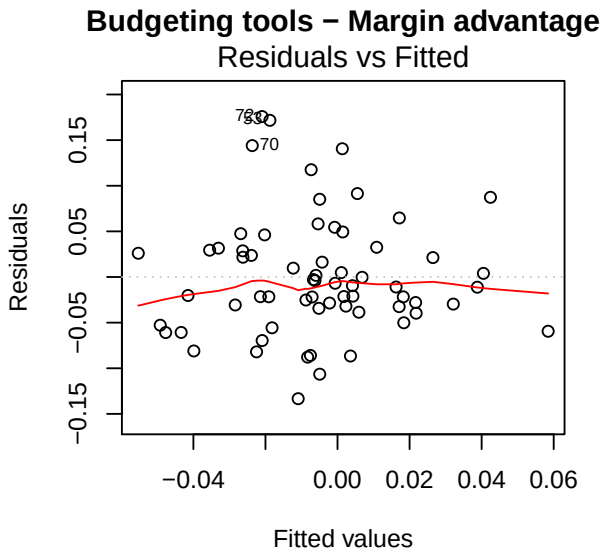
C.0.2 OLS-Models for Budgeting Tools

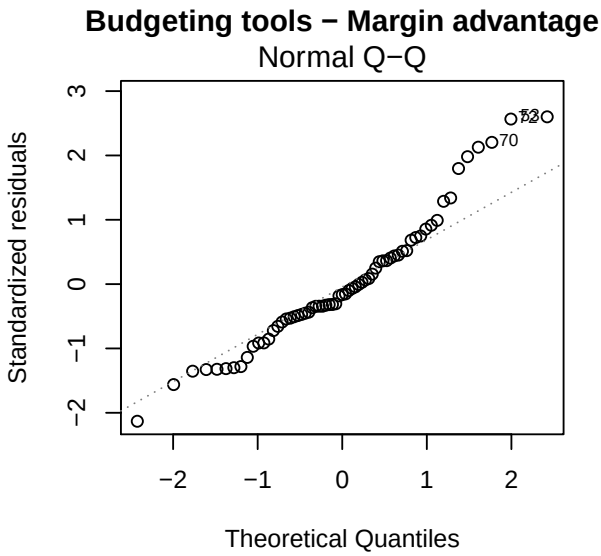

Budgeting tools − Resource advantage
Residuals vs Fitted
Residuals
Fitted values
20
66
72
−0.15
−0.10
−0.05
0.00
0.05
0.15

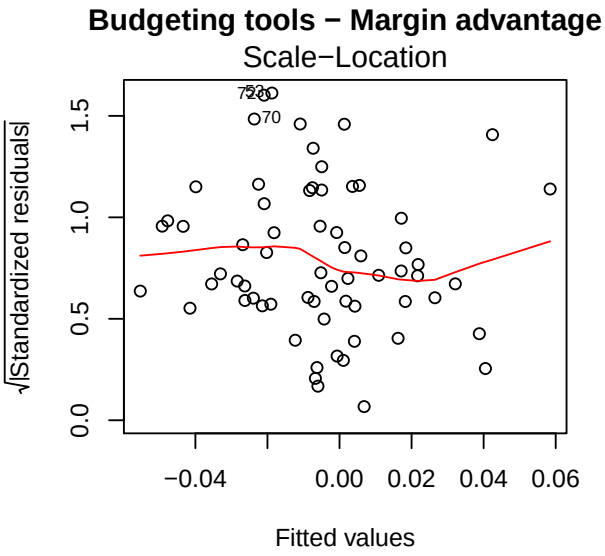

Budgeting tools − Resource advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
20
66
1
−2
−1
0
1
2
3

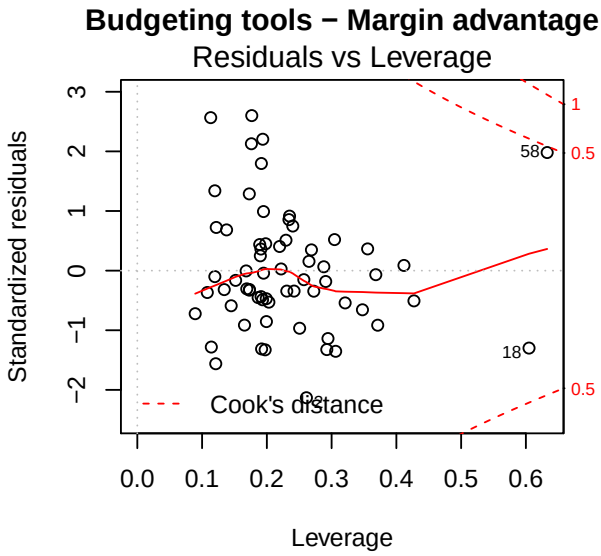

Budgeting tools − Resource advantage
Scale−Location
√|Standardized residuals|
Fitted values
20
1
66
0.0
0.5
1.0
1.5
−0.15
−0.10
−0.05
0.00

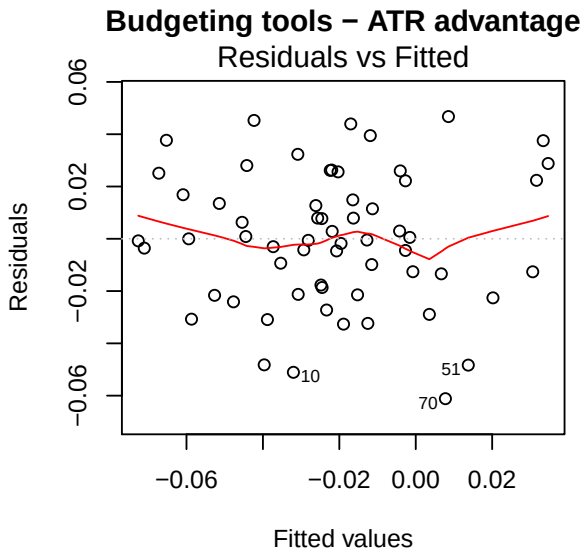

Budgeting tools − Resource advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
20
58
38
1
0.5
0.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6

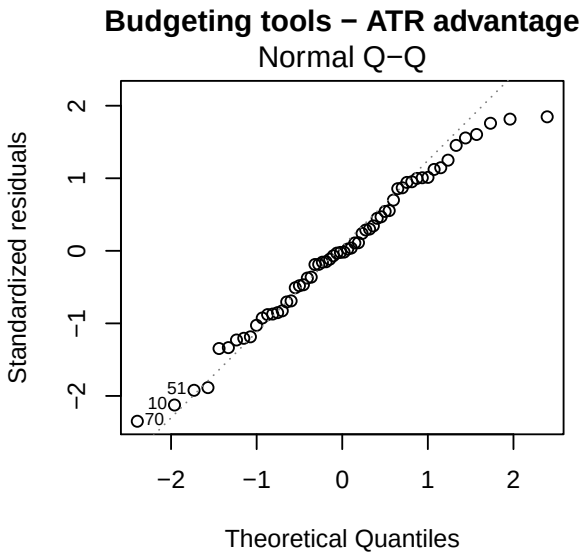

Budgeting tools − Margin advantage
Residuals vs Fitted
Residuals
Fitted values
70

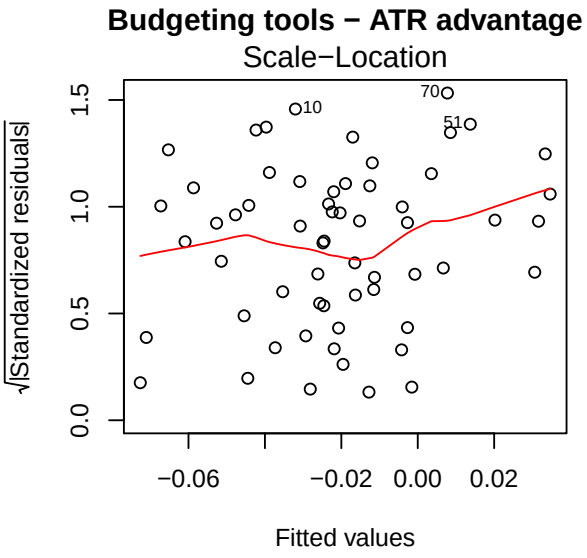

Budgeting tools − Margin advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
70

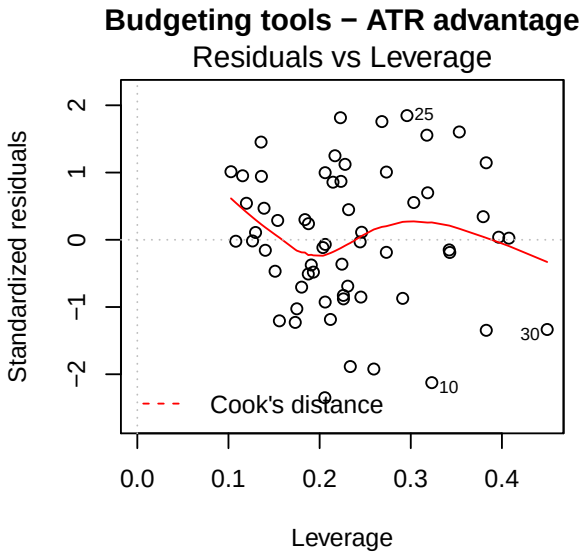

Budgeting tools − Margin advantage
Scale−Location
√|Standardized residuals|
Fitted values
70

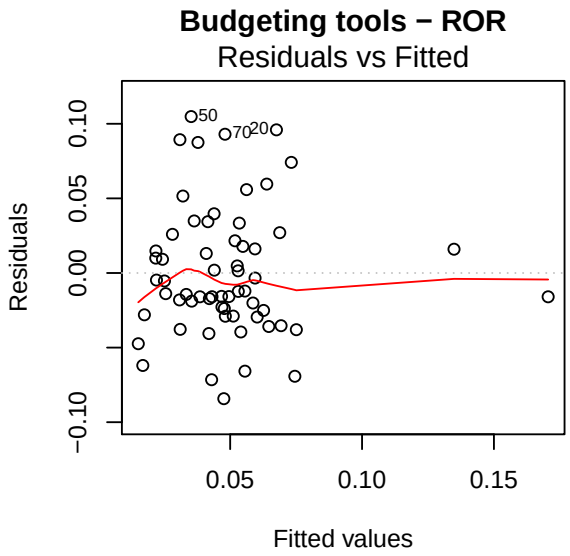

Budgeting tools − Margin advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
58
18

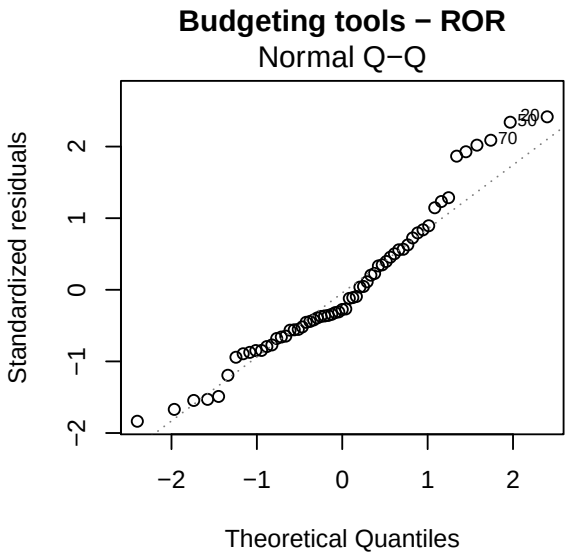

Budgeting tools − ATR advantage
Residuals vs Fitted
Residuals
Fitted values
10
51
70

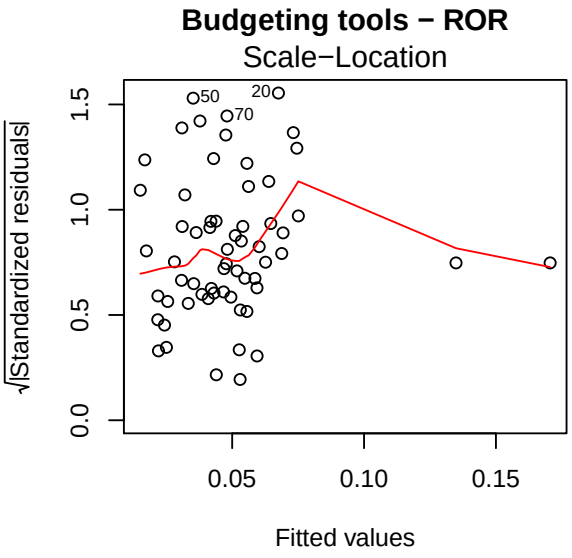

Budgeting tools − ATR advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
51
10
70

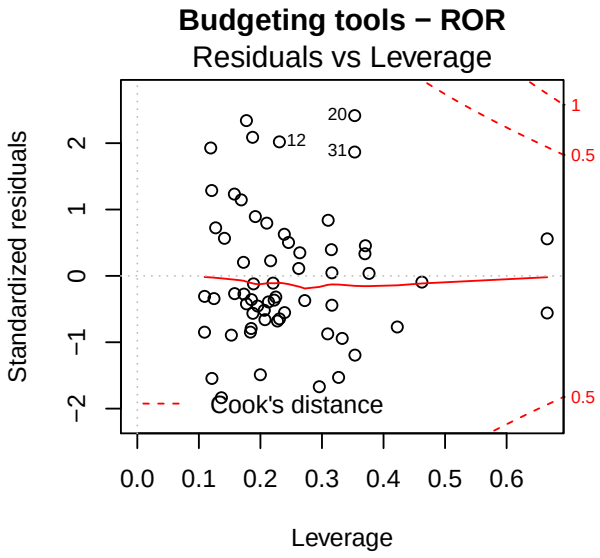

Budgeting tools − ATR advantage
Scale−Location
√|Standardized residuals|
Fitted values
70
10
51

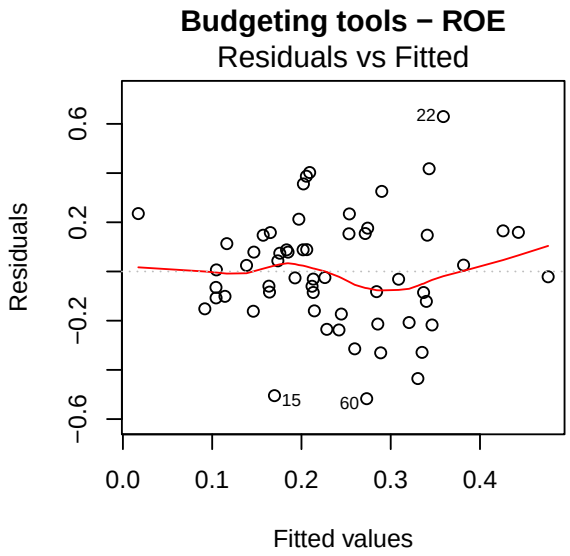

Budgeting tools − ATR advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
25
30
10

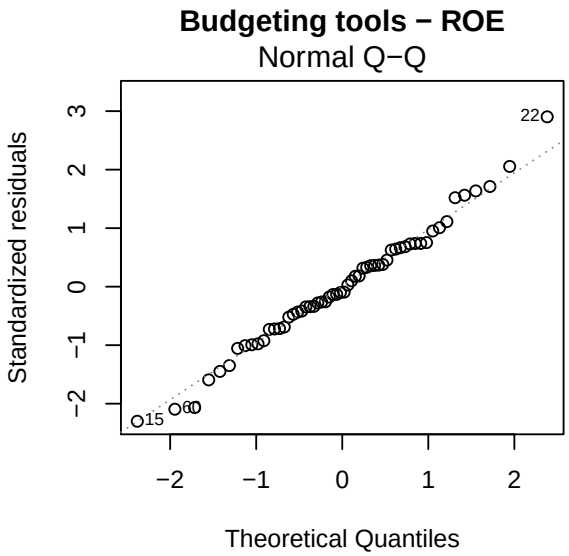

Budgeting tools − ROR
Residuals vs Fitted
Residuals
Fitted values
50
70
20

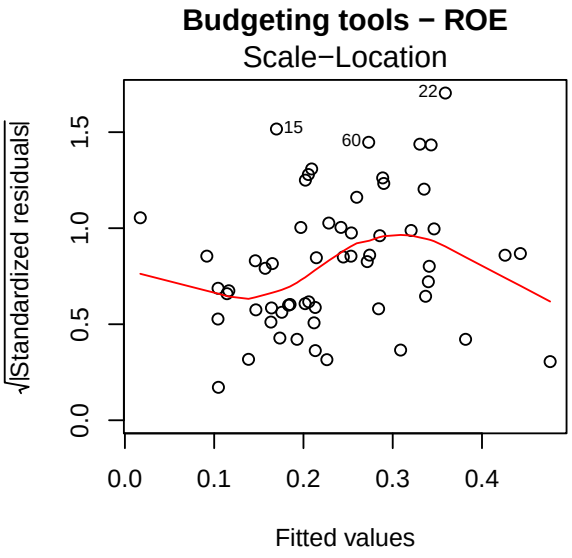

Budgeting tools − ROR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
20
30
70

