The Impact of the IFRS Introduction on the Predictive Power of Earnings: An Empirical Examination of Public and Private German Firms

D I S S E R T A T I O N
of the University of St. Gallen,
School of Management,
Economics, Law, Social Sciences
and International Affairs
to obtain the title of
Doctor of Philosophy in Management

submitted by

Stephan Gossner

from

Germany

Approved on the application of

Prof. Dr. Thomas Berndt

and

Prof. Dr. Markus Schmid

Dissertation no. 4437

Difo-Druck GmbH, Bamberg 2015

The University of St. Gallen, School of Management, Economics, Law, Social Sciences and International Affairs hereby consents to the printing of the present dissertation, without hereby expressing any opinion on the views herein expressed.

St. Gallen, May 19, 2015

The President:

Prof. Dr. Thomas Bieger

To my dear wife, Natália, and my sweet daughter, Magdalena Franziska

Acknowledgements

I am indebted to many people who assisted with my research project. I am particularly indebted to my doctoral advisor, Prof. Dr. Thomas Berndt, who guided me throughout the project with his knowledgeable comments on the normative part of this dissertation and with his supportive attitude. Our discussion sessions significantly widened my accounting horizon. I am also very grateful to Prof. Dr. Markus Schmid for serving as the co-advisor of this dissertation and providing very valuable comments on the empirical approach and the results.

I would also like to express my gratitude to my colleagues at the Institute of Accounting, Control and Auditing at the University of St. Gallen, especially to Ludwig Müller, and to many fellow students at various PhD research seminars at the University of St. Gallen, the University of Zurich (UZH), and the WHU – Otto Beisheim School of Management in Vallendar. All of them provided valuable feedback in various discussion rounds and during my presentations. In this context, I am particularly grateful to Prof. Daniel W. Collins from the University of Iowa who gave me valuable feedback at an early stage of my project during his visit at WHU.

The empirical part of this dissertation is based on proprietary data provided by Deutsche Bundesbank in Frankfurt. I am very grateful to the bank for granting me access to their database and for providing funding, work resources as well as accommodation in their tremendous guest house. The provision of the data allowed me to make a considerable contribution to accounting literature; the overall support allowed me to conduct the empirical part of my dissertation very effectively. I am particularly indebted to Dr. Till Förstemann who served as my official contact person at Deutsche Bundesbank's research department. I greatly benefited from his deep empirical knowledge, critical feedback, and supportive attitude throughout the project.

My appreciation also goes to many faculty members and scholars in the Accounting Division at Columbia University in New York who gave me the opportunity to present and discuss my research during my time as a visiting scholar. I am particularly grateful to my faculty sponsor, Prof. Stephen H. Penman, who was always available for a talk, to Prof. Trevor S. Harris, who showed great appreciation for the German prudence principle, and to Prof. Gil Sadka. I am also very grateful to Prof. Ray Ball from the University of Chicago for taking the time to discuss my research with him during his visit in New York and to the PhD students at Columbia University who gave me valuable feedback in formal and informal meetings.

I am also grateful for comments on my work from participants at the AAA Annual Meeting in Anaheim, USA, and from Prof. Stephen A. Zeff from Rice University in Houston with whom I discussed my research during his visit in St. Gallen.

I would also like to thank Prof. Dr. Christina Felfe, Prof. Dr. Martin Huber, and Dr. Klaus Edel from the Advisory Service for Empirical Research at the University of St. Gallen. Their support with empirical matters helped me define the focus of the empirical part of this dissertation.

I am particularly indebted to my close friend, roommate, and colleague, Dr. Robert Gutsche, with whom I had a magnificent time here in St. Gallen. I greatly benefited

from his extensive accounting knowledge. Our endless discussions of accounting issues—frequently held during mountain bike tours across the hills of St. Gallen—helped me define the wider scope of this paper.

Last but not least I would like to express my gratitude to my parents, Hermine and Theo Gossner, who supported me throughout this project in various ways. My father also provided very valuable comments on the final draft of the paper.

I dedicate this dissertation to my wife, Natália, and to my little daughter, Magdalena Franziska. My wife's patience, love, and support throughout this endeavor were invaluable for me. The smile of my adorable little daughter helped me finish this project.

Brief Contents

Table of Contents

List of Tables

List of Figures

List of Notations and Abbreviations

#	Number
%	Percent
AB stat	Arellano-Bond z-statistic
Accounting policy change	See IFRS introduction
Adj	Adjusted
AMORT	Amortization expense
AP	Accounts payable
AR	Accounts receivable
Avg	Average
BilMoG	Bilanzrechtsmodernisierungsgesetz (German Accounting Law Modernization Act)
BilReG	Bilanzrechtsreformgesetz (German Accounting Law Reform Act)
BiRiLiG	Bilanzrichtliniengesetz (German Accounting Directives Law)
CF	Conceptual Framework for Financial Reporting (see also IASB Framework)
ΔAP	One-period change in accounts payable
ΔAR	One-period change in accounts receivable
DEPR	Depreciation expense
DEPRAMORT	Depreciation and amortization expense
df	Degrees of freedom
DID	Difference-in-Differences
ΔINV	One-period change in inventory
$\Delta PROV$	One-period change in provisions
EU	European Union
Experiment	Natural or quasi-experiment
F	Framework for the Preparation and Presentation of Financial Statements (see also IASC Framework)
FASB	Financial Accounting Standards Board
Final data set	Data used in the dissertation's empirical analysis
FirmFE	Firm fixed effects
FN	Footnote
GAAP	Generally Accepted Accounting Principles
GMM	Generalized method of moments
GoB	Grundsätze ordnungsmäßiger Bilanzierung
HGB	Handelsgesetzbuch (German Commercial Code)

HGB system	German accounting principles and rules set forth in the Third Book of the HGB
IAS	International Accounting Standard
IAS Regulation	Regulation (EC) No. 1606/2002 of the European Parliament and of the Council of 19 July 2002 on the application of international accounting standards
IASB	International Accounting Standards Board
IASB Framework	Conceptual Framework for Financial Reporting (see also CF)
IASC	International Accounting Standards Committee
IASC Framework	Framework for the Preparation and Presentation of Financial Statements (see also F)
ID	Identifier
IDW	Institut der Wirtschaftsprüfer
IFRIC	IFRS Interpretations Committee Interpretation
IFRS	International Financial Reporting Standard
IFRS introduction	Introduction of the IFRS system through the IAS Regulation
IFRS mandate	See IFRS introduction
IFRS system	Set of authoritative literature (e.g., IASB Framework, IASC Framework, IFRSs, IASs, IFRICs, and SICs)
INV	Inventory
Investor	Shareholder or debtholder
IV	Instrumental variable
ln	Natural logarithm
Mandate	See IFRS introduction
Max	Maximum
Mean	Arithmetic mean
Min	Minimum
N	Number of firms in the sample
NA	Not applicable
No	Number
NT	Number of firm-year observations in the sample
OB	Objective (in the IASB Framework)
Obs	Observation(s)
OCF	Operating cash flow
OLS	Ordinary least squares
Original data set	Data provided by Deutsche Bundesbank's USTAN database
Ov	Overall
p	Page

pp	Pages
Private firm	Non-listed (parent) company
PROV	Provisions
Public firm	Listed parent company
Q1	First quartile
Q3	Third quartile
QC	Qualitative characteristic (in the IASB Framework)
R^2	R-squared
Sargan stat	Sargan test statistic
SD	Standard deviation
SIC	Standing Interpretations Committee Interpretation
T	Number of years in the sample
TA	Total assets
TA_lagged	Lagged total assets
Treatment	See IFRS introduction
U.K.	United Kingdom
U.S.	United States
VIF	Variance Inflation Factor
Wald stat	Wald chi-square test statistic
WpHG	Wertpapierhandelsgesetz (German Securities Trading Act)
YearFE	Year fixed effects