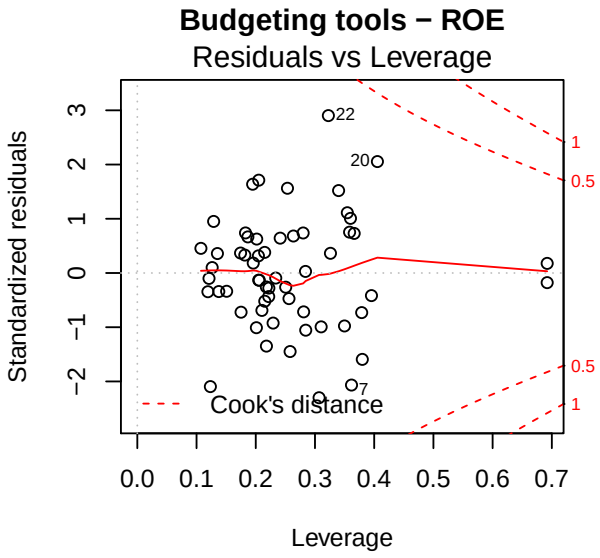

Budgeting tools − ROR
Scale−Location
√|Standardized residuals|
Fitted values
50
70
20

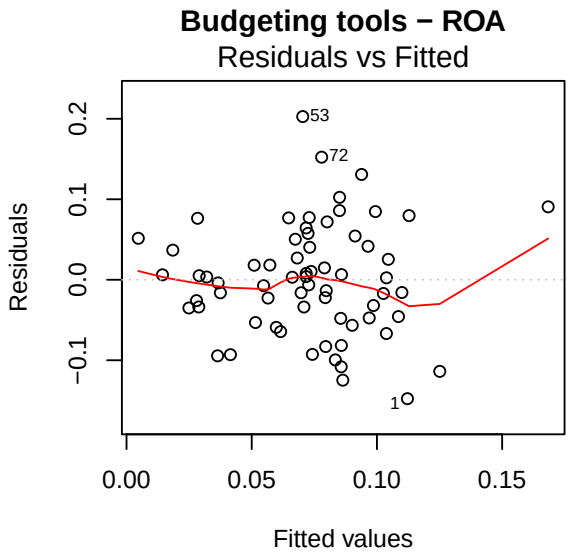

Budgeting tools − ROR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
20
12
31
1
0.5
0.5

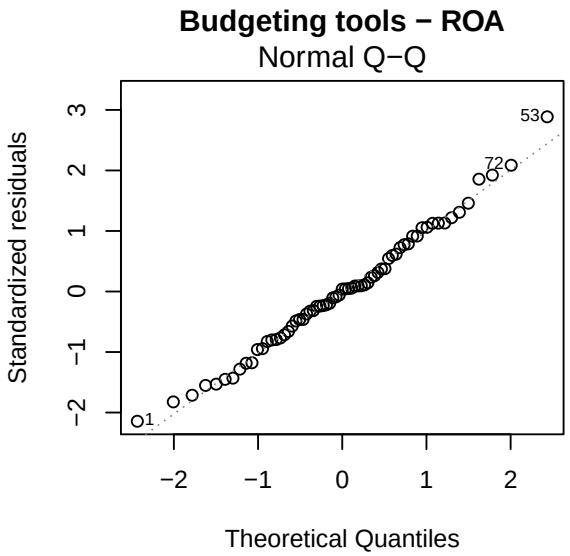

Budgeting tools − ROE
Residuals vs Fitted
Residuals
Fitted values
22
15
60

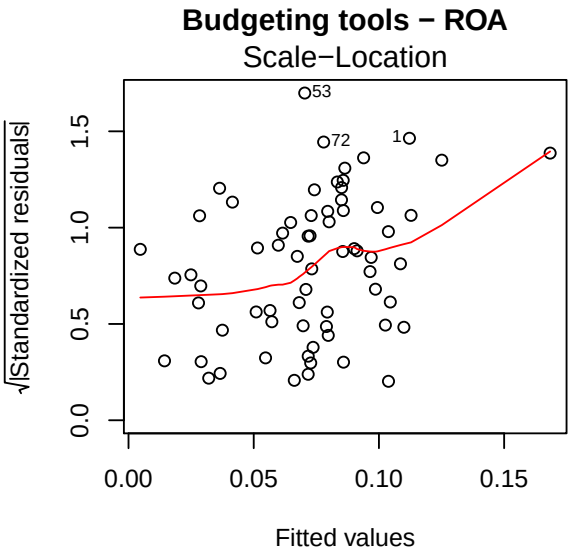

Budgeting tools − ROE
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
15
60

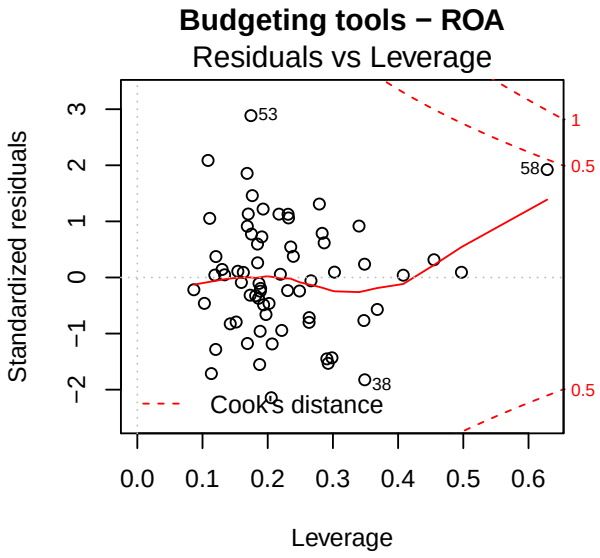

Budgeting tools − ROE
Scale−Location
√|Standardized residuals|
Fitted values
22
15
60

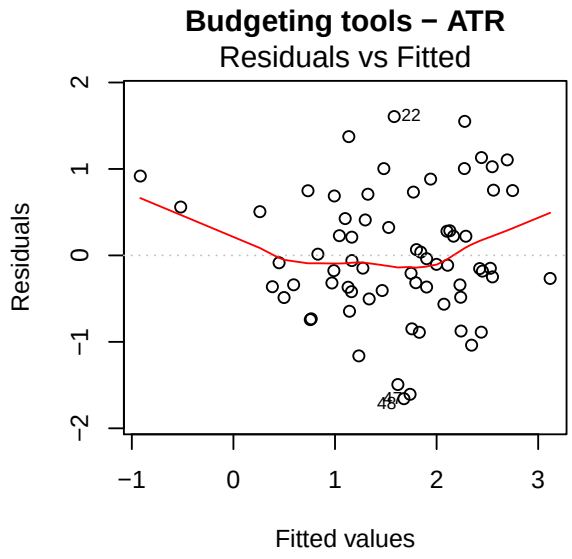

Budgeting tools − ROE
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
20
7
1
0.5
0.5
1

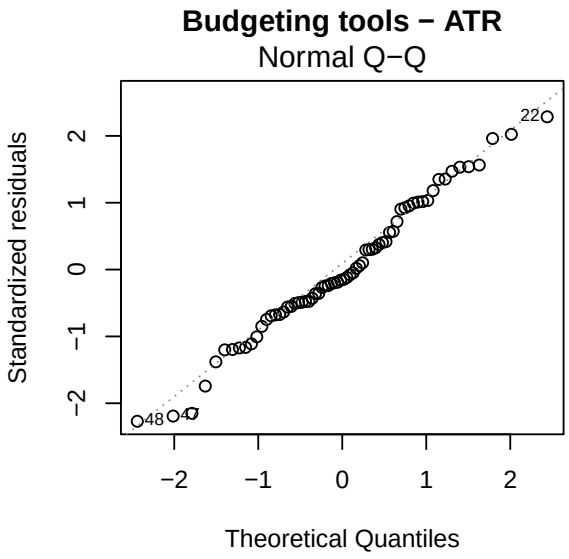

Budgeting tools − ROA
Residuals vs Fitted
Residuals
Fitted values
53
72
1
0.00
0.05
0.10
0.15
−0.1
0.0
0.1
0.2

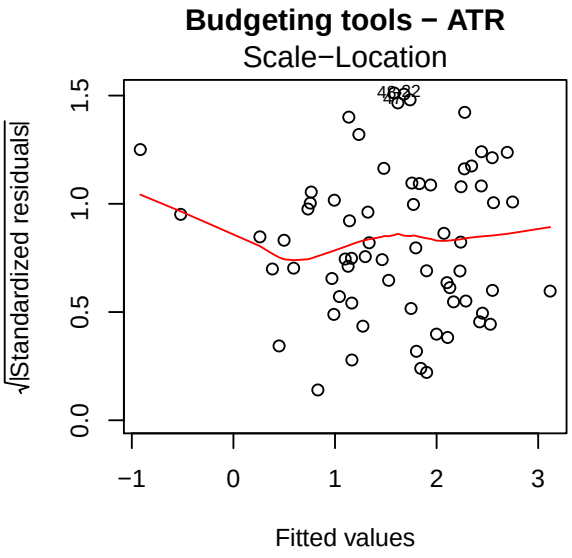

Budgeting tools − ROA
Normal Q−Q
Standardized residuals
Theoretical Quantiles
53
72
1
−2
−1
0
1
2
3

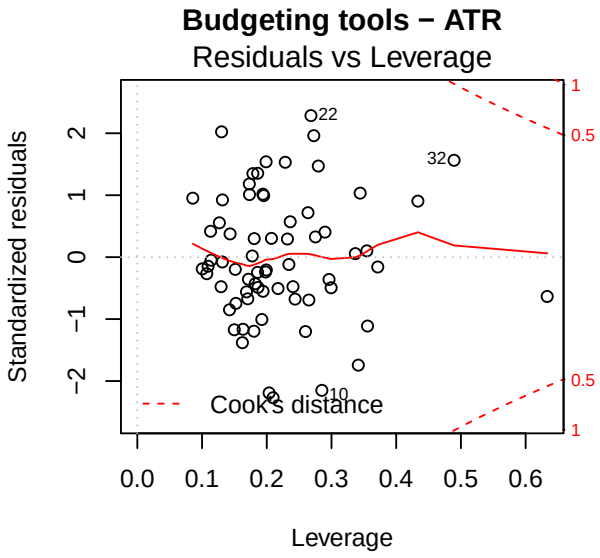

Budgeting tools − ROA
Scale−Location
√|Standardized residuals|
Fitted values
53
72
1
0.00
0.05
0.10
0.15
0.0
0.5
1.0
1.5


Budgeting tools − ROA
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
53
58
38
1
0.5
0.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6
−2
−1
0
1
2
3

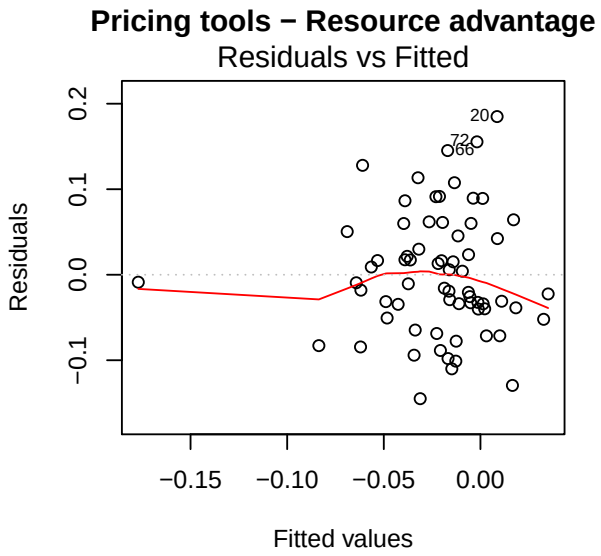

Budgeting tools − ATR
Residuals vs Fitted
Residuals
Fitted values
22
47
48

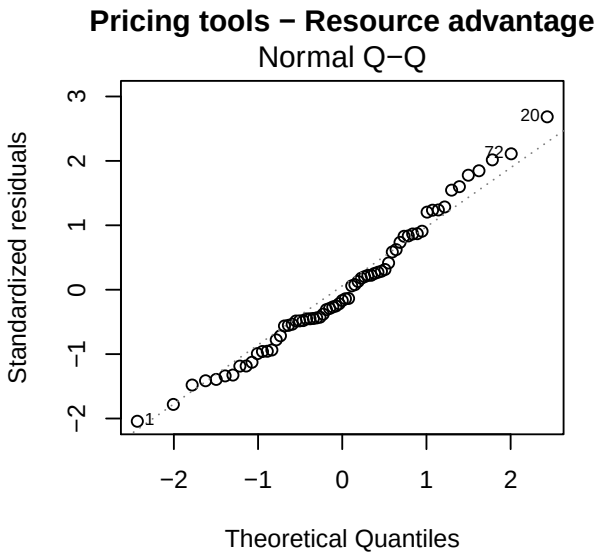

Budgeting tools − ATR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
48
47

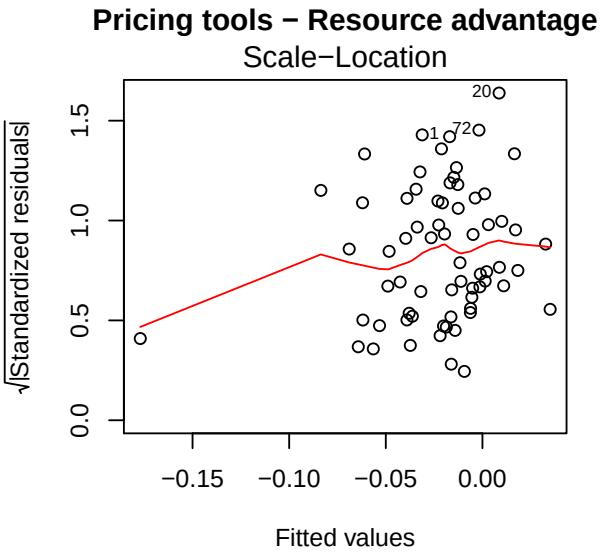

Budgeting tools − ATR
Scale−Location
√|Standardized residuals|
Fitted values

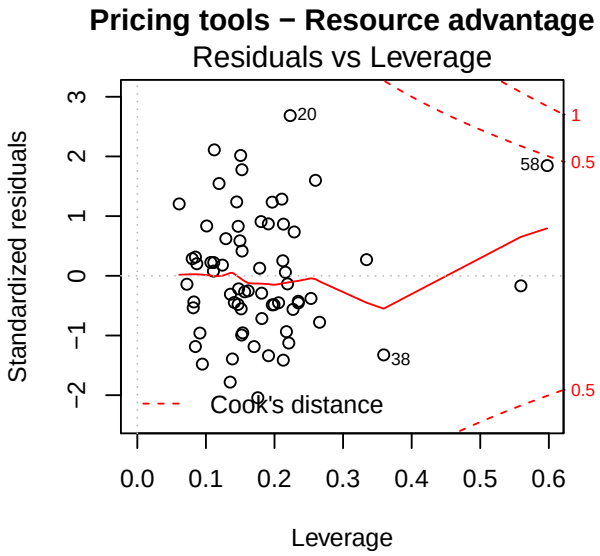

Budgeting tools − ATR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
32
10

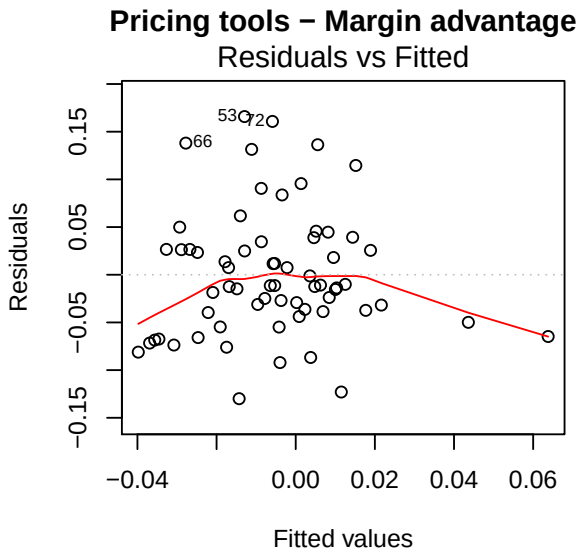
C.0.3 OLS-Models for Pricing Tools

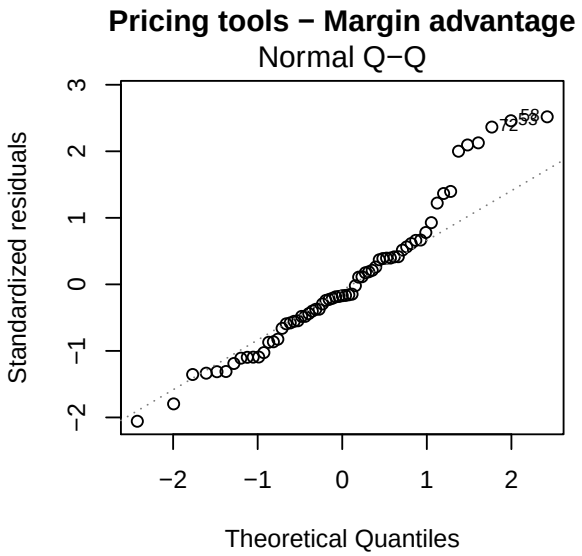

Pricing tools − Resource advantage
Residuals vs Fitted
Residuals
Fitted values
20
72
66

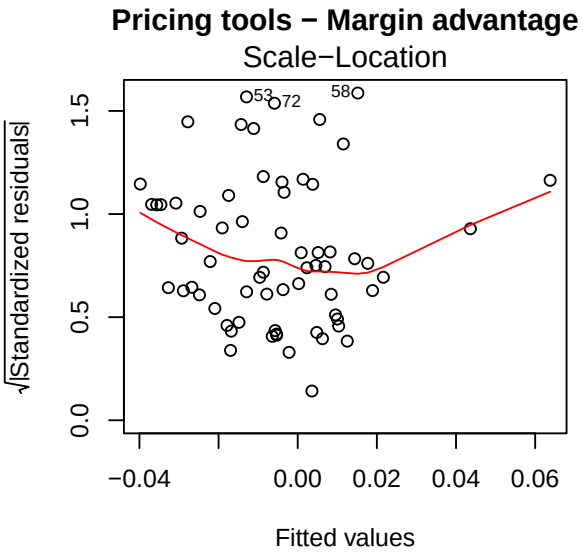

Pricing tools − Resource advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
20
72
1

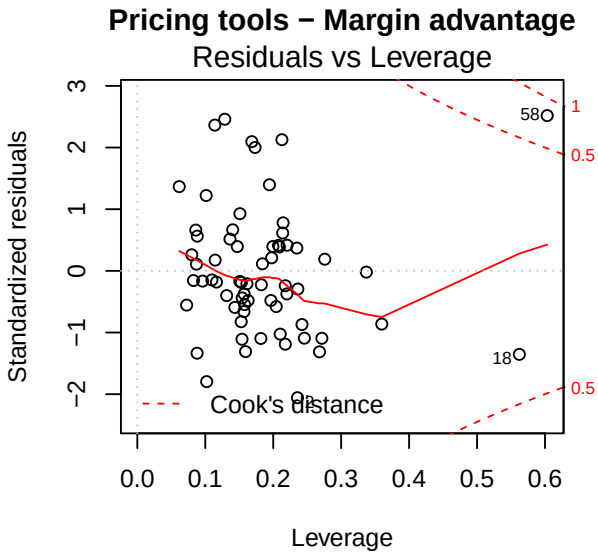

Pricing tools − Resource advantage
Scale−Location
√|Standardized residuals|
Fitted values
20
1
72

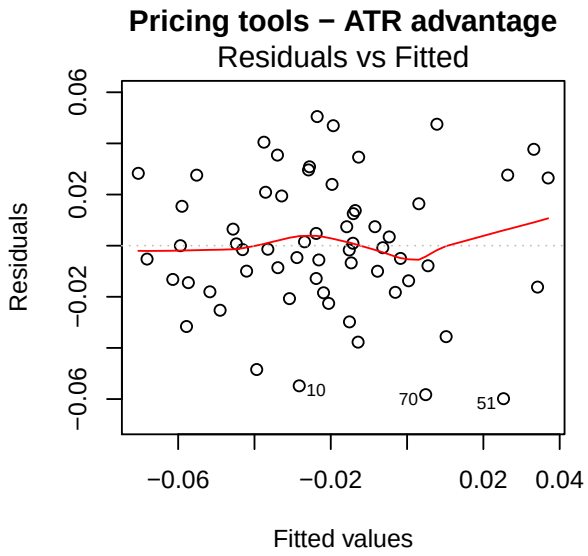

Pricing tools − Resource advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
20
58
38
1
0.5
0.5

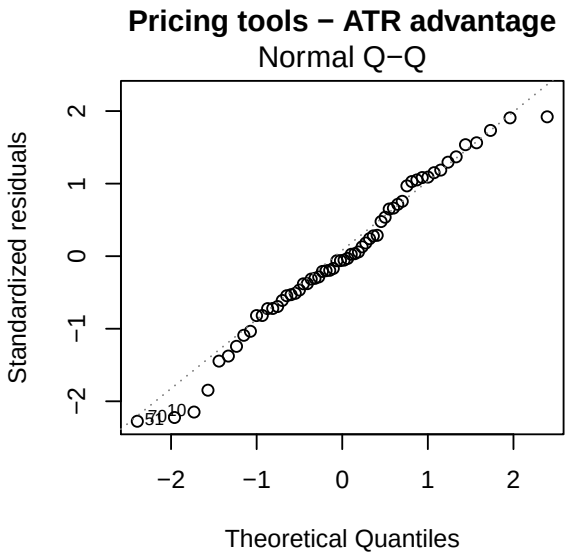

Pricing tools − Margin advantage
Residuals vs Fitted
Residuals
Fitted values
53
72
66
−0.15
−0.05
0.05
0.15
−0.04
0.00
0.02
0.04
0.06

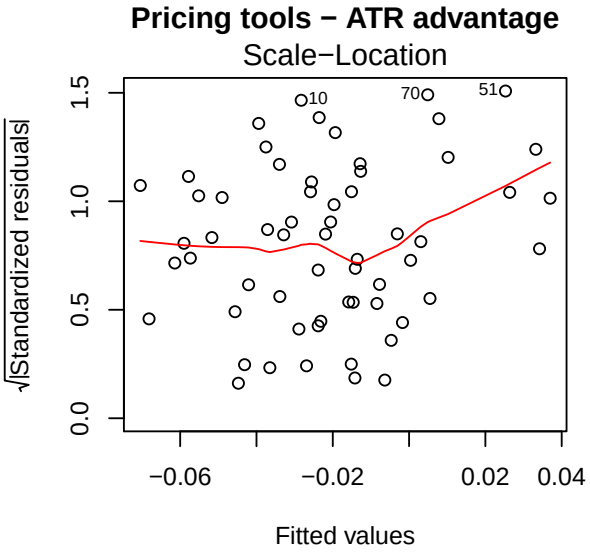

Pricing tools − Margin advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
58
72
53
−2
−1
0
1
2
3

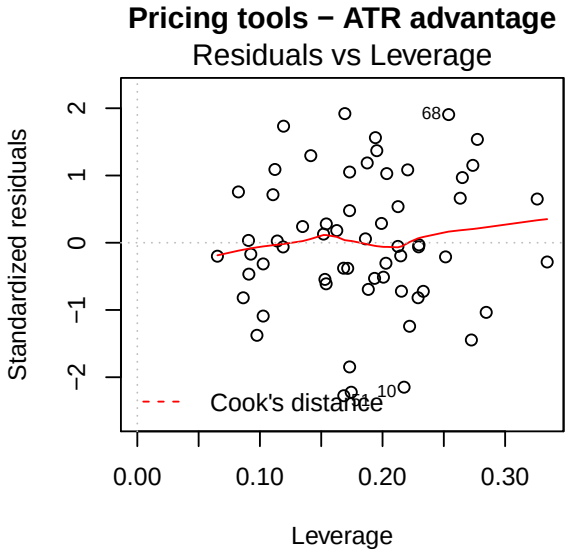

Pricing tools − Margin advantage
Scale−Location
√|Standardized residuals|
Fitted values
53
72
58
0.0
0.5
1.0
1.5
−0.04
0.00
0.02
0.04
0.06

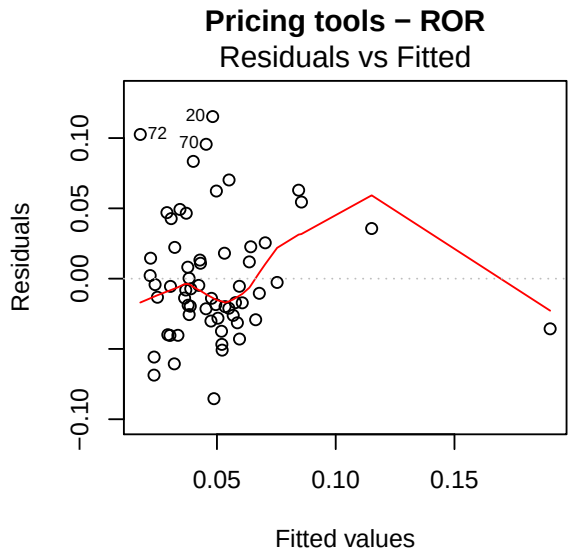

Pricing tools − Margin advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
58
18
1
0.5
0.5
−2
−1
0
1
2
3
0.0
0.1
0.2
0.3
0.4
0.5
0.6

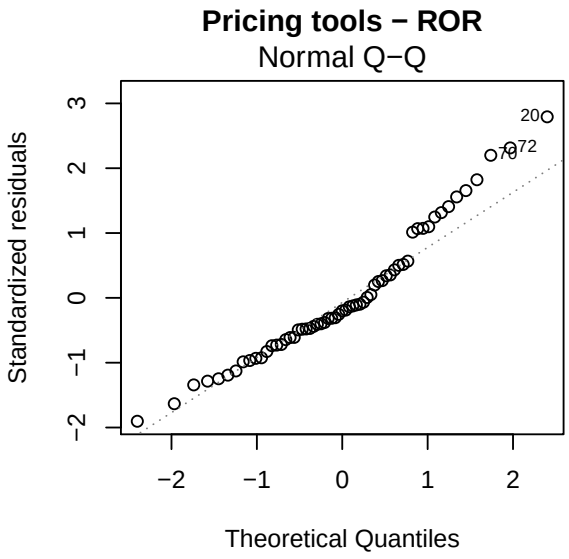

Pricing tools − ATR advantage
Residuals vs Fitted
Residuals
Fitted values
−0.06
−0.02
0.02
0.04
0.06
10
70
51

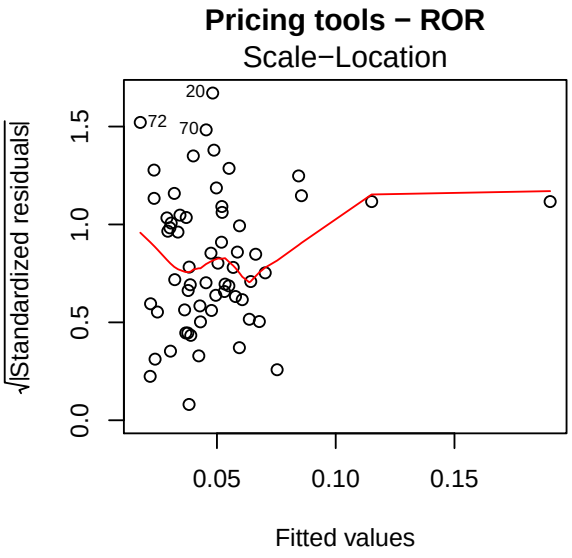

Pricing tools − ATR advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
−2
−1
0
1
2
10
70
51

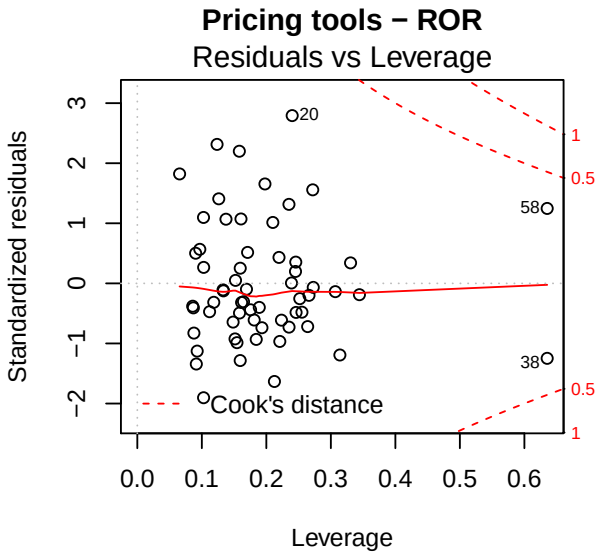

Pricing tools − ATR advantage
Scale−Location
√|Standardized residuals|
Fitted values
0.0
0.5
1.0
1.5
−0.06
−0.02
0.02
0.04
10
70
51


Pricing tools − ATR advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
−2
−1
0
1
2
0.00
0.10
0.20
0.30
68
10


Pricing tools − ROR
Residuals vs Fitted
Residuals
Fitted values
20
72
70
−0.10
0.00
0.05
0.10
0.15


Pricing tools − ROR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
20
72
70
−2
−1
0
1
2
3


Pricing tools − ROR
Scale−Location
√|Standardized residuals|
Fitted values
20
72
70
0.0
0.5
1.0
1.5
0.05
0.10
0.15