List of Authoritative Literature

Authoritative literature concerning international accounting rules

IAS Regulation	Regulation (EC) No. 1606/2002 of the European Parliament and of the Council of 19 July 2002 on the application of international accounting standards.
The Conceptual Framework for Financial Reporting	International Accounting Standards Board (IASB). (2010). The Conceptual Framework for Financial Reporting. London (UK): IFRS Foundation.
Framework for the Preparation and Presentation of Financial Statements	International Accounting Standards Committee (IASC). (1989). Framework for the Preparation and Presentation of Financial Statements. London (UK): IASC Foundation.
IFRS 3 Business Combinations	International Accounting Standards Board (IASB). (2008). *International Financial Reporting Standard No. 3—Business Combinations*. London (UK): IFRS Foundation.
IFRS 13 Fair Value Measurement	International Accounting Standards Board (IASB). (2011). *International Financial Reporting Standard No. 13—Fair Value Measurement*. London (UK): IFRS Foundation.
IFRS 15 Revenue from Contracts with Customers	International Accounting Standards Board (IASB). (2015). *International Financial Reporting Standard No. 15—Revenue from Contracts with Customers*. London (UK): IFRS Foundation.
IAS 1 Presentation of Financial Statements	International Accounting Standards Board (IASB). (2007). *International Accounting Standard No. 1—Presentation of Financial Statements*. London (UK): IFRS Foundation.
IAS 2 Inventories	International Accounting Standards Board (IASB). (2005). *International Accounting Standard No. 2—Inventories*. London (UK): IFRS Foundation.

Authoritative literature concerning international accounting rules (continued)

IAS 11 Construction Contracts	International Accounting Standards Board (IASB). (1993). *International Accounting Standard No.11—Construction Contracts*. London (UK): IFRS Foundation.
IAS 16 Property, Plant and Equipment	International Accounting Standards Board (IASB). (2003). *International Accounting Standard No. 16—Property, Plant and Equipment*. London (UK): IFRS Foundation.
IAS 18 Revenue	International Accounting Standards Board (IASB). (1993). *International Accounting Standard No.18—Revenue*. London (UK): IFRS Foundation.
IAS 36 Impairment of Assets	International Accounting Standards Board (IASB). (2004). *International Accounting Standard No. 36—Impairment of Assets*. London (UK): IFRS Foundation.
IAS 37 Provisions, Contingent Liabilities and Contingent Assets	International Accounting Standards Board (IASB). (1998). *International Accounting Standard No. 37—Provisions, Contingent Liabilities and Contingent Assets*. London (UK): IFRS Foundation.
IAS 38 Intangible Assets	International Accounting Standards Board (IASB). (2004). *International Accounting Standard No. 38—Intangible Assets*. London (UK): IFRS Foundation.

Authoritative literature concerning U.S. accounting rules

SFAS 1 Objectives of Financial Reporting by Business Enterprises	Financial Accounting Standards Board (FASB). (1978). *Statement of Financial Accounting Concepts No. 1—Objectives of Financial Reporting by Business Enterprises*. Stamford (USA): Financial Accounting Foundation.

Authoritative literature concerning German laws—versions of the German Commercial Code (Handelsgesetzbuch [HGB])

German Commercial Code in the version of the Accounting Directives Law (Bilanzrichtliniengesetz [BiRiLiG])	HGB (1985): Handelsgesetzbuch vom 10.05.1897 (RGBl., S. 219) mit allen späteren Änderungen einschließlich der Änderung durch das Gesetz zur Durchführung der Vierten, Siebenten und Achten Richtlinie des Rates der Europäischen Gemeinschaften zur Koordinierung des Gesellschaftsrechts (Bilanzrichtlinien-Gesetz—BiRiLiG) vom 19.12.1985, in: BGBl. I, S. 2355.
German Commercial Code in the version of the Accounting Law Reform Act (Bilanzrechtsreformgesetz [BilReG])	HGB (2004): Handelsgesetzbuch vom 10.05.1897 (RGBl., S. 219) mit allen späteren Änderungen einschließlich der Änderung durch das Gesetz zur Einführung internationaler Rechnungslegungsstandards und zur Sicherung der Qualität der Abschlussprüfung (Bilanzrechtsreformgesetz—BilReG) vom 4.12.2004, in: BGBl. I, S. 3166.
German Commercial Code in the version of the Accounting Law Modernization Act (Bilanzrechtsmodernisierungsgesetz [BilMoG])	HGB (2009): Handelsgesetzbuch vom 10.05.1897 (RGBl., S. 219) mit allen späteren Änderungen einschließlich der Änderung durch das Gesetz zur Modernisierung des Bilanzrechts (Bilanzrechtsmodernisierungsgesetz—BilMoG) vom 25.5.2009, in: BGBl. I, S. 1102.

Authoritative literature concerning German laws—other

German Securities Trading Act (Wertpapierhandelsgesetz [WpHG])	WpHG (2009): Gesetz über den Wertpapierhandel vom 09.09.1998 (BGBl. I, S. 2708) mit allen späteren Änderungen einschließlich der Änderung durch das Gesetz zur Neuregelung der Rechtsverhältnisse bei Schuldverschreibungen aus Gesamtemissionen und zur verbesserten Durchsetzbarkeit von Ansprüchen von Anlegern aus Falschberatung vom 31.07.2009, in: BGBl. I, S. 2512.

Abstract

The dissertation examines whether the introduction of international financial reporting standards (IFRS) deteriorated public German firms' financial statement quality. The dissertation measures financial statement quality with earnings' predictive power with regard to forecasting operating cash flow and develops a disaggregated earnings-based cash flow forecasting model, thereby making a considerable contribution to the empirical financial accounting literature as only a few studies proxy financial statement quality this way. The disaggregated earnings-based cash flow forecasting model explains future operating cash flow with components of current earnings. These components are: current operating cash flow and current accruals. Current accruals are: depreciation expense, amortization expense, provisions, accounts receivable, inventory, and accounts payable. Given that IFRS, relative to the Third Book of the German Commercial Code (Handelsgesetzbuch, HGB), grants management a significantly larger margin of discretion with regard to the measurement of accruals and given the insight from agency theory that management seeks to maximize their own wealth instead of the wealth of principals, the dissertation hypothesizes that the predictive power of earnings declines following the IFRS introduction.

The IFRS introduction constitutes a natural experiment as it divides the universe of German firms into a treatment group—public German firms being subject to the policy change—and a control group—private German firms not being subject to the policy change. The dissertation uses this natural experiment and investigates the IFRS effect under a difference-in-differences design. The use of this design constitutes another contribution to the literature as it is rarely used in IFRS-related research.

The dissertation uses panel data provided by Deutsche Bundesbank's USTAN database, thereby making another contribution to the literature as this database has only recently become available to the wider research community and has therefore not widely been used in accounting research. The sample comprises 47,303 firm-year observations covering the period from 1987 through 2013.

The dissertation finds that the disaggregated earnings-based cash flow forecasting model's prediction error increases after the IFRS introduction. This result means that earnings' predictive power with regard to forecasting operating cash flow has declined, thereby indicating that earnings quality and ultimately financial statement quality has deteriorated for public German firms and, in a broader sense, that information asymmetry between investors and managers of public German firms has widened as a consequence of the accounting policy change. The result is robust to a variety of sensitivity tests concerning the estimation method of the model

Kurzzusammenfassung

Die vorliegende Arbeit untersucht den Zusammenhang zwischen der Einführung der internationalen Rechnungslegungsstandards (International Financial Reporting Standards, IFRS) und der Jahresabschlussqualität deutscher, kapitalmarktorientierter Unternehmen. Die Arbeit operationalisiert Jahresabschlussqualität durch die Prognosegüte des Gewinns im Hinblick auf den zukünftigen operativen Cashflow und entwickelt ein disaggregiertes, gewinnbasiertes Cashflow-Prognosemodell. Dieser Ansatz stellt einen beachtlichen Beitrag zur empirischen Rechnungslegungsliteratur dar, da nur wenige Studien Jahresabschlussqualität auf diese Weise operationalisieren. Das Cashflow-Prognosemodell erklärt den zukünftigen operativen Cashflow mit Hilfe von gegenwärtigen Gewinnkomponenten. Diese Komponenten sind: gegenwärtiger operativer Cashflow und gegenwärtige Abgrenzungsposten (Accruals). Die verwendeten gegenwärtigen Accruals sind: Abschreibungsaufwand, Amortisationsaufwand, Rückstellungen, Forderungen und Verbindlichkeiten aus Lieferung und Leistung und Vorräte). Aufgrund der Tatsache, dass die IFRS, anders als das deutsche Handelsgesetzbuch (HGB), dem Management einen erheblich größeren Ermessensspielraum bei der Bewertung von Accruals einräumt, und aufgrund der Tatsache, dass laut Prinzipal-Agent-Theorie Manager bei der Erstellung von Jahresabschlüssen ihren eigenen Nutzen und nicht den Nutzen von Investoren maximieren, stellt die Arbeit die Hypothese auf, dass die Prognosegüte nach der IFRS-Einführung abnimmt.

Die IFRS-Einführung stellt ein natürliches Experiment dar, da die Maßnahme das Universum deutscher Firmen in eine Treatmentgruppe—kapitalmarktorientierte deutsche Unternehmen, welche die IFRS anwenden müssen—und eine Kontrollgruppe—nicht-kapitalmarktorientierte deutsche Unternehmen, welche nach wie vor HGB anwenden—unterteilt. Die Arbeit macht sich dieses natürliche Experiment zu Nutze und untersucht den IFRS-Effekt mit Hilfe eines Difference-in-Differences-Ansatzes. Diese Vorgehensweise stellt einen weiteren Beitrag zur Rechnungslegungsliteratur dar, da ein solcher Ansatz bei der Untersuchung des IFRS-Effekts selten angewandt wird.

Die Arbeit verwendet Paneldaten, die von der USTAN-Datenbank der Deutschen Bundesbank zur Verfügung gestellt wurden. Die Verwendung dieser Daten stellt einen weiteren Beitrag zur Rechnungslegungsliteratur dar, da die Datenbank erst kürzlich für Forschungszwecke zugänglich gemacht wurde und somit in der Rechnungslegungs-forschung noch nicht stark genutzt wird. Die verwendete Stichprobe umfasst 47.303 Firmen-Jahr-Beobachtungen der Periode von 1987 bis 2013.

Das Ergebnis der Untersuchung ist, dass sich der Prognosefehler des disaggregierten, gewinnbasierten Cashflow-Prognosemodells nach der IFRS-Einführung erhöht. Dieses Ergebnis bedeutet, dass sich die Prognosegüte des Gewinns und letztlich die Jahresabschlussqualität deutscher, kapitalmarktorientierter Unternehmen verschlechtert hat. In einem weiteren Sinn bedeutet das Ergebnis, dass sich die Informationsasymmetrie zwischen Investoren und Managern dieser Unternehmen ausgeweitet hat. Das Ergebnis ist robust hinsichtlich einer Reihe von Sensitivitätstests der konkreten Ausprägung der Schätzmethode.

1 Introduction

"I think it is fair to say that the spread of IFRS around the world has been an astonishing success."
- Hans Hoogervorst (2014)[1]

The frequent lack of observable market prices, which would allow the derivation of fair value objectively, requires the use of substitutes and leads to de facto unlimited discretionary choices for managers.
- Dr. Horst Vinken (2013)[2]

Has the introduction of the International Financial Reporting Standards (IFRS) been a success? Approximately ten years after the accounting regime change this question is still contentiously debated. Thus far, more than 12,000 firms in more than 100 countries have adopted the international accounting principles and rules.[3] While these impressive numbers certainly constitute success in the sense that the widespread use of a single set of accounting principles and rules likely enhances comparability of financial statements across borders, comparability benefits alone are insufficient if they are gained to the detriment of another dimension of financial statement quality—transparency. Transparency is critically dependent on the amount of discretion granted to management when preparing financial statements. From a conceptual perspective, the extensive application of the fair value measurement concept in the IFRS suggests that the transparency of financial statements has been deteriorating for firms that follow the new rules. Ultimately, however, the question of whether transparency has actually deteriorated is empirical.

The dissertation empirically examines the effect of the IFRS introduction on financial statement quality—interpreted in the sense of transparency—in Germany. Since 2005, public firms in Germany are required to prepare consolidated financial statements according to IFRS, whereas private firms continue to apply the traditional German accounting system set forth in the Third Book of the German Commercial Code (*Handelsgesetzbuch* [*HGB*]). Given that the introduction of the IFRS has resulted in a

---

[1] Hans Hoogervorst, Chairman of the IASB, during a speech titled "Charting progress towards global accounting standards" (IFRS Conference in Singapore, May 29, 2014).

[2] Dr. Horst Vinken, President of the German Federal Chamber of Tax Consultants (Bundessteuerberater-kammer) in a foreword to the book: Küting, K., Pfitzer, N., & Weber, C.-P. (2013). IFRS oder HGB? Systemvergleich und Beurteilung (2nd ed.). Stuttgart: Schäffer-Poeschel; own translation from German.

[3] PricewaterhouseCoopers LLP (2015).

significant increase in public firms' costs of preparing financial statements[4], an offsetting benefit in the form of an improvement in financial statement quality seems warranted. An extant body of empirical financial accounting literature has addressed the question of whether the IFRS introduction has resulted in such an improvement (e.g., Ahmed, Neel, & Wang (2013); Daske, Hail, Leuz, & Verdi (2013); Horton, Serafeim, & Serafeim (2013); Barth, Landsman, Lang, & Williams (2012); Armstrong, Barth, Jagolinzer, & Riedl (2010); Barth, Landsman, & Lang (2008); Christensen, Lee, & Walker (2008); and Daske, Hail, Leuz, & Verdi (2008)).[5] Despite a considerable amount of studies in this field, however, the literature arrives at mixed results and thus fails to conclusively show that the IFRS introduction has indeed improved financial statement quality.

Not only because of mixed empirical results but also from a conceptual point of view there is considerable doubt, especially among German accounting academics, as to whether the IFRS introduction has in fact resulted in an improvement in financial statement quality (e.g., Küting, et al. (2013); Schildbach (2012); and Ballwieser, Küting, & Schildbach (2004)). Critics argue that IFRS, relative to the HGB, provide managers with a significantly larger amount of discretion when preparing financial statements—especially in the context of fair value accounting—, thereby giving managers significantly more potential to *opportunistically* represent business transactions in financial statements (i.e., to engage in earnings management). In an agency-theoretic setting in which managers seek to maximize their own wealth, I follow the critics' argument and hypothesize that more discretion granted by IFRS leads to more opportunistic accounting amounts in financial statements and ultimately to a deterioration of financial statement quality. To examine the hypothesis, I take the perspective of fundamental shareholders and debtholders who value firms and rely on current consolidated financial statements as an anchor for their operating cash flow forecasts.

The dissertation operationalizes the broad concept of *financial statement quality* using the more specific concept of *earnings quality*. Due to the focus on valuation and cash flow forecasting, the dissertation measures changes in earnings quality with changes in *earnings' predictive power with regard to forecasting operating cash flow*.

---

[4] Examples of costs that increased as a result of the accounting regime change are costs necessary to train accounting personnel to become familiar with the new accounting principles and rules, costs to revise existing procedures (e.g., accounting guidelines and charts of accounts), and costs to update the existing information technology environment (Küting, Pfitzer, & Weber (2013), pp. 68-69).