Pricing tools − ROR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
20
58
38
1
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0.5
1
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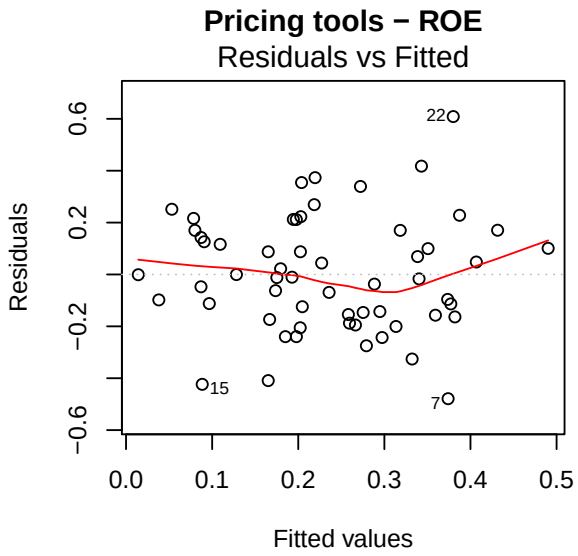
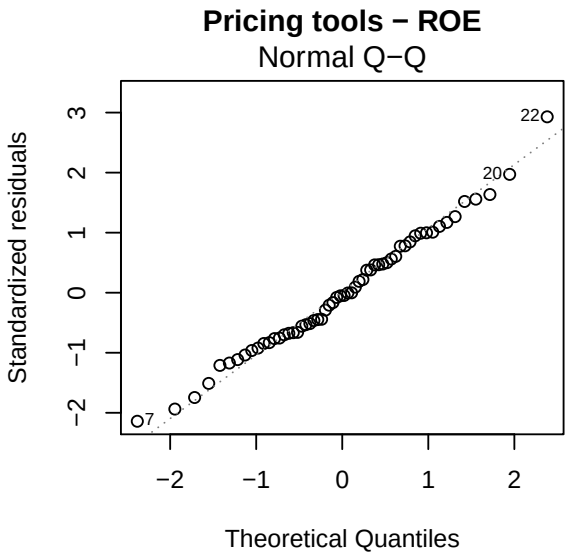
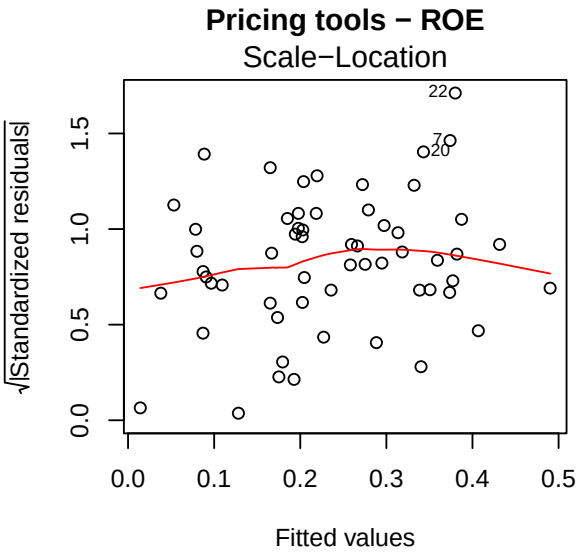
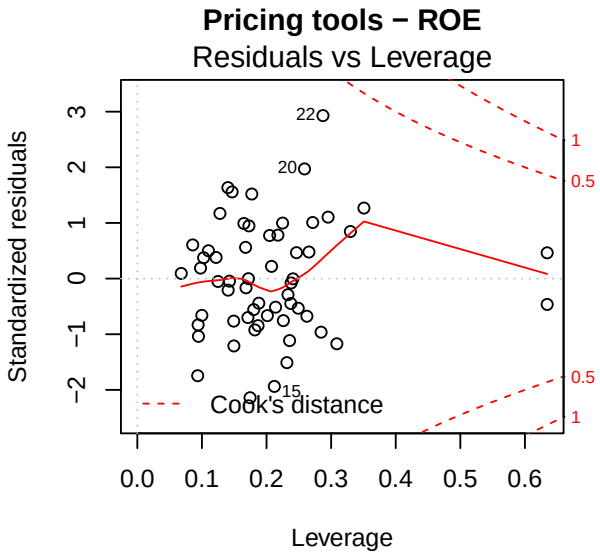
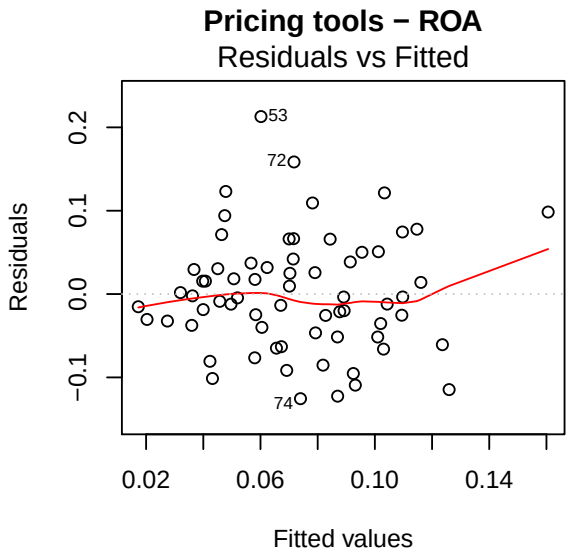
0.1
0.2
0.3
0.4
0.5
0.6

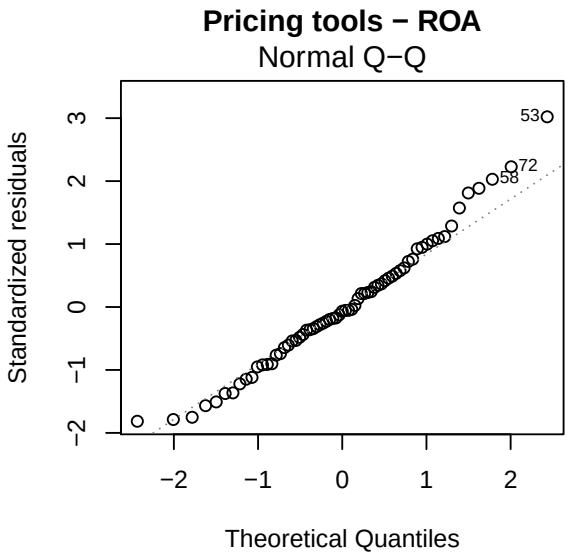

Pricing tools − ROE
Residuals vs Fitted
Residuals
Fitted values
22
15
7

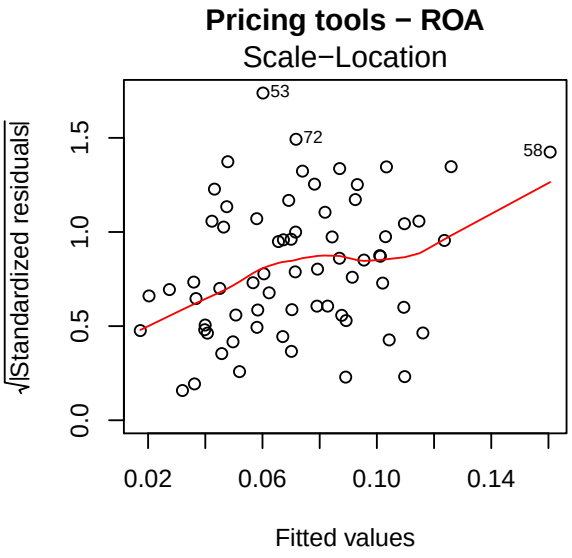

Pricing tools − ROE
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
20
7

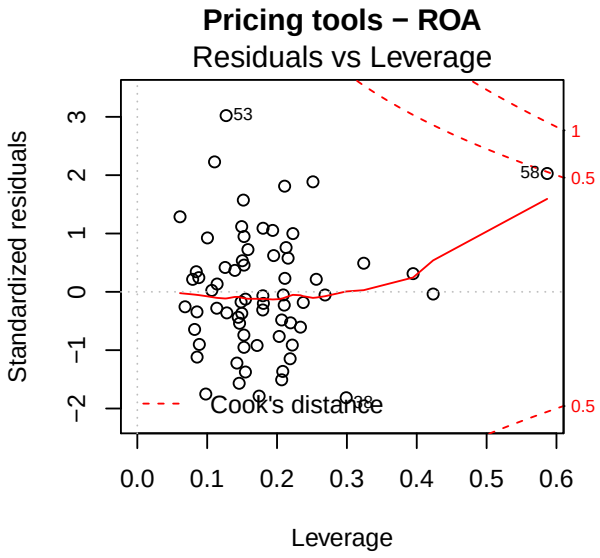

Pricing tools − ROE
Scale−Location
√|Standardized residuals|
Fitted values
22
7
20

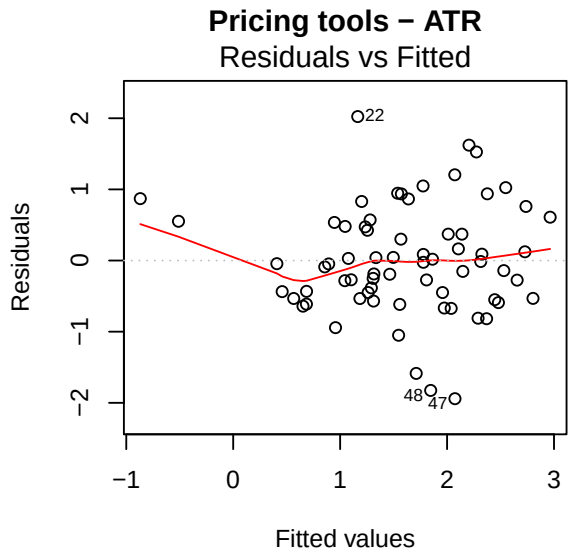

Pricing tools − ROE
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
20
15

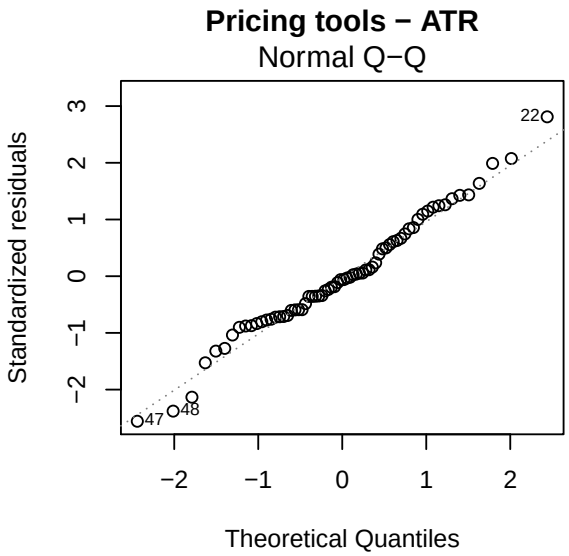

Pricing tools − ROA
Residuals vs Fitted
Residuals
Fitted values
53
72
74
0.02
0.06
0.10
0.14
−0.1
0.0
0.1
0.2

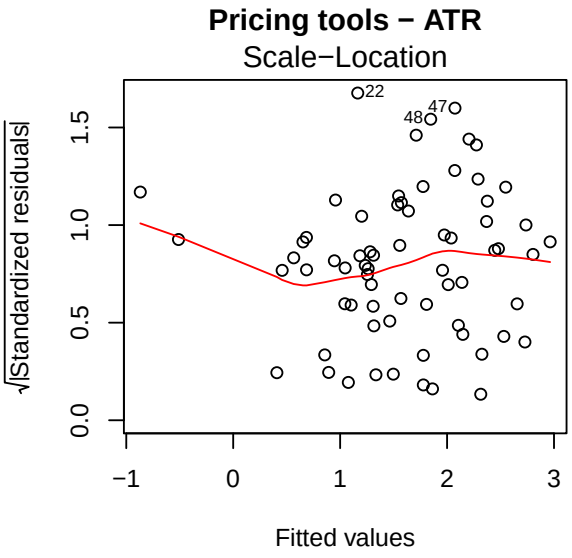

Pricing tools − ROA
Normal Q−Q
Standardized residuals
Theoretical Quantiles
53
72
58
−2
−1
0
1
2
3

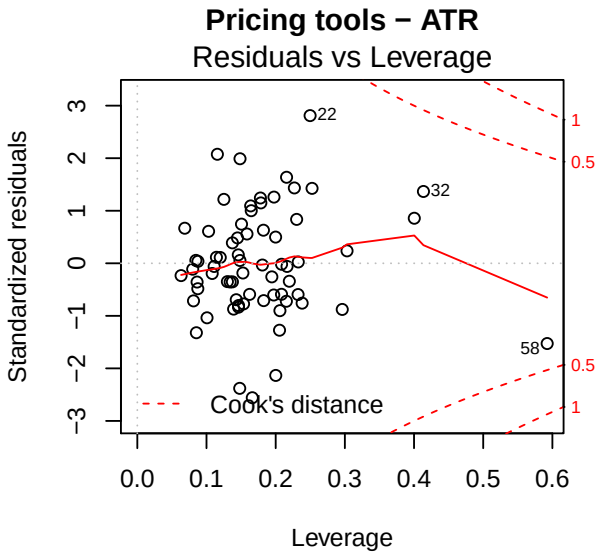

Pricing tools − ROA
Scale−Location
√|Standardized residuals|
Fitted values
53
72
58
0.02
0.06
0.10
0.14
0.0
0.5
1.0
1.5


Pricing tools − ROA
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
53
58
1
0.5
0.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6
−2
−1
0
1
2
3

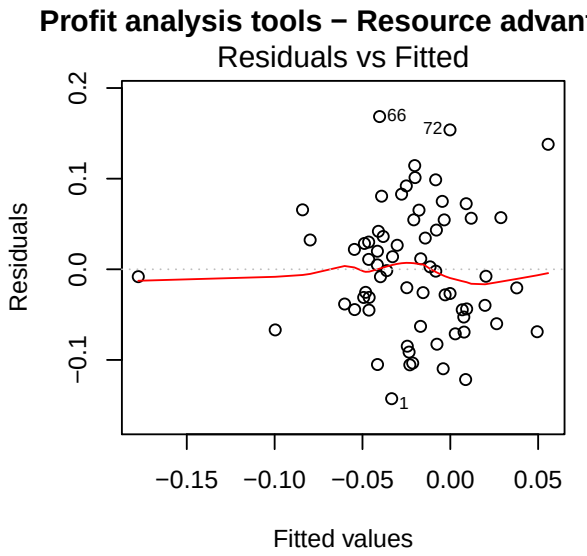

Pricing tools − ATR
Residuals vs Fitted
Residuals
Fitted values
22
48
47

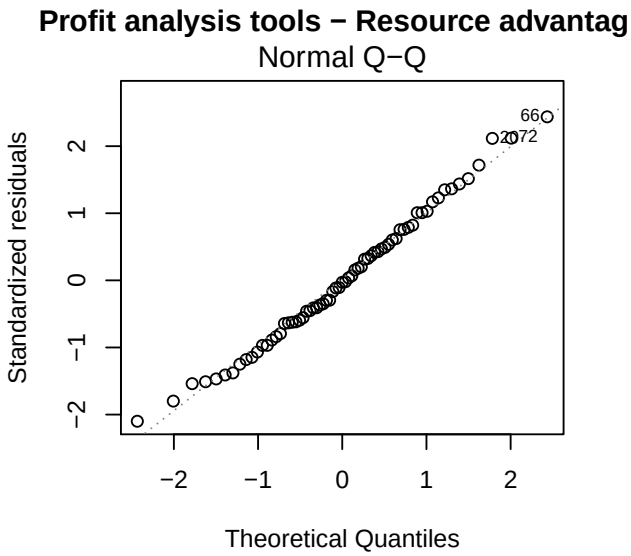

Pricing tools − ATR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
47
48

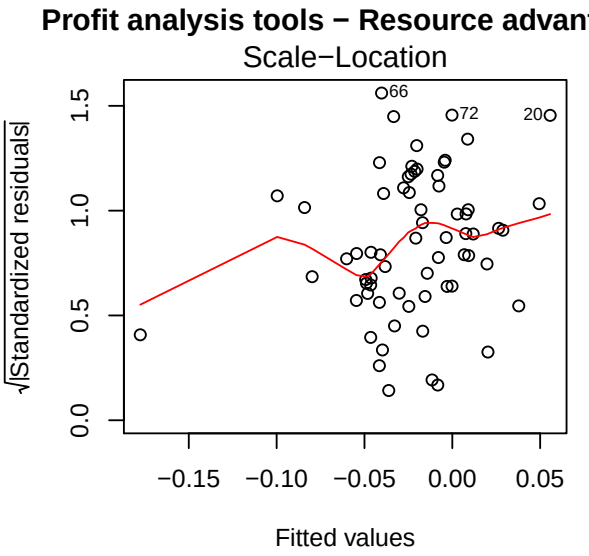

Pricing tools − ATR
Scale−Location
√|Standardized residuals|
Fitted values
22
48
47