[5] For a detailed literature review, see Subsection 4.1.

To detect changes in earnings' predictive power with regard to forecasting operating cash flow, the dissertation uses a disaggregated earnings-based cash flow forecasting model as a measurement tool, a model that is widely used by valuation practitioners such as banks, rating agencies, and financial analysts. The model explains future operating cash flow with components of current earnings: current operating cash flow and current accruals. (Current accruals are further decomposed into various accrual components.) The use of an *earnings-based* rather than a *cash-based* cash flow forecasting model is justified as accounting literature has revealed that current earnings better explain future operating cash flow than current operating cash flow. Similarly, the use of a *disaggregated* rather than an *aggregated* cash flow forecasting model is justified as accounting literature has also revealed that disaggregated earnings better explain future operating cash flow than aggregated earnings (e.g., Wrede (2009); Homburg & Wrede (2007); Al-Attar & Hussain (2004); Barth, Cram, & Nelson (2001)).

Main Contribution

The use of earnings' predictive power as a proxy for earnings quality as well as the use of a disaggregated earnings-based cash flow forecasting model as a measurement tool to detect changes in earnings' predictive power constitutes a considerable contribution to the IFRS-related empirical financial accounting literature for two reasons: (1) IFRS-related studies use various proxies for financial statement quality but generally fail to consider earnings' predictive power with regard to forecasting operating cash flow; and (2) studies investigating the usefulness of different types of cash flow forecasting models (e.g., earnings-based versus cash-based models or disaggregated versus aggregated models) generally arrive at the result that disaggregated earnings-based cash flow forecasting models are superior to other types but generally fail to apply this insight to IFRS-specific research questions. Thus, a combination of these two streams of literature seems natural. Surprisingly, however, such a combination is rare in the literature. The few exceptions are: Li & Sougiannis (2014); Jarva & Lantto (2012); and Atwood, Drake, Myers, & Myers (2011).

Research Method

The dissertation uses a disaggregated earnings-based cash flow forecasting model to measure changes in earnings' predictive power with regard to forecasting operating cash flow. To specify the model, the dissertation uses accruals representing differences between IFRS and HGB with regard to the amount of discretion granted to

management. For example, amortization expense is chosen as one accrual in the model as IFRS 3, International Accounting Standard (IAS) 36, and IAS 38 grant management, relative to the HGB, a substantially larger amount of discretion when valuing intangible assets and deriving goodwill in the context of business combinations; these differences, in turn, affect amortization expense in years following the business combination.

The IFRS introduction is a natural experiment as it leads to the formation of two distinct groups of firms: a treatment group of firms that are subject to the accounting policy change (i.e., public German firms) and a control group of firms that are not subject to the accounting policy change (i.e., private German firms). The dissertation uses this natural experiment by measuring changes in earnings' predictive power under a difference-in-differences design. The design takes both groups of firms explicitly into account and, therefore, allows causal interpretations of empirically examined changes in earnings' predictive power. The use of a difference-in-differences design constitutes another contribution to the literature as many IFRS-related studies simply investigate public firms (i.e., the treatment group) and do not consider a control group of private firms.

When measuring changes in earnings' predictive power, the dissertation takes a two-step approach: (1) estimation of the disaggregated earnings-based cash flow forecasting model itself; and (2) estimation of the model's residuals. The purpose of the first step is twofold: to ensure that the chosen accruals in the model explain future operating cash flow (i.e., to ensure that the model is correctly specified) and to generate residuals. The second step directly measures changes in the cash flow forecasting model's prediction error following the IFRS introduction. This two-step approach—in particular the use of a residual model instead of other, less sophisticated tools—constitutes another contribution to empirical financial accounting literature.

Data

The dissertation uses Deutsche Bundesbank's USTAN database. The database, which was specifically established for the purpose of creating a data set for IFRS-specific research, contains highly accurate accounting amounts covering both public and private German firms. The database has become available to the research community only recently and, thus, has not been widely used in empirical financial accounting research. Therefore, by using this database, the dissertation makes another contribution to the literature.

Results

The main finding of the dissertation indicates that the cash flow forecasting model's prediction error has increased for firms preparing financial statements according to IFRS, thereby suggesting that earnings' predictive power with regard to forecasting operating cash flow has declined. This finding supports the hypothesis that the IFRS introduction has led to more opportunistic management behavior when preparing accounting amounts and ultimately to a decrease in the quality of consolidated financial statements of public German firms.

Method of Investigation

The dissertation's method of investigation is as follows:

- Section 2 formulates the dissertation's research problem and highlights its audience and aims;
- Section 3 provides the conceptual foundation necessary to derive a specific research question and empirically testable hypotheses;
- Section 4 presents the research question and a literature review of IFRS-related studies. The section also highlights the dissertation's contributions to the empirical financial accounting literature;
- Section 5 develops the economic model and research hypotheses;
- Section 6 explains the research method by providing an in-depth description of the data and the approach to measure changes in earnings' predictive power (overall research design and statistical tests employed);
- Section 7 reports empirical results of univariate and hypothesis tests and provides interim conclusions;
- Section 8 provides a discussion of empirical results, an outline of possible limitations, and suggestions for future research; and
- Section 9 includes an executive summary of the dissertation.

Figure 1.1 illustrates the dissertation's method of investigation.

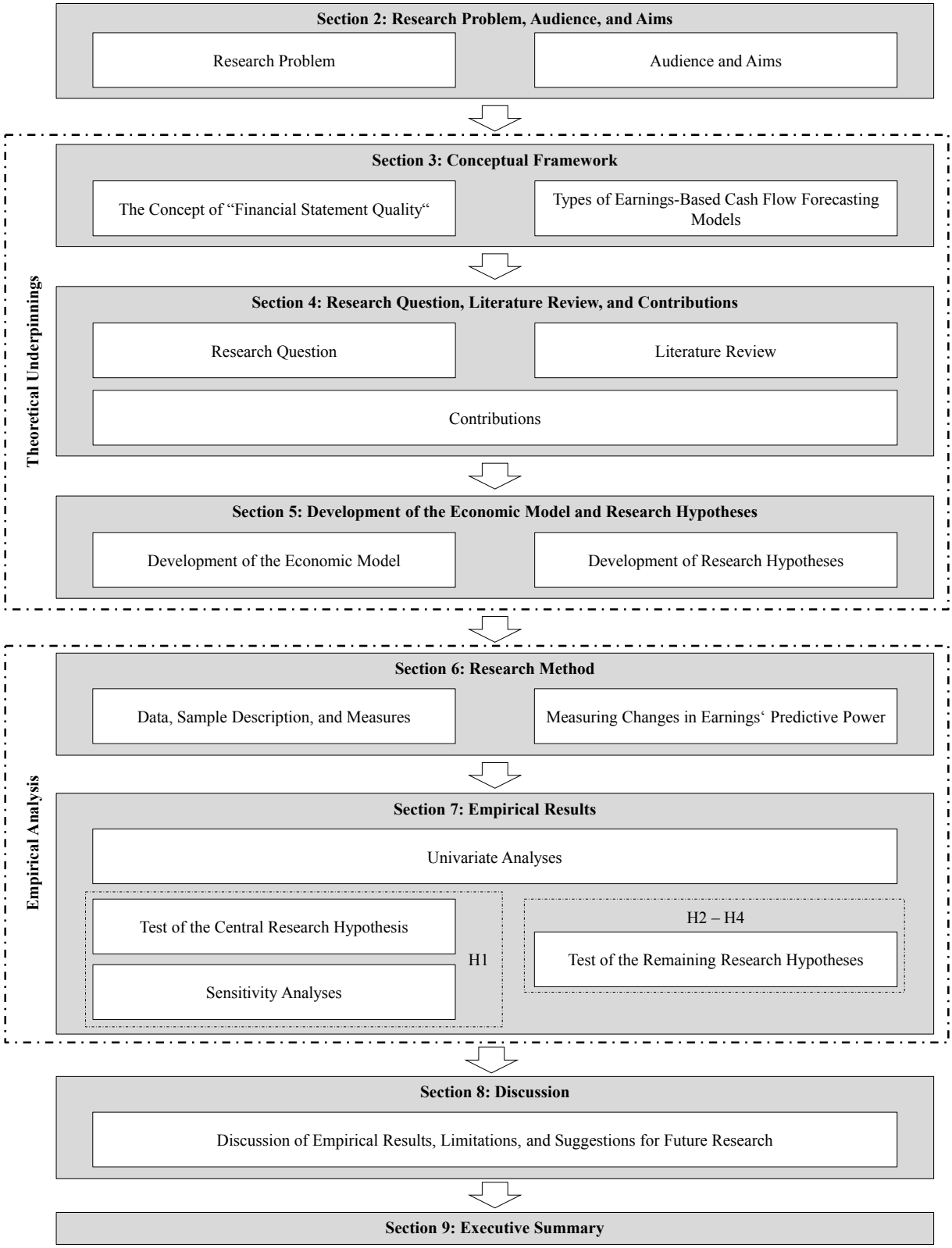

FIGURE 1.1
METHOD OF INVESTIGATION

Notes. The figure illustrates the dissertation's method of investigation; own depiction.

2 Research Problem, Audience, and Aims

2.1 Research Problem

The IAS Regulation

In 2002, the European Parliament and the European Council (EU) approved Regulation (EC) No. 1606/2002 (IAS Regulation), thereby formally adopting accounting principles and rules developed by the International Accounting Standards Board (IASB).[6] The IAS Regulation mandates that EU member states require from their listed[7] parent companies (public EU firms) the application of the IASB's accounting principles and rules when preparing *consolidated* financial statements for fiscal years starting on or after January 1, 2005.[8] In addition to this mandate, the IAS Regulation provides EU member states with three options: (1) to permit or require the application of the IASB's accounting principles and rules from *public* EU firms when preparing *unconsolidated* financial statements; (2) to permit or require the application of the IASB's accounting principles and rules from *private* EU firms when preparing *consolidated* financial statements, *unconsolidated* financial statements, or both; and (3) to permit *public* EU firms to postpone the application of the IASB's accounting principles and rules until 2007 if, in 2005, they had only issued bonds in an EU

---

[6] The IASB's accounting principles and rules are documented in the standard setter's body of authoritative literature with the following key elements: (1) *Conceptual Framework for Financial Reporting* (IASB Framework or CF); (2) *International Financial Reporting Standards* (IFRS); and *IFRS Interpretations Committee Interpretations* (IFRIC). (For a comprehensive list of authoritative documents, see Ernst & Young LLP (2015), pp. xix-xxii.)

When referring to these key authoritative documents, the dissertation also implicitly refers to the preceding authoritative documents developed by the *International Accounting Standards Committee* (IASC). Thus, when referring to the IASB Framework, the IFRS, and the IFRIC, the dissertation also implicitly refers to the IASC's *Framework for the Preparation and Presentation of Financial Statements* (IASC Framework), the IASC's *International Accounting Standards* (IAS), and the IASC's *Standing Interpretations Committee Interpretations* (SIC). (For a discussion of the IASC's evolution into the IASB, see Zeff (2012), pp. 807-837; Argento (2008), pp. 1-6; and Camfferman & Zeff (2007).)

[7] A firm is listed if its "securities [are] admitted to trading on a regulated market […] or […] offered to the public in view of their admission to such trading […]" (Ernst & Young LLP (2015), p. 32, FN 61). The term *securities* comprises both stocks and bonds (see Section 264d HGB and Section 2(1)(1) of the German Securities Trading Act (Wertpapierhandelsgesetz [WpHG]).

[8] IAS Regulation, Article 4; Ernst & Young LLP (2015), pp. 19-21.

member state's debt capital market or if they had only issued securities in a stock market in the United States (U.S.).[9]

Terminology and Country Focus

Throughout the dissertation, when referring to the above-mentioned key authoritative documents issued by the IASB, the term *IFRS system* will be used; when referring to the IAS Regulation's mandate requiring public EU firms to prepare consolidated financial statements in accordance to the IFRS system, the terms *IFRS mandate*, *IFRS introduction*, *accounting policy change*, or *treatment* will be used interchangeably. When referring to the entire set of German accounting principles and rules set forth in the HGB, the term *HGB system* will be used.

The dissertation confines its attention to public firms in Germany. Even though the IAS Regulation applies to all public EU firms, such a focus is useful as the HGB system fundamentally differs from the IFRS system, thereby allowing a precise measurement of the effect of the IFRS introduction under a research design in which firms that switched from the HGB system to the IFRS system (i.e., public German firms) are compared to firms that continued using the HGB system (i.e., private German firms).

Research Problem

There is uncertainty as to whether the IFRS introduction has resulted in benefits for public German firms and, in particular, for public German firms' *owners*. Due to the fact that public German firms are organized as corporations, potential benefits for owners will arise if the accounting regime change improves financial statement quality.

In a corporation, owners—frequently denoted as *principals*—delegate economic decision-making to managers—frequently denoted as *agents*.[10] The consequence is a

[9] Firms issuing securities in the U.S. are required to follow U.S. Generally Accepted Accounting Principles (GAAP) established by the U.S. Financial Accounting Standards Board (FASB). The IASB's accounting principles and rules and the U.S. GAAP are considered to have similar characteristics (IAS Regulation, Article 9; Ernst & Young LLP (2015), pp. 19-21).

[10] Jensen & Meckling (1976), p. 305, FN 1. The separation of the ownership and management function is also denoted as *separation of ownership and control* (Jensen & Meckling (1976), pp. 306-307). For details on

separation of the ownership and management function. A consequence of the separation of the ownership and management function, in turn, is that principals have *less* information about pertinent business transactions than agents; thus, there is *information asymmetry* between principals and agents *to the detriment of principals*. Information asymmetry leads to negative economic outcomes for principals, denoted as agency problems, as "[…] agents will not always act in the best interests of the principal."[11] (An example of an agency problem is moral hazard on the side of managers.[12]) One means to mitigate agency problems is the monitoring of managers' behavior. Monitoring, however, is costly and thus leads to agency costs.[13] The most common means to minimize agency costs is the preparation and public dissemination of financial reports by managers—a process denoted as accounting.[14] Financial reports consist of two main elements: financial statements and disclosures.[15] The dissertation confines its attention to financial statements and considers them to be of high quality if they effectively mitigate agency costs of principals.

There is considerable uncertainty among accounting practitioners and academics as to whether the IFRS introduction has resulted in an improvement in financial statement quality relative to the quality level that existed under the HGB system. This uncertainty is addressed by the dissertation in the context of cash flow forecasting. The following statement summarizes the research problem:

---

the relationship between principals and agents, refer to the following literature: Jensen (1986), pp. 323-329; Pratt, Zeckhauser, & Arrow (1985) (especially Pratt & Zeckhauser (1985); and Arrow (1985)), Jensen & Meckling (1976), p. 305-360; Ross (1973), pp. 134-139; and the early work of A. BERLE AND G. MEANS (Berle & Means (1939), p. 6) and R. COASE (Coase (1937), pp. 386-405).

[11] Jensen & Meckling (1976), p. 308.

[12] Ruhnke & Simons (2012), pp. 87-88.