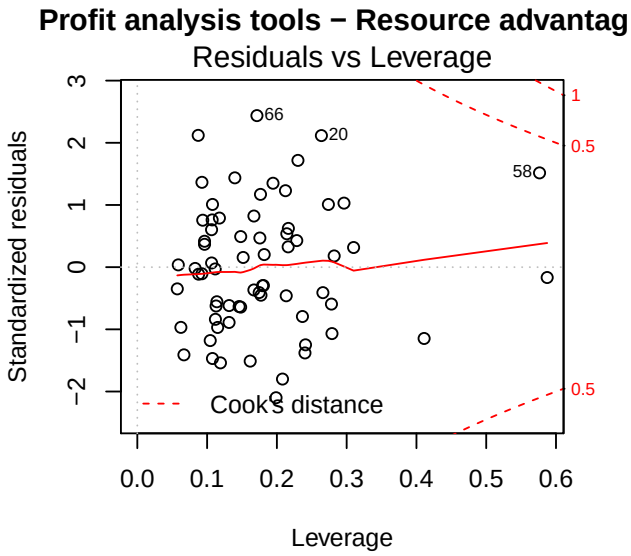

Pricing tools − ATR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
32
58
1
0.5
0.5
1

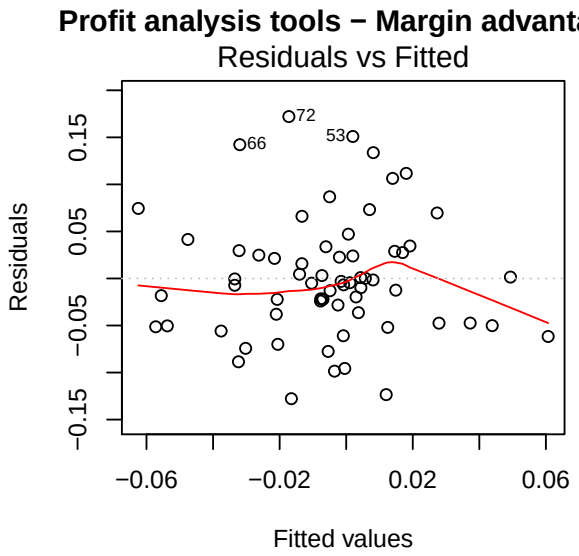
C.0.4 OLS-Models for Profit Analysis Tools

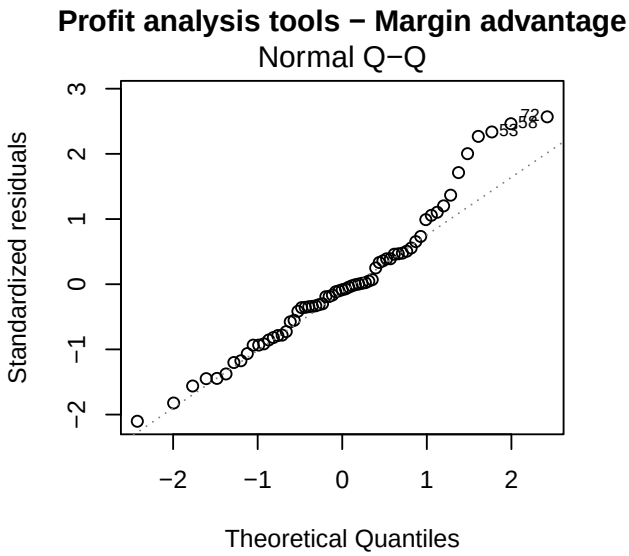

Profit analysis tools − Resource advantag
Residuals vs Fitted
Residuals
Fitted values
66
72
1
−0.15
−0.10
−0.05
0.00
0.05
−0.1
0.0
0.1
0.2

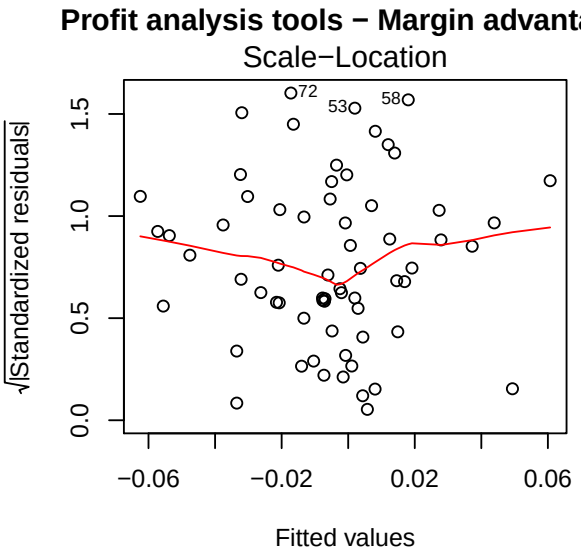

Profit analysis tools − Resource advantag
Normal Q−Q
Standardized residuals
Theoretical Quantiles
66
20
72
−2
−1
0
1
2

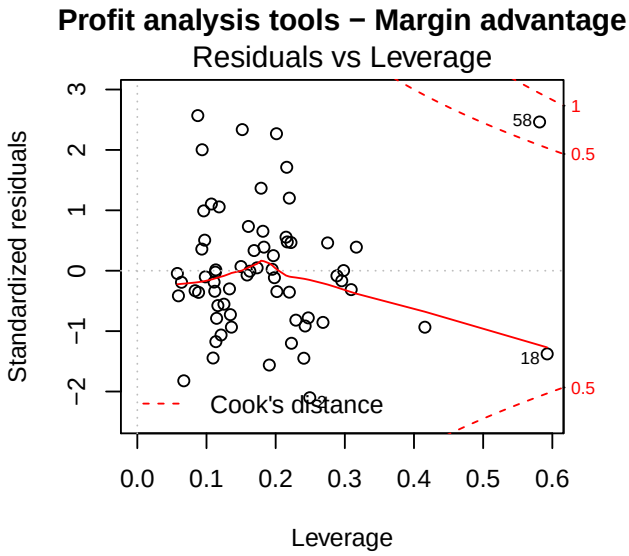

Profit analysis tools − Resource advantag
Scale−Location
√|Standardized residuals|
Fitted values
66
72
20
−0.15
−0.10
−0.05
0.00
0.05
0.0
0.5
1.0
1.5

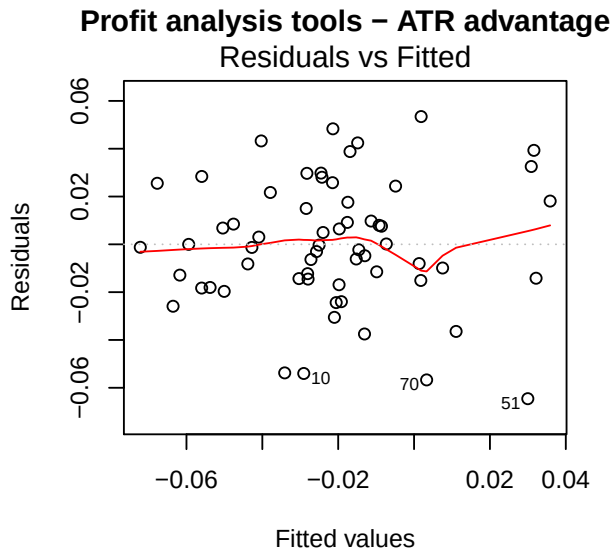

Profit analysis tools − Resource advantag
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
66
20
58
1
0.5
0.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6
−2
−1
0
1
2
3

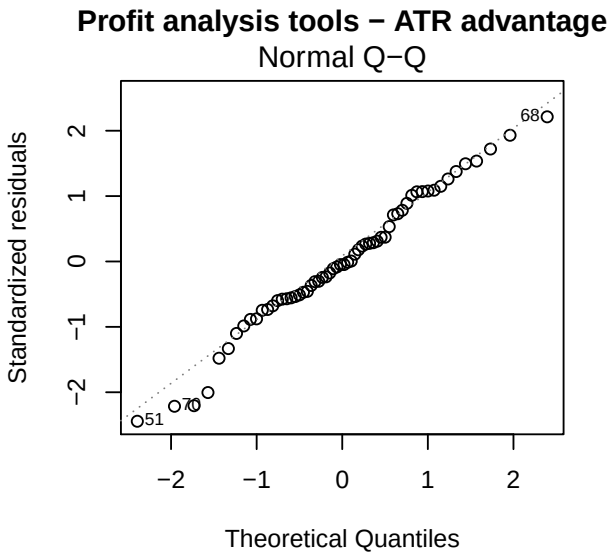

Profit analysis tools − Margin advantage
Residuals vs Fitted
Residuals
Fitted values
72
66
53
−0.15
−0.05
0.05
0.15
−0.06
−0.02
0.02
0.06

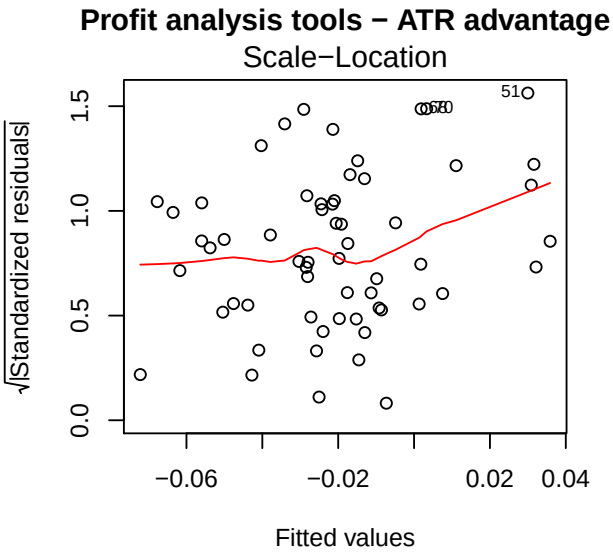

Profit analysis tools − Margin advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
72
58
33
−2
−1
0
1
2
3

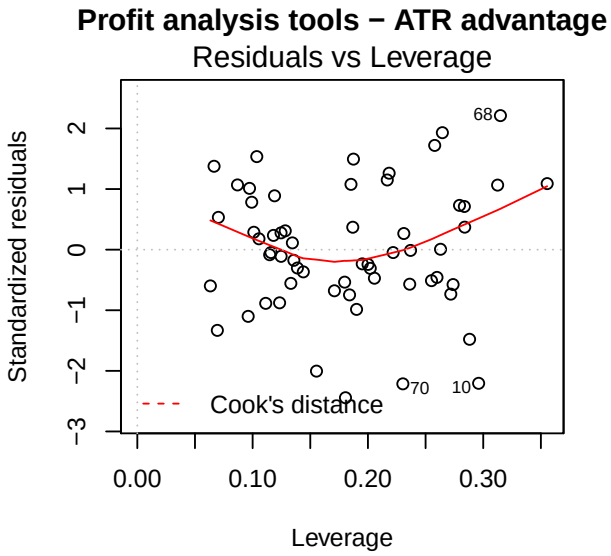

Profit analysis tools − Margin advantage
Scale−Location
√|Standardized residuals|
Fitted values
72
53
58
0.0
0.5
1.0
1.5
−0.06
−0.02
0.02
0.06

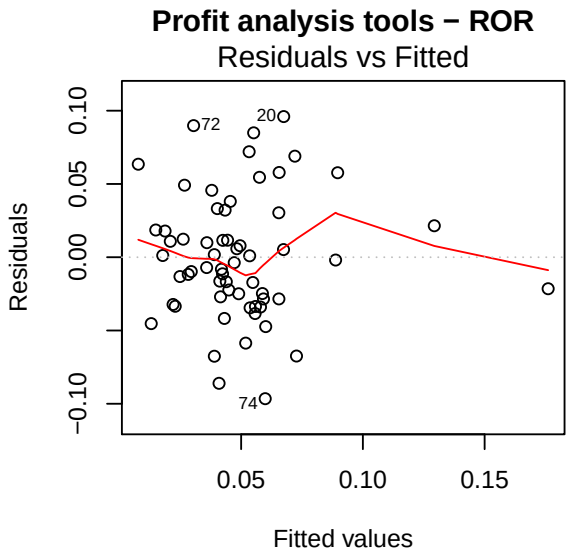

Profit analysis tools − Margin advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
58
18
1
0.5
0.5
−2
−1
0
1
2
3
0.0
0.1
0.2
0.3
0.4
0.5
0.6

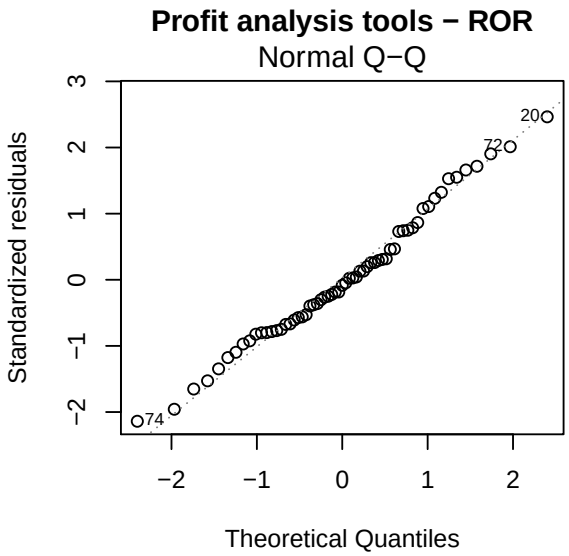

Profit analysis tools − ATR advantage
Residuals vs Fitted
Residuals
Fitted values
−0.06
−0.02
0.02
0.04
0.06
10
70
51

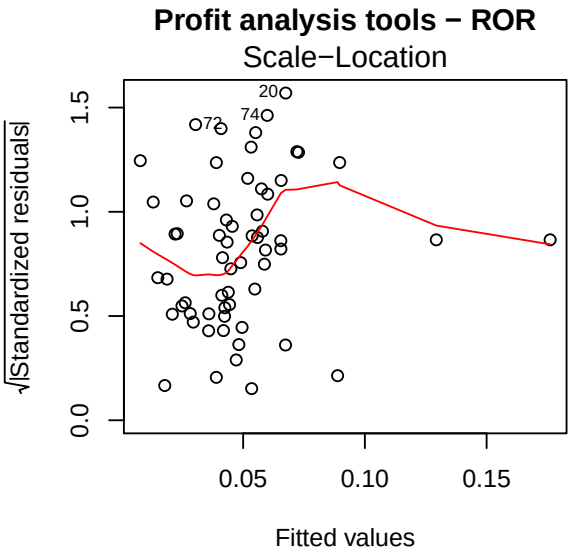

Profit analysis tools − ATR advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
−2
−1
0
1
2
68
70
51

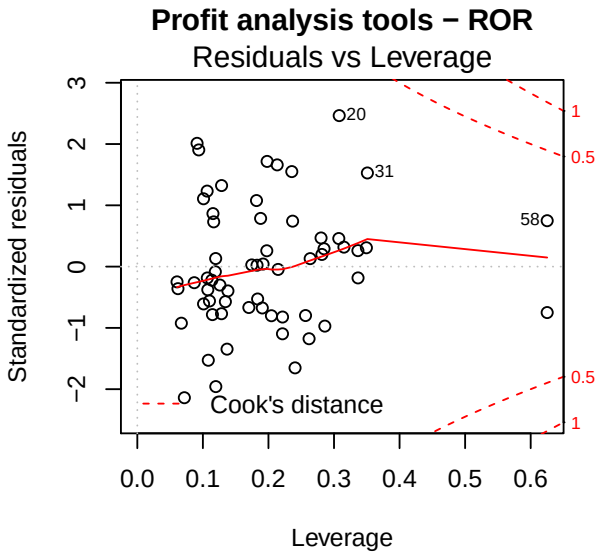

Profit analysis tools − ATR advantage
Scale−Location
√|Standardized residuals|
Fitted values
0.0
0.5
1.0
1.5
−0.06
−0.02
0.02
0.04
51