[13] Monitoring is only one way of mitigating agency problems. As a result, monitoring costs are only one element of agency costs. Agency costs are the sum of monitoring costs, bonding costs, and the residual loss (i.e., the principal's loss of welfare; Jensen & Meckling (1976), p. 308). Monitoring costs are expenditures borne by principals to ensure that agents act in their best interest; bonding costs are expenditures borne by agents to signal their willingness to act in the principal's best interest; the principal's loss of welfare results from the fact that the agent will never make decisions that are entirely in agreement with what the principal would have done if he had been in charge (Watts & Zimmerman (1986), p. 181; see also Pratt & Zeckhauser (1985), p. 5; and Arrow (1985) p. 45).

[14] Pellens, Fülbier, Gassen, & Sellhorn (2014), p. 4; Frankel & Li (2004), p. 230.

[15] Ruhnke & Simons (2012), p. 46 and p. 56; Horngren, Sundem, Elliott, & Philbrick (2014), p. 7.

RESEARCH PROBLEM STATEMENT
There is uncertainty among accounting practitioners and academics as to whether the IFRS introduction has improved the quality of public German firms' financial statements relative to the quality level that existed under the HGB system.

Uncertainty about the IFRS effect on financial statement quality arises from two distinct sources: mixed results of IFRS-related empirical studies and criticism of the IFRS system on the conceptual level. Key IFRS-related *empirical studies* are: Ahmed, et al. (2013); Daske, et al. (2013); Horton, et al. (2013); Barth, et al. (2012); Armstrong, et al. (2010); Barth, et al. (2008); Christensen, et al. (2008); and Daske, et al. (2008); these studies measure the IFRS effect on financial statements quality using various proxies, methodologies, and data but fail to conclusively demonstrate the existence and potential direction of the IFRS effect.[16]

Criticism on the *conceptual level* concerns several issues. For example, critics argue that, relative to the HGB system, the IFRS system is considerably more complex and encounters more frequent revisions, thereby leading to high (ongoing) accounting costs for firms.[17] However, at the core of the debate is another issue: the extensive use of the fair value measurement concept in the IFRS system. Critics argue that the IFRS system, relative to the HGB system, focuses heavily on fair values being derived using a wide range of subjective management assumptions and estimates when measuring assets and liabilities, thereby compromising financial statement quality if management acts opportunistically (e.g., Küting, et al. (2013); Schildbach (2012); and Ballwieser, et al. (2004). As fair value measurement is at the core of the IFRS-related controversy[18], the dissertation confined its attention to this issue. The following provides a brief conceptual discussion of the fair value measurement concept.

[16] For a detailed discussion of the IFRS-related literature, see Subsection 4.1.
[17] Küting, et al. (2013), p. 284.
[18] Kühnberger (2014), pp. 428-450; the fair value issue has not only contentiously been debated in Germany but also world-wide. For example, NISSIM and PENMAN note with regard to the U.S.: "The adoption of fair value accounting is arguably the most important and controversial issue facing regulators and accounting standard setters today […]" (Nissim & Penman (2008), p. 1).

Historical Cost Accounting versus Fair Value Accounting

To measure assets and liabilities, two distinct methods are available: historical cost accounting and fair value accounting. Under *historical cost accounting*, assets and (liabilities) are measured at the costs incurred when originally purchased (assumed)—that is, at historical cost.[19] Under *fair value accounting*, the measurement of assets and liabilities is more complex. Generally, fair value may be defined as:

> […] the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.[20]

As this definition is rather vague, fair values are generally considered to be derived from one of three distinct inputs: (1) Level 1 inputs; (2) Level 2 inputs; or (3) Level 3 inputs. Level 1 inputs are "[…] observable market inputs that reflect *quoted prices* for identical assets or liabilities in active markets […]"; Level 2 inputs are "[…] *observable market inputs* other than quoted prices for identical assets or liabilities in active markets […]"; and Level 3 inputs are "[…] *unobservable market inputs* […]".[21]

Level 3 inputs play a key role in accounting practice. For example, the accounting treatment of business combinations requires management to recognize and measure intangible assets and goodwill; as no active markets exist for these kind of balance sheet items, mark-to-model accounting is common. Given the importance of Level 3 inputs and the challenges associated with making reasonable assumptions and estimates, the dissertation confines its attention to fair values derived using Level 3 inputs (Level 3 fair values).

The advantage of historical cost accounting is that it predominantly focuses on actual, past transactions and thus provides a rather objective measurement of accounting amounts. Level 3 fair values, on the contrary, predominantly rely on subjective, future-oriented management assumptions and estimates and are, therefore, prone to

---

[19] Penman (2011), p. 578. Historical cost accounting is frequently interpreted as conservative accounting.
[20] IFRS 13.9.
[21] All three quotes from Mard, Hitchner, & Hyden (2011), pp. 7-8; emphases added. The authors further note: "Level 1 and Level 2 inputs are sometimes called mark-to-market inputs, while Level 3 inputs are sometimes called mark-to-model inputs." (p. 8). For details on the definition of these types of inputs, see also IFRS 13.76-13.90.

manipulation. On the other hand, historical costs may lead to the creation of hidden reserves, whereas Level 3 fair values may present a more realistic picture of a firm's current financial position and performance if management assumptions and estimates are accurate.

The question as to which measurement method should be applied is a question of principle and has long been debated in the accounting literature.[22] The dissertation, however, is not concerned with such a fundamental debate. Instead, the dissertation's overall aim is to contribute to a reduction in uncertainty about the effect of the IFRS introduction on financial statement quality. Given that the IFRS system is, to a large extent, based on Level 3 fair values, an ideal empirical setting arises if firms have to switch from a local, predominantly historical cost accounting-oriented system to IFRS. For this reason, the dissertation focuses on German firms (i.e., on the German setting) as the HGB system emphasizes, relative to the IFRS system, historical cost accounting and does not allow the extensive use of Level 3 fair values. Putting it differently, the HGB system fundamentally differs from the IFRS system and thus allows the precise measurement of the effect of the IFRS introduction on financial statement quality.

To verify the usefulness of the German setting, the dissertation presents a brief comparison of the HGB accounting system with the IFRS accounting system on the level of the systems' overall objectives. As overall *accounting objectives* form the basis for the formulation of specific *accounting rules* for concrete business transactions, differences in accounting objectives directly translate into differences in accounting rules.[23] The dissertation compares the two accounting systems with regard to the relative emphasis given to the historical cost accounting and fair value measurement method; it confines its attention to key differences.[24]

---

[22] The debate goes back to the early work of E. SCHMALENBACH, who argued in favor of the (dynamic) *revenue expense approach*, which is closely related to historical cost accounting (Schmalenbach (1962) and Schmalenbach (1919), pp. 1-50); and to the early work of H. V. SIMON, who argued in favor of the (static) *asset liability approach*, which is closely related to fair value accounting (Simon (1910)). For a discussion of the two fundamental approaches, see, for example, Moxter (1984), pp. 5-56; and Nissim & Penman (2008), pp. 12-20. For a critique of the current development pointing at a new emphasis of the (static) fair value approach see, for example, Schildbach (2009), pp. 581-598; and Penman (2009), pp. 358-371.

[23] Subsection 5.1.1 extends this comparison by showing that differences between the HGB and IFRS system exist on the level of specific accounting issues.

[24] For a comprehensive comparison of the two accounting systems, see, for example, Hayn & Waldersee (2014); and Küting, et al. (2013).

Brief Comparison of the HGB and IFRS System

Both the HGB and IFRS system have undergone several revisions in past years. In the *HGB system*, the most notable revision occurred with the enactment of the German Accounting Law Modernization Act (Bilanzrechtsmodernisierungsgesetz [BilMoG]) in May 2009, which affects fiscal years beginning in 2010. In the *IFRS system*, the most notable revision occurred with the introduction of the new framework, the IASB Framework, in September 2010, which replaced the IASC Framework. The empirical analysis of the dissertation uses a sample ranging from 1987 through 2013 and thus primarily contains observations obtained from financial statements prepared under the old (i.e., pre-BilMoG) version of the HGB[25] and the old (i.e., IASC) version of the framework.[26] As a consequence, the discussion of differences of HGB and IFRS accounting objectives primarily focuses on these two versions. Nevertheless, reference is made to the current version of the HGB and to the IASB Framework if appropriate.

The following gives a brief overview of commonalities and, more importantly, differences between the HGB and IFRS system with regard to their stated overall objective and the way this objective is concretized in various sections in the authoritative literature. The discussion outlines that differences in the relative weight given to the historical cost and fair value measurement method arise due to differences in this concretization. The aim of the discussion is to highlight the fact that both accounting systems fundamentally differ from each other and to underscore the point that exclusively focusing on German firms when empirically addressing the stated research problem is a suitable approach.

1) *The Overall Objective of Accounting in the HGB System*

In the HGB system, the overall objective of consolidated financial statements is to provide information to investors.[27] By assigning this information role to consolidated

[25] For an extensive comparison of the previously effective HGB system with BilMoG, see Zwirner (2013).

[26] The sample contains less than 15 percent of observations prepared in years falling under the new version of the HGB and the new framework (i.e., 2010 through 2013; see Table 6.6 below).

[27] The information role is codified in Section 297(2)(2) HGB (see also Adler, Düring, & Schmaltz (1987), p. 8, note 16). This section, also denoted as the general norm (Ruhnke & Simons (2012), p. 7), requires firms to prepare consolidated financial statements in a way that they truly reflect the firm's financial position and financial performance: „*[Der Konzernabschluss hat] ein den tatsächlichen Verhältnissen entsprechendes Bild der Vermögens-, Finanz- und Ertragslage des Konzerns zu vermitteln.*“ The general norm was

financial statements, the HGB system embraces the fair value measurement concept—at least to a certain extent.

Albeit acknowledging the importance of the information role, the HGB system is nevertheless primarily guided by the prudence principle (*Vorsichtsprinzip*[28]), which is motivated by the German legislator's particular concern to protect creditors (*Gläubigerschutzprinzip*). A concretization of the prudence principle is the realization principle (*Realisationsprinzip*), which requires that only realized transactions may be reflected in financial statements, and the imparity principle (*Imparitätsprinzip*), "[…] which requires unrealized losses to be recognized but not unrealized gains […]."[29] Further, firms are guided by the principles of correct accounting[30] (*Grundsätze ordnungsmäßiger Bilanzierung* [*GoB*]) when preparing financial statements, which are "[…] a part of *GAAP* formulated by the courts, accounting professionals, and academics."[31] Similar to the explicitly codified prudence principle, the *GoB* represent the conservative approach to accounting that emphasizes objectivity.[32]

The prudence principle, the related principles of realization and imparity, and the *GoB* are codified in the part of the HGB dealing with stand-alone financial statements; nevertheless, they apply to consolidated financial statements, too. This is evident from the following facts:

- the part of HGB dealing with consolidation[33] is strongly linked to the part dealing with stand-alone financial statements[34];
- the general norm in the part of HGB dealing with consolidation strongly resembles

---

incorporated into the HGB through the enactment of the Accounting Directives Law (*Bilanzrichtliniengesetz* [*BiRiLiG*] in 1985 and led to a fundamental shift in the German accounting philosophy as it introduced the *true and fair view* principle and thus the idea of *economic substance over legal form*. (For a discussion, see Moxter (1986), pp. 1-3; and pp. 63-108.)

In the IFRS system, the information objective is codified in the IASB Framework (CF.OB2).

[28] The prudence principle is codified in Section 252(1)(4) HGB: "*Es ist vorsichtig zu bewerten, namentlich sind alle vorhersehbaren Risiken und Verluste, die bis zum Abschlußstichtag entstanden sind, zu berücksichtigen, selbst wenn diese erst zwischen dem Abschlußstichtag und dem Tag der Aufstellung des Jahresabschlusses bekanntgeworden sind; Gewinne sind nur zu berücksichtigen, wenn sie am Abschlußstichtag realisiert sind.*"

[29] Harris, Lang, & Mőller (1994), p. 191.

[30] Translation of the German term according to Harris, et al. (1994), p. 191.

[31] Harris, et al. (1994), p. 191; authors' emphasis.

[32] Moxter (1995), p. 419.

[33] Sections 290 through 315a HGB.

[34] The reference is established through Section 298(1) HGB (see also Förschle & Deubert (2012), p. 1595, note 1; and p. 1597, note 7).

the general norm in the part of HGB dealing with stand-alone financial statements[35] and explicitly refers to the *GoB*; and

- investors use consolidated earnings as a basis to form expectations about dividend payments that have to be made out of earnings from stand-alone financial statements. As a result, consolidated earnings de facto determine dividend payments.[36]

2) *The Overall Objective of Accounting in the IFRS System*

In the IFRS system, the overall objective of consolidated financial statements is related to the information role, too. This is evident from the fact that the overall objective of consolidated financial statements is to provide decision-useful information to addressees.[37] A concretization of the decision-usefulness objective is the principle of fair presentation.[38] By assigning an information and fair presentation role to consolidated financial statements, the IFRS system embraces the fair value measurement concept. Nevertheless, the prudence principle is also embedded in the IFRS system.[39]

Despite the fact that the IFRS system embraces both the fair presentation and prudence principle, it assigns a significantly larger weight to the fair presentation principle. This is evident from the fact that the overall objective of financial statements is decision-usefulness—an objective being more closely related to the fair presentation than to the prudence principle.

In summary, the brief discussion of accounting objectives (and related principles) underlying the HGB and IFRS system has shown that there are fundamental differences in the emphasis of the historical cost and fair value measurement method. The HGB system embraces both the historical cost and fair value measurement

[35] That is, Section 297(2)(2) HGB strongly resembles Section 264(2)(1) HGB. Both provisions explicitly refer to the *GoB* (see also Claussen & Scherrer (2011), notes 41 and 46-48).

[36] Brüggemann, Hitz, & Sellhorn (2013), p. 26; Ruhnke & Simons (2012), p. 10; Adler, et al. (1987), p. 9, note 17.

[37] F.12; CF.OB2.

[38] IAS 1.15.

[39] F.37; in the new framework, the IASB Framework, the prudence principle is not explicitly mentioned anymore (Lüdenbach, Hoffmann, & Freiberg (2014), p. 33). Nevertheless, the prudence principle is still embedded in the new version of the IFRS system, albeit only implicitly. For example, IAS 2 requires the use of historical costs for the measurement of inventory at recognition and the use of the "lower of cost and net realizable value" rule (IAS 2.9) for the measurement of inventory after recognition.

concept but clearly emphasizes historical costs (due to the dominance of the prudence principle and the *GoB*). The IFRS system, on the contrary, while also embracing both measurement concepts, clearly emphasizes fair value accounting (due to the dominance of decision-usefulness and fair presentation). As a consequence, in the HGB system, the use of Level 3 fair values and the related use of (subjective) management assumptions and estimates is limited whereas it is a common practice in the IFRS system. (This is particularly true in the context of the measurement of acquired intangible assets such as patents, customer relationships, and unpatented technology.[40])

Differences in the amount of discretion granted to management when making future-oriented assumptions and estimates are at the core of the fair value debate.[41] Critics of the IFRS system argue that an extensive discretionary margin will likely result in a *misuse* of discretion by management—that is, in *opportunistic* instead of honest management behavior when preparing financial statements; opportunistic management behavior, in turn, will ultimately lead to a deterioration of financial statement quality.[42] The dissertation follows this argument and hypothesizes that the switch from the HGB system to the IFRS system will deteriorate financial statement quality of public German firms.[43]

2.2 Audience and Aims

2.2.1 Audience

As noted above, the dissertation's primary addressees are equity and debt investors. Nevertheless, the group of parties ultimately benefitting from the dissertation's results is larger. This subsection discusses the wider audience of the dissertation.