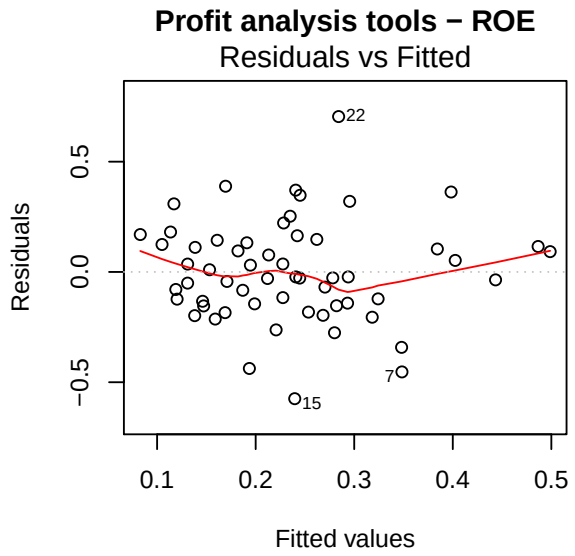

Profit analysis tools − ATR advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
0.00
0.10
0.20
0.30
−3
−2
−1
0
1
2
68
70
10

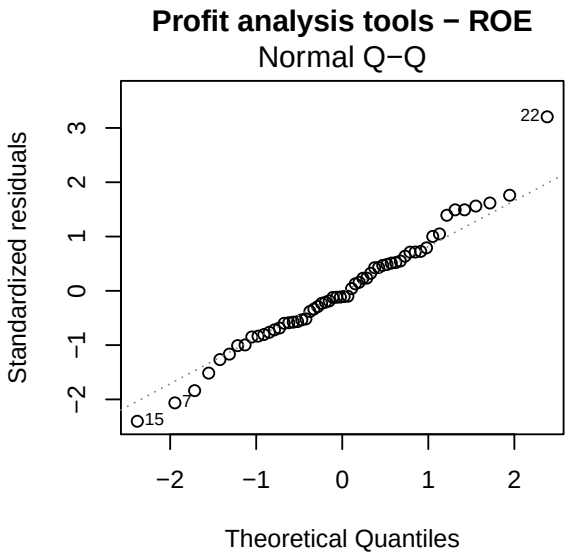

Profit analysis tools − ROR
Residuals vs Fitted
Residuals
Fitted values
72
20
74
0.10
0.05
0.00
−0.10
0.05
0.10
0.15

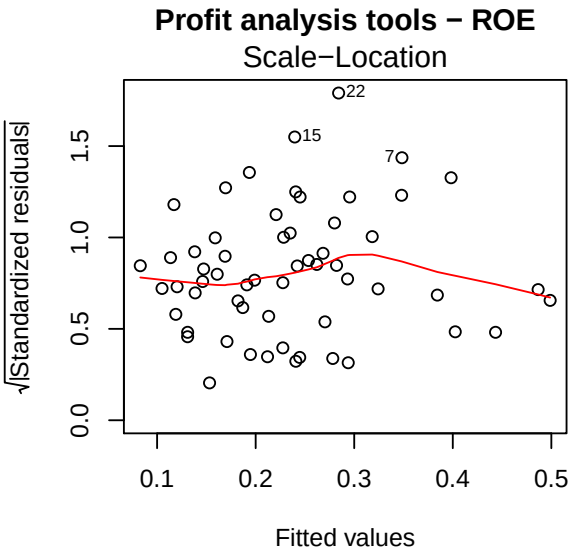

Profit analysis tools − ROR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
20
72
74
3
2
1
0
−1
−2
−2
−1
0
1
2

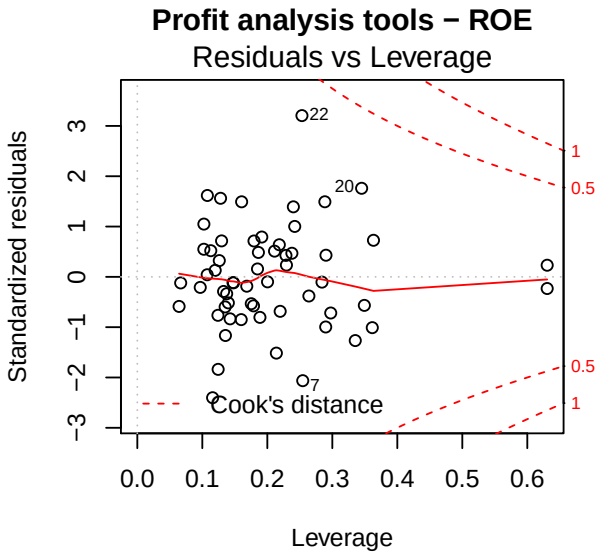

Profit analysis tools − ROR
Scale−Location
√|Standardized residuals|
Fitted values
20
74
72
1.5
1.0
0.5
0.0
0.05
0.10
0.15

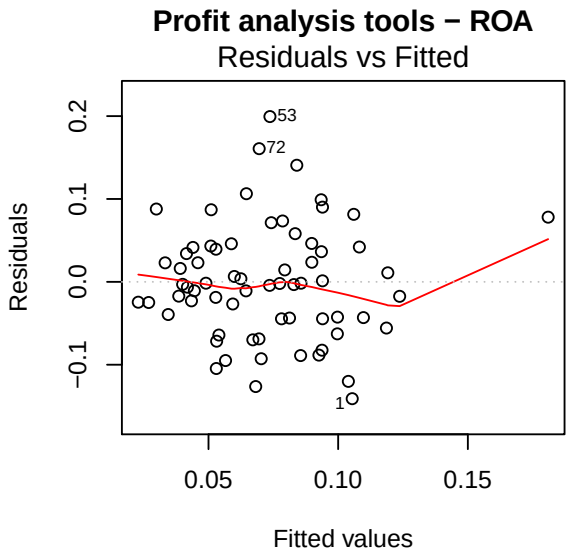

Profit analysis tools − ROR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
20
31
58
1
0.5
0.5
1
3
2
1
0
−1
−2
0.0
0.1
0.2
0.3
0.4
0.5
0.6

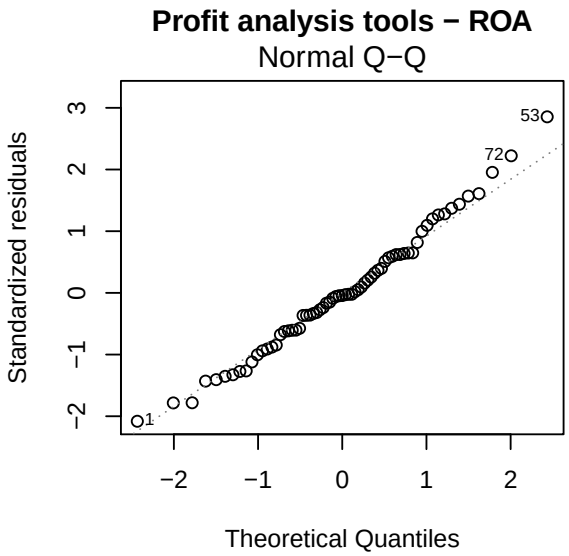

Profit analysis tools − ROE
Residuals vs Fitted
Residuals
Fitted values
22
7
15

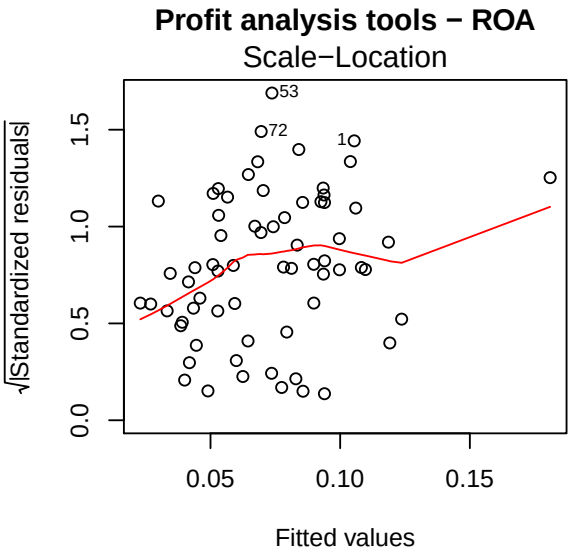

Profit analysis tools − ROE
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
7
15

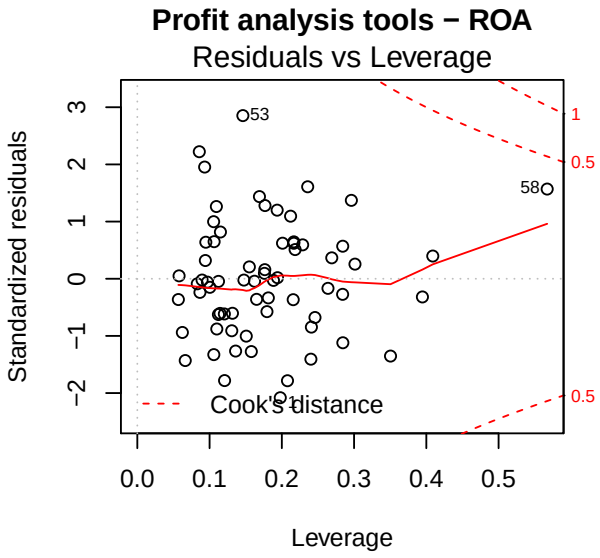

Profit analysis tools − ROE
Scale−Location
√|Standardized residuals|
Fitted values
22
15
7

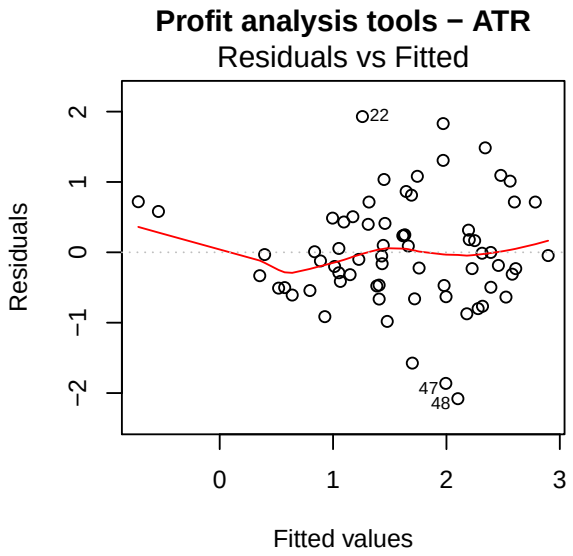

Profit analysis tools − ROE
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
20
7
1
0.5
0.5
1

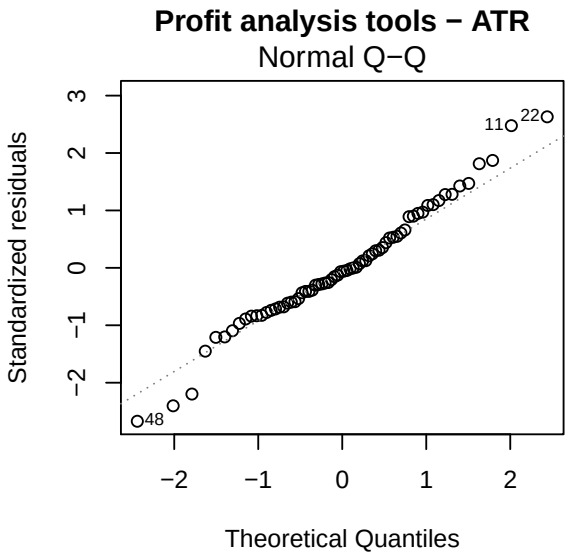

Profit analysis tools − ROA
Residuals vs Fitted
Residuals
Fitted values
53
72
1
0.05
0.10
0.15
−0.1
0.0
0.1
0.2

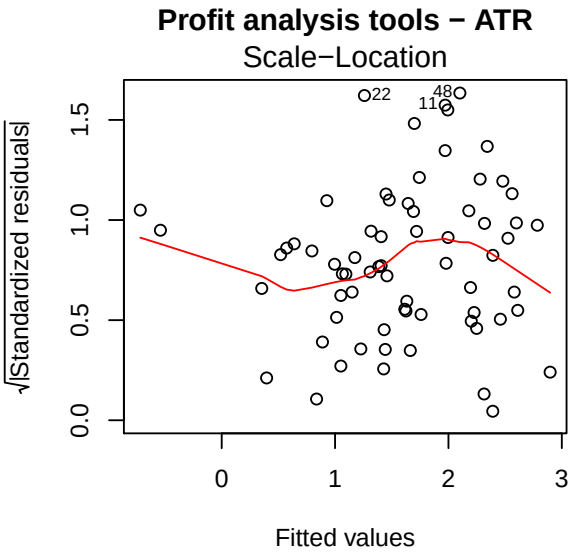

Profit analysis tools − ROA
Normal Q−Q
Standardized residuals
Theoretical Quantiles
53
72
1
−2
−1
0
1
2
3

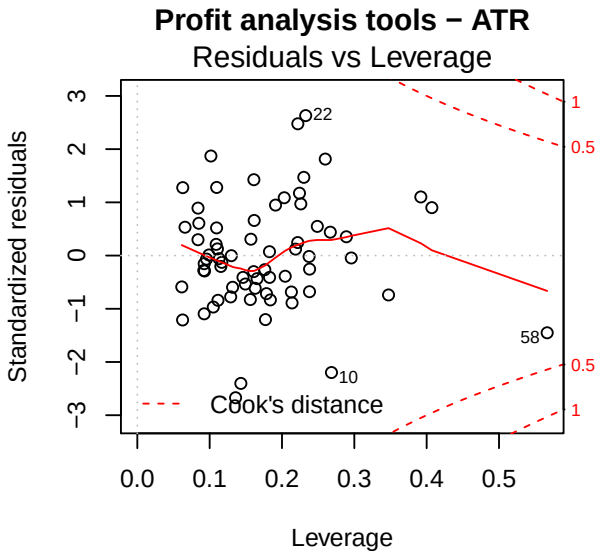

Profit analysis tools − ROA
Scale−Location
√|Standardized residuals|
Fitted values
53
72
1
0.05
0.10
0.15
0.0
0.5
1.0
1.5


Profit analysis tools − ROA
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
53
58
1
0.5
0.5
0.0
0.1
0.2
0.3
0.4
0.5
−2
−1
0
1
2
3

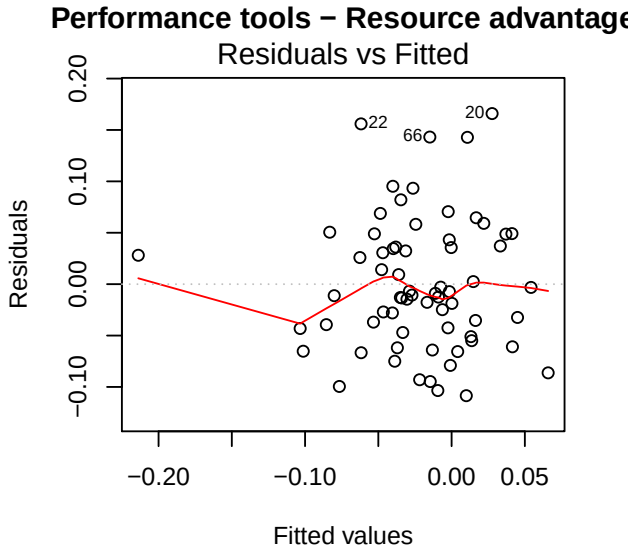

Profit analysis tools − ATR
Residuals vs Fitted
Residuals
Fitted values
22
47
48

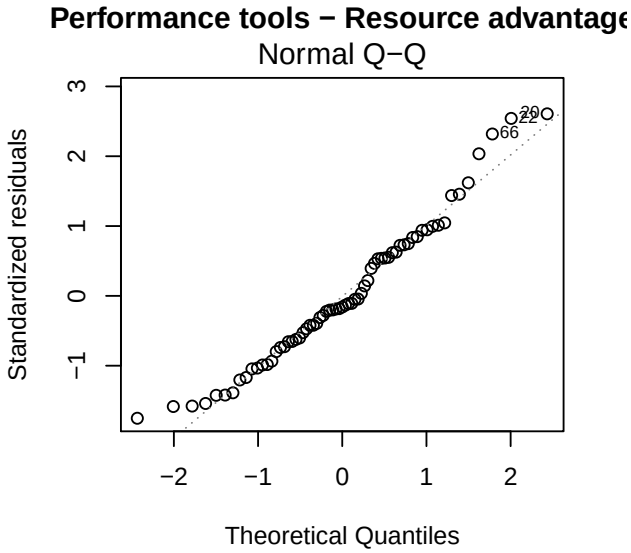

Profit analysis tools − ATR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
11
22
48

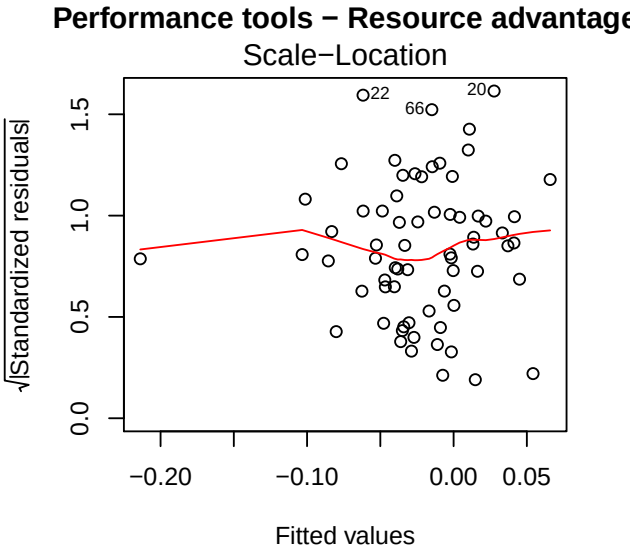

Profit analysis tools − ATR
Scale−Location
√|Standardized residuals|
Fitted values
22
11
48

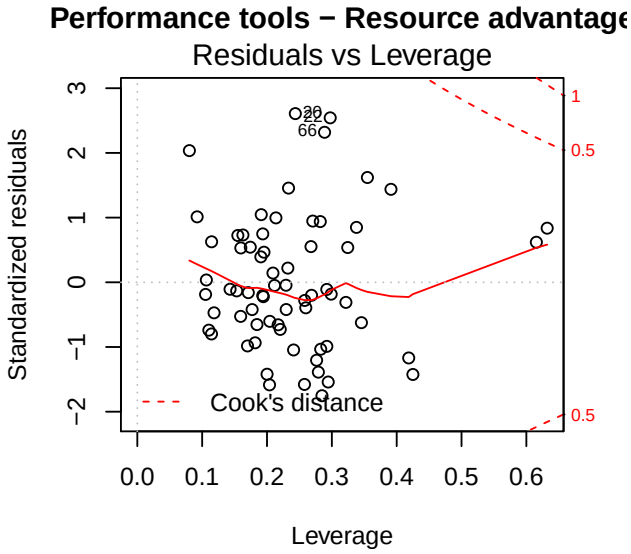

Profit analysis tools − ATR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
10
58
1
0.5
0.5
1

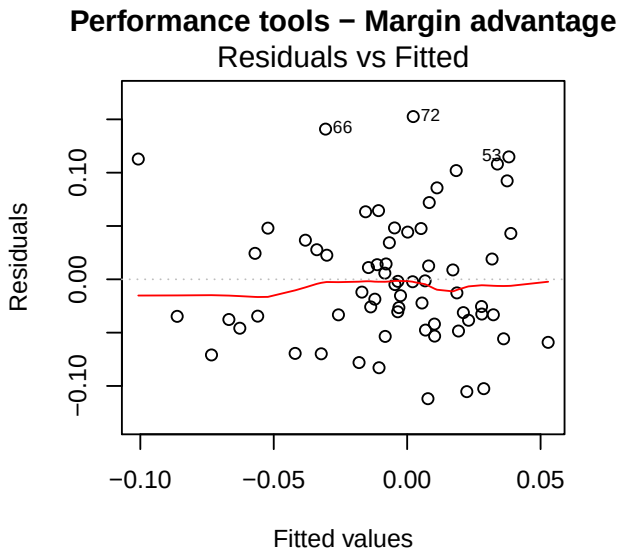
C.0.5 OLS-Models for Performance Management Tools

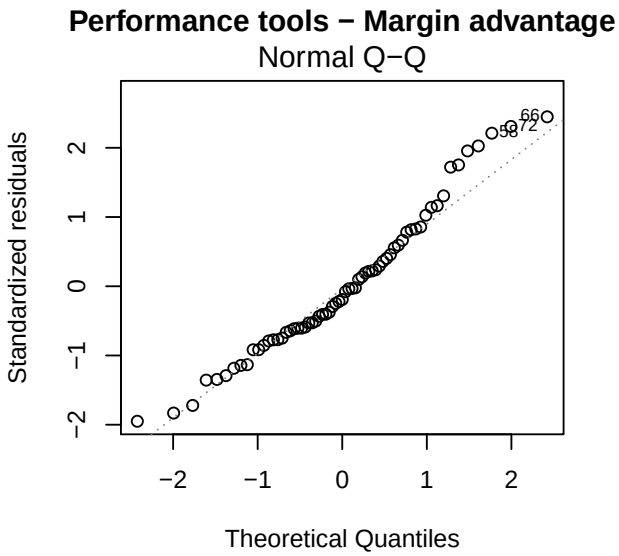

Performance tools − Resource advantage
Residuals vs Fitted
Residuals
Fitted values
22
66
20
−0.20
−0.10
0.00
0.05
0.20
0.10
0.00
−0.10

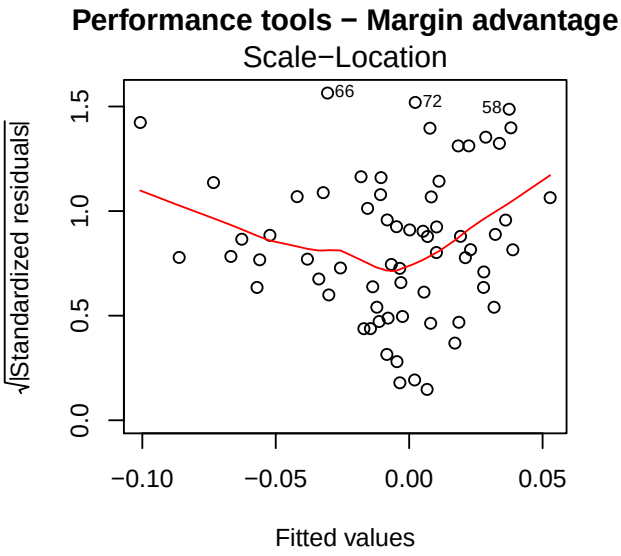

Performance tools − Resource advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
66
20
−2
−1
0
1
2
3

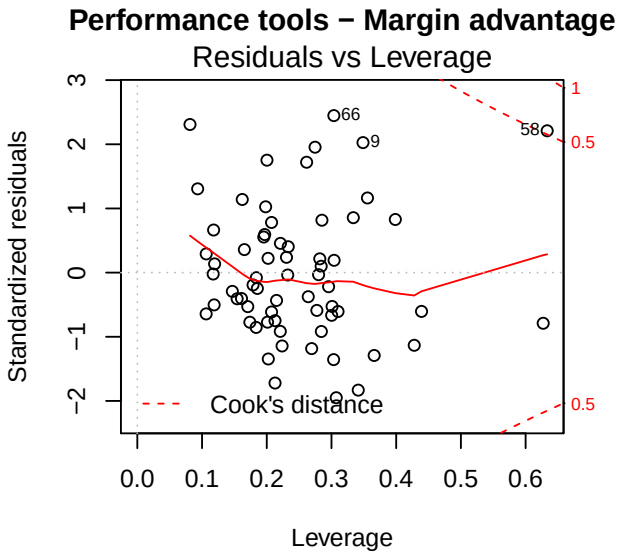

Performance tools − Resource advantage
Scale−Location
√|Standardized residuals|
Fitted values
22
66
20
−0.20
−0.10
0.00
0.05
0.0
0.5
1.0
1.5

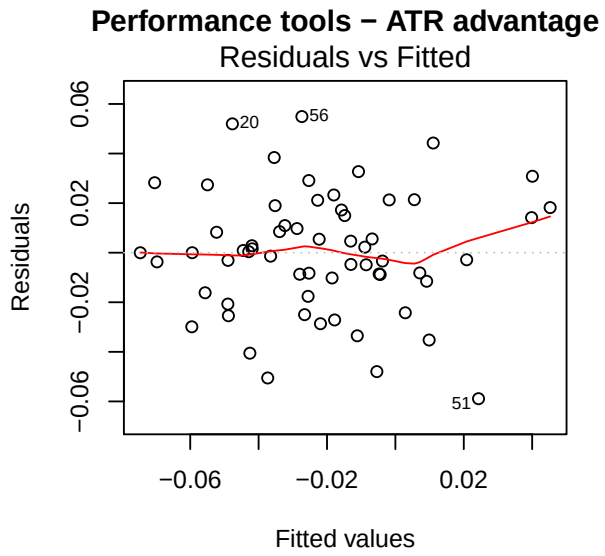

Performance tools − Resource advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
66
20
1
0.5
0.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6
−2
−1
0
1
2
3

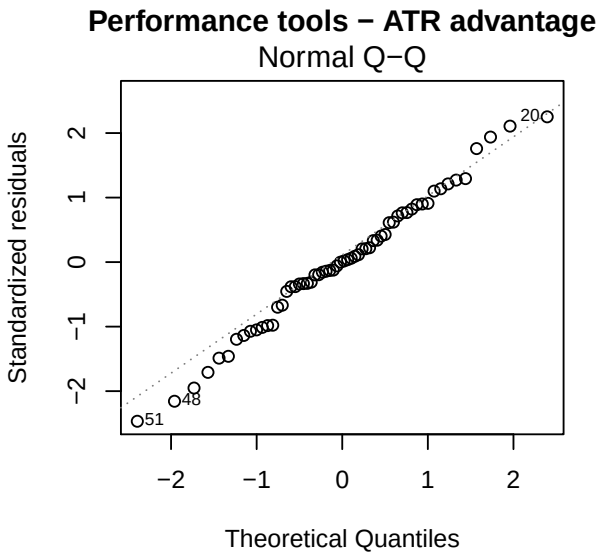

Performance tools − Margin advantage
Residuals vs Fitted
Residuals
Fitted values
66
72
53
−0.10
0.00
0.10
−0.10
−0.05
0.00
0.05

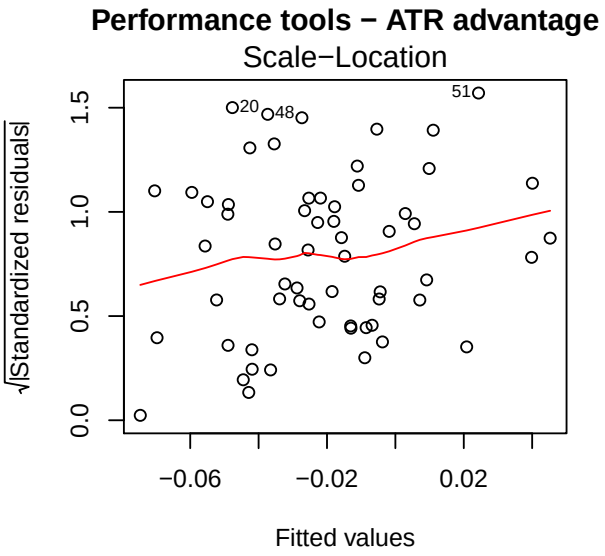

Performance tools − Margin advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
66
58
72
−2
−1
0
1
2

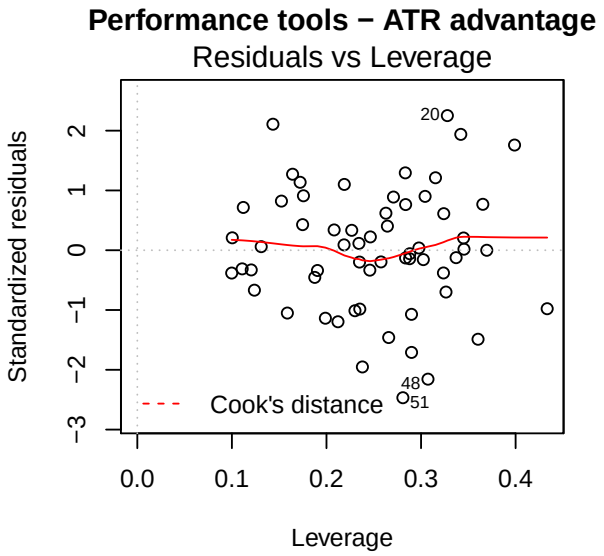

Performance tools − Margin advantage
Scale−Location
√|Standardized residuals|
Fitted values
66
72
58
0.0
0.5
1.0
1.5
−0.10
−0.05
0.00
0.05

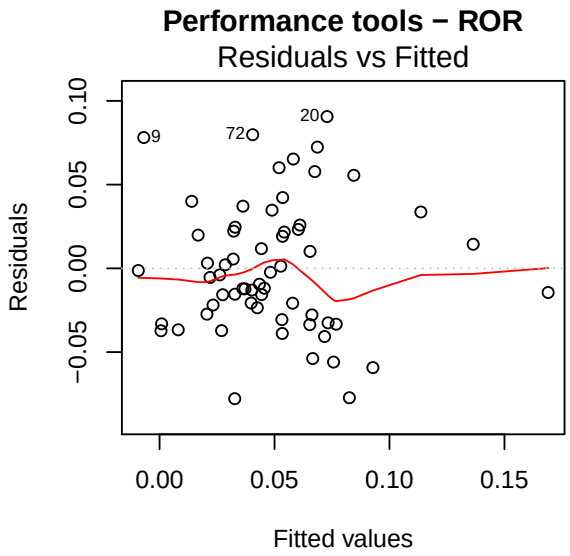

Performance tools − Margin advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
66
9
58
1
0.5
0.5
0.0
0.1
0.2
0.3
0.4
0.5
0.6

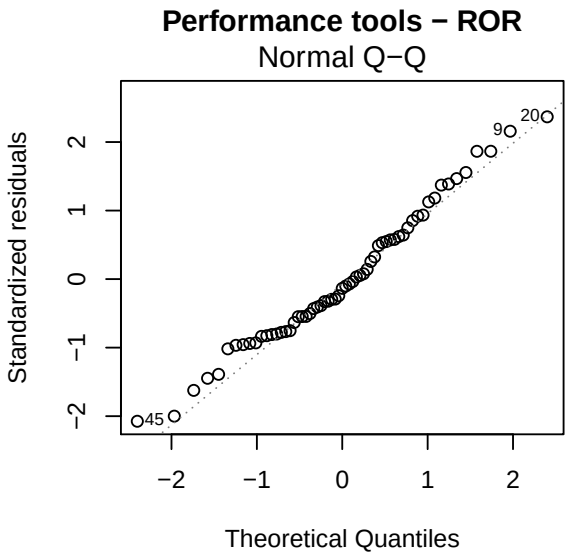

Performance tools − ATR advantage
Residuals vs Fitted
Residuals
Fitted values
20
56
51
0.06
0.02
−0.02
−0.06
−0.06
−0.02
0.02

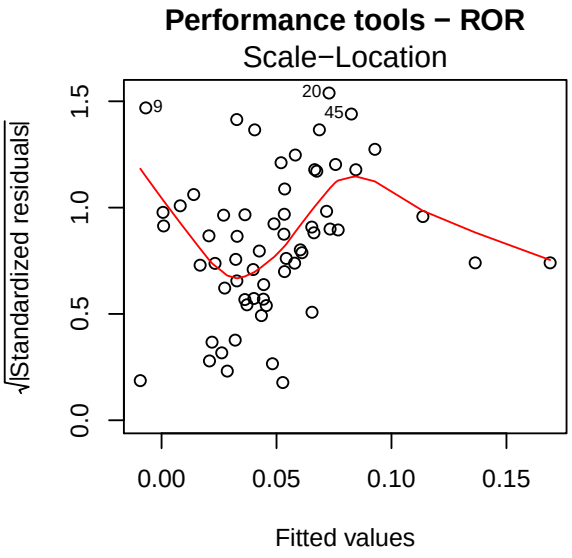

Performance tools − ATR advantage
Normal Q−Q
Standardized residuals
Theoretical Quantiles
20
48
51
2
1
0
−1
−2
−2
−1
0
1
2

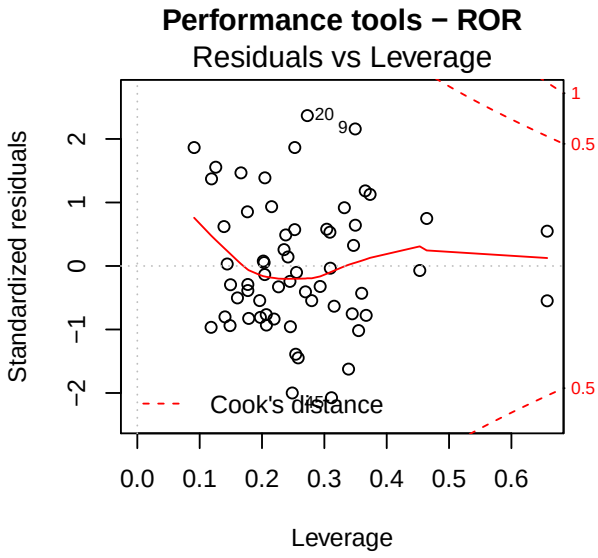

Performance tools − ATR advantage
Scale−Location
√|Standardized residuals|
Fitted values
20
48
51
1.5
1.0
0.5
0.0
−0.06
−0.02
0.02

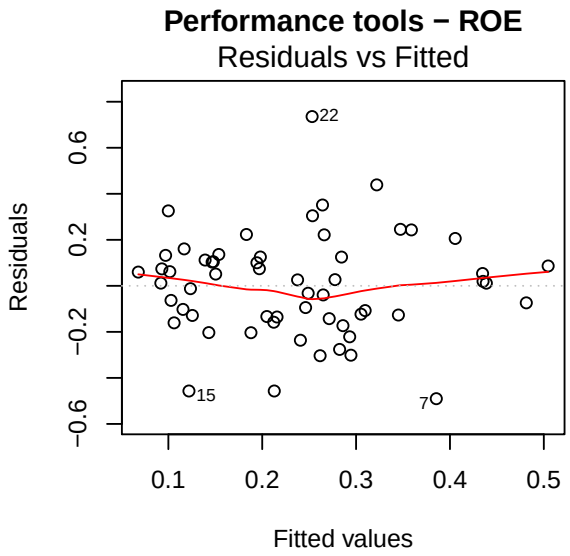

Performance tools − ATR advantage
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
20
48
51
2
1
0
−1
−2
−3
0.0
0.1
0.2
0.3
0.4

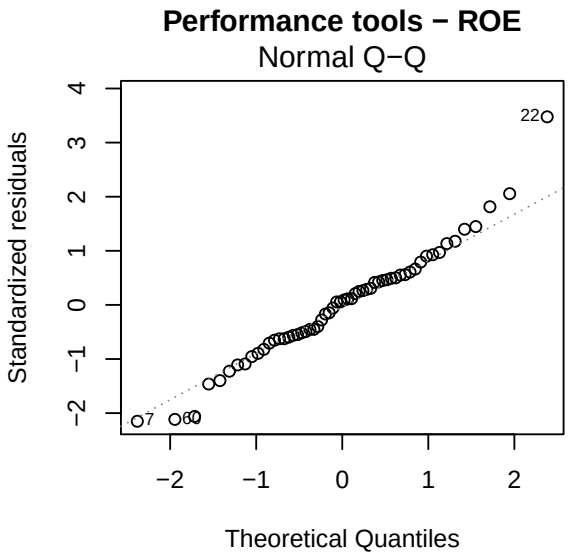

Performance tools − ROR
Residuals vs Fitted
Residuals
Fitted values
9
72
20
0.00
0.05
0.10
0.15
−0.05
0.00
0.05
0.10

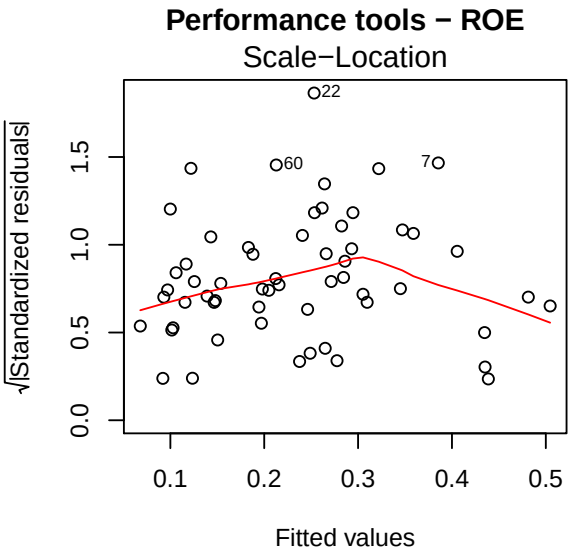

Performance tools − ROR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
9
20
45
−2
−1
0
1
2

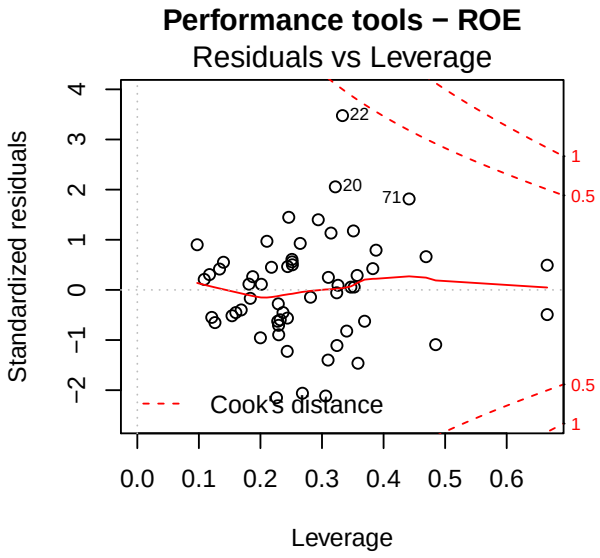

Performance tools − ROR
Scale−Location
√|Standardized residuals|
Fitted values
9
20
45
0.0
0.5
1.0
1.5
0.00
0.05
0.10
0.15

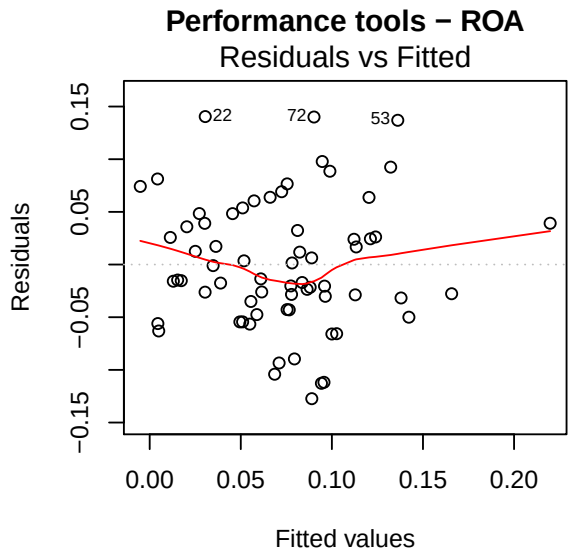

Performance tools − ROR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
20
9
45
1
0.5
0.5
−2
−1
0
1
2
0.0
0.1
0.2
0.3
0.4
0.5
0.6

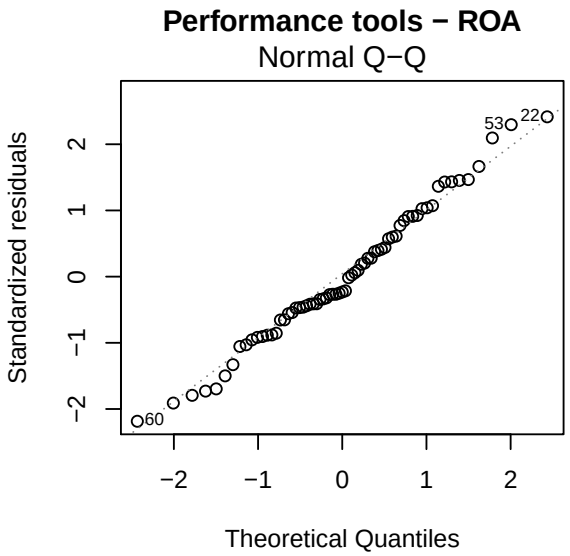

Performance tools − ROE
Residuals vs Fitted
Residuals
Fitted values
22
15
7

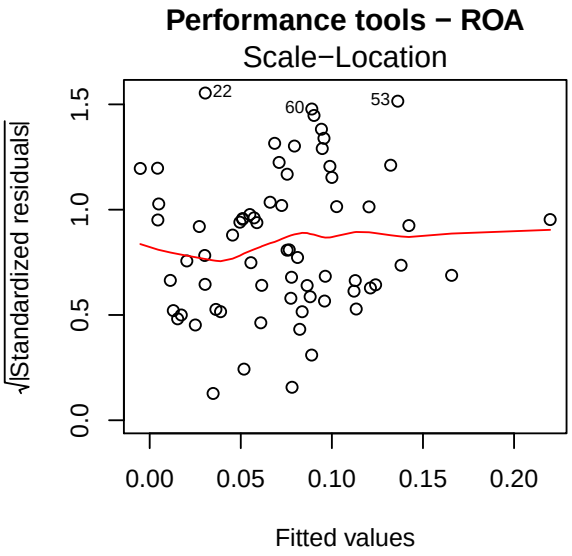

Performance tools − ROE
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
7
60

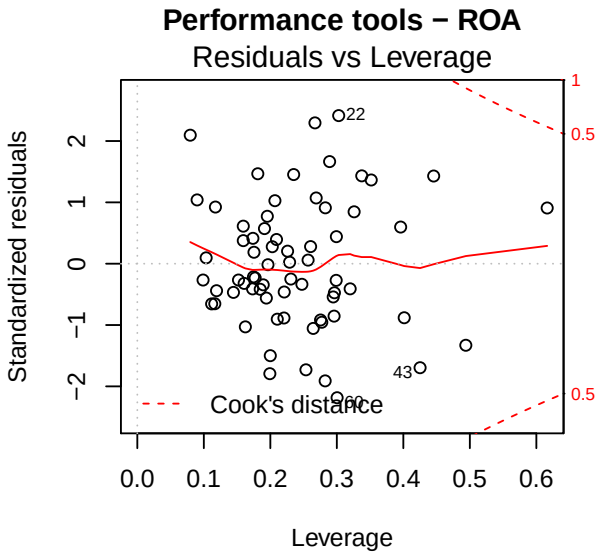

Performance tools − ROE
Scale−Location
√|Standardized residuals|
Fitted values
22
60
7

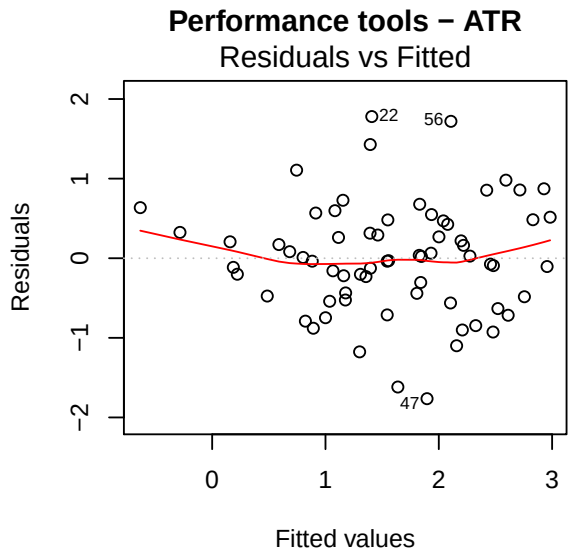

Performance tools − ROE
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
20
71

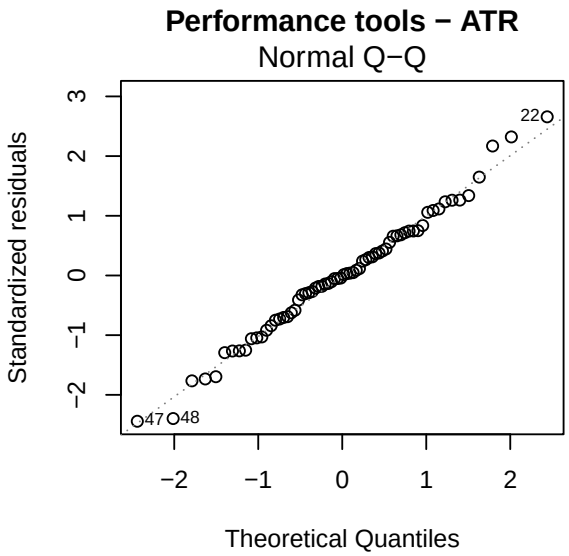

Performance tools − ROA
Residuals vs Fitted
Residuals
Fitted values
22
72
53
0.15
0.05
−0.05
−0.15
0.00
0.05
0.10
0.15
0.20

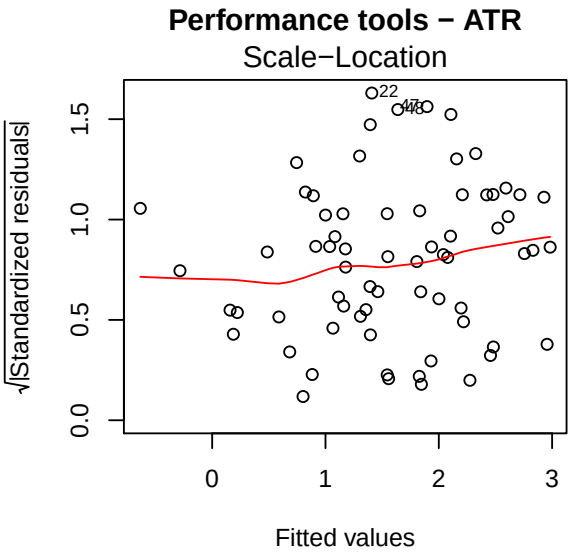

Performance tools − ROA
Normal Q−Q
Standardized residuals
Theoretical Quantiles
53
22
60
2
1
0
−1
−2

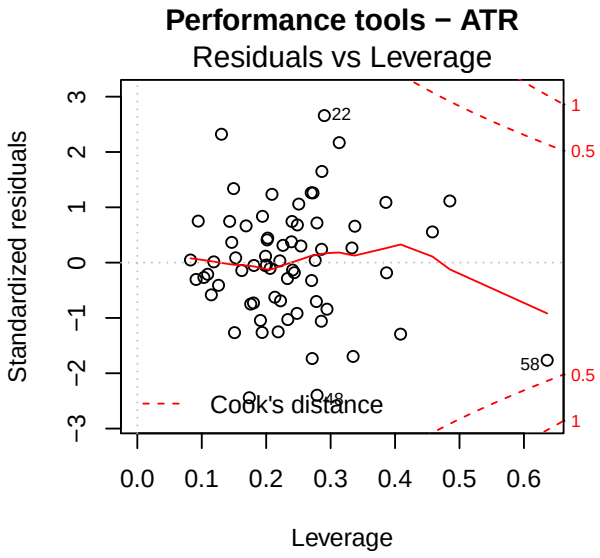

Performance tools − ROA
Scale−Location
√|Standardized residuals|
Fitted values
22
60
53
1.5
1.0
0.5
0.0
0.00
0.05
0.10
0.15
0.20


Performance tools − ROA
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
43
60
1
0.5
0.5
2
1
0
−1
−2
0.0
0.1
0.2
0.3
0.4
0.5
0.6


Performance tools − ATR
Residuals vs Fitted
Residuals
Fitted values
22
56
47


Performance tools − ATR
Normal Q−Q
Standardized residuals
Theoretical Quantiles
22
47
48


Performance tools − ATR
Scale−Location
√|Standardized residuals|
Fitted values
22
47
48


Performance tools − ATR
Residuals vs Leverage
Standardized residuals
Leverage
Cook's distance
22
58
48
1
0.5
0.5
1