---

[40] Goodwill is not directly valued using level three inputs but derived as a residual from fair values of other assets and liabilities. Given this indirect derivation of its value, goodwill critically depends on the use of Level 3 inputs (see Subsection 5.1.1 for details).

[41] Ballwieser, et al. (2004), pp. 537-538.

[42] Ballwieser, et al. (2004), pp. 541-542; Küting, et al. (2013), p. 282; Schildbach (2012), p. 522; Penman (2011), pp. 167-169. Nissim & Penman (2008) note that fair values should only be used if Level 1 inputs are available (p. 23); for a discussion of pros and cons of fair value accounting, see Ball (2006), pp. 12-14.

[43] The dissertation's specific research hypotheses are formulated in Subsection 5.2.

Addressees may generally be divided into two broad categories: (1) parties that are contractually related to public German firms; and (2) parties that are not contractually related (i.e., indirectly) related to public German firms. *Contractually-related* parties have a vital interest in learning about the association between the IFRS introduction and financial statement quality as any change in financial statement quality directly affects their contractual position. They include:

- investors (i.e., shareholders and debtholders);
- employees other than top-level managers;
- suppliers; and
- customers of long-lived products.

Non-contractually-related parties are interested in learning about the association between the IFRS introduction and financial statement quality, too, albeit to a lesser extent. Non-contractually-related parties include:

- standard setting bodies (i.e., private standard setters and national legislators);
- audit firms;
- financial analysts;
- rating agencies; and
- academics.

The following characterizes each of these parties in turn and describes why addressing the stated research problem is important to them.[44]

Contractually-Related Parties

Investors. The key contractually-related parties of public German firms are investors, namely shareholders and debtholders. *Shareholders* invest equity capital in firms and have a residual claim on net assets; their payoffs come in the form of dividends, share repurchases, or both.[45] *Debtholders* invest debt capital in firms in the form of bond investments or loans; their payoffs come in the form of interest and principal

[44] The discussion is primarily based on Pellens, et al. (2014), pp. 4-6.
[45] Pellens, et al. (2014), p. 4; Penman (2013), p. 11.

payments.[46] Shareholders are typically divided into two categories: passive shareholders and fundamental shareholders.[47] *Passive shareholders* base their reasoning on the belief that market prices of shares reflect all available information in the market. Thus, the process of accounting (and valuation) is not important to them. This view is commonly referred to as the *efficient market hypothesis*.[48] In contrast, *fundamental shareholders* view markets as being inefficient and are therefore concerned with the analysis of financial information (i.e., fundamentals) provided by financial statements. They perform their own valuation in order to *challenge* the market prices of shares.[49] As PENMAN puts it:

> [Fundamental] investors buy investments only after thoroughly examining information about firms and reaching conclusions about the underlying value that the information implies.[50]

Another, related characteristic of fundamental shareholders is the belief that a distinction is to be made between firm value and speculation, and that speculation about a firm's future prospects is only useful if based on fundamentals.[51] The dissertation takes the view that financial markets are not efficient and that fundamental analysis is necessary to challenge the market prices of shares.[52]

Fundamental shareholders rely on financial statements to challenge market prices. Similarly, fundamental debtholders rely on financial statements to assess the creditworthiness of firms; the dissertation primarily takes the perspective of fundamental shareholders and fundamental debtholders (henceforth collectively

---

[46] Penman (2013), p. 11.
[47] Penman (2013), pp. 1-23; Penman (2011), pp. 1-5.
[48] See, for example, Penman (2011), pp. 3-4; the efficient market hypothesis is to a large extent based on the work of E. FAMA from the University of Chicago (Fama (1970), pp. 383-417; and Fama (1991), pp. 1575-1617).
[49] Penman (2011), p. 4. The concept of the fundamental investor is to a large extent based on the work of B. GRAHAM from Columbia University (Graham & Dodd (1934); and Graham (1949)).
[50] Penman (2013), p. 23.
[51] Fundamental investors may further be divided into active and defensive investors. Active investors undertake a fundamental analysis "[…] in order to earn exceptional rates of return […]" Defensive investors undertake a fundamental analysis "[…] in order to avoid trading at the wrong price […]" (both quotes from Penman (2013), pp. 22-23). The dissertation, however, does not make this distinction.
[52] For a discussion of the usefulness of financial statements as a provider of information in the context of the efficient market and other hypotheses, see Schmidt (1982), pp. 728-748.

referred to as fundamental investors[53]). Given their reliance on financial statements in the context of valuation or credit analysis, fundamental investors have a vital interest in learning about the association between the IFRS introduction and financial statement quality. If the IFRS introduction deteriorates the quality of financial statements, their valuation will directly be affected.

Employees other than top-level managers. These parties rely on financial statements to estimate future compensation payments and general career prospects.[54] Thus, employees other than top-level managers have an interest in learning whether the IFRS introduction has improved the quality of financial statements or not.

Suppliers. Many suppliers invest in firms, albeit indirectly. That is, suppliers do not invest by directly providing funds to firms but by adjusting their production lines to meet specific customer demands (e.g., by building production sites in close proximity to their customers).[55] Suppliers rely on financial statements to determine whether these investments are worth initiating. In addition, suppliers are frequently firms' creditors and, therefore, similarly to debtholders, they rely on financial statements to assess the firms' creditworthiness. Given their reliance on financial statements, suppliers are interested in learning whether the IFRS introduction has changed the quality of financial statements.[56]

Customers of long-lived products. These customers usually possess warranties requiring firms to render repair services free of charge, if needed. Thus, customers of long-lived products may also rely on financial statements to determine whether firms are in the financial position to provide these services.[57]

Non-Contractually Related Parties

Standard setting bodies (i.e., private standard setters and national legislators). Private standard setters (e.g.., the IASB and FASB) as well as national legislators (e.g., the German legislator) develop accounting principles and rules. Therefore, these parties

[53] Focusing on shareholders and debtholders as a group is common in the accounting literatures (see, for example, Berndt (2005), p. 23).
[54] Pellens, et al. (2014), p. 5.
[55] Pellens, et al. (2014), p. 5
[56] Pellens, et al. (2014), p. 5
[57] Pellens, et al. (2014), p. 5.

have an interest in learning whether the IFRS introduction has resulted in a change in financial statement quality. Private standard setting bodies may use the dissertation's insights to further develop their conceptual frameworks and accounting standards; national legislators may use the dissertation's insights to determine whether it is useful to exercise the option to extend the IFRS mandate.

Audit firms. These parties are responsible for reviewing public German firms' financial statements prepared under the IFRS system. Thus, auditors have an interest in learning whether the IFRS introduction has resulted in a potential deterioration of financial statement quality, thereby requiring them to increase their effort in the review process to ensure that accounting amounts are ultimately in line with Generally Accepted Accounting Principles (GAAP).

Financial analysts. Similar to shareholders, financial analysts rely on financial statements as an anchor to estimate future payoffs arising from investments with the ultimate goal of determining a firm's value. Thus, financial analysts have an interest in learning whether the IFRS introduction has resulted in a change in financial statement quality.

Rating agencies. Similar to debtholders, rating agencies rely on financial statements to determine the creditworthiness of firms with the ultimate goal of assigning credit ratings. Thus, rating agencies have an interest in learning whether the IFRS introduction has resulted in a change in financial statement quality.

Academics. When empirically addressing accounting-related research questions, these parties rely on financial statement data—usually stored in archival data bases. Thus, academics have an interest in learning whether these data have improved or deteriorated in quality as a result of the IFRS introduction.

Figure 2.1 gives an overview of the dissertation's audience and highlights parties of particular importance.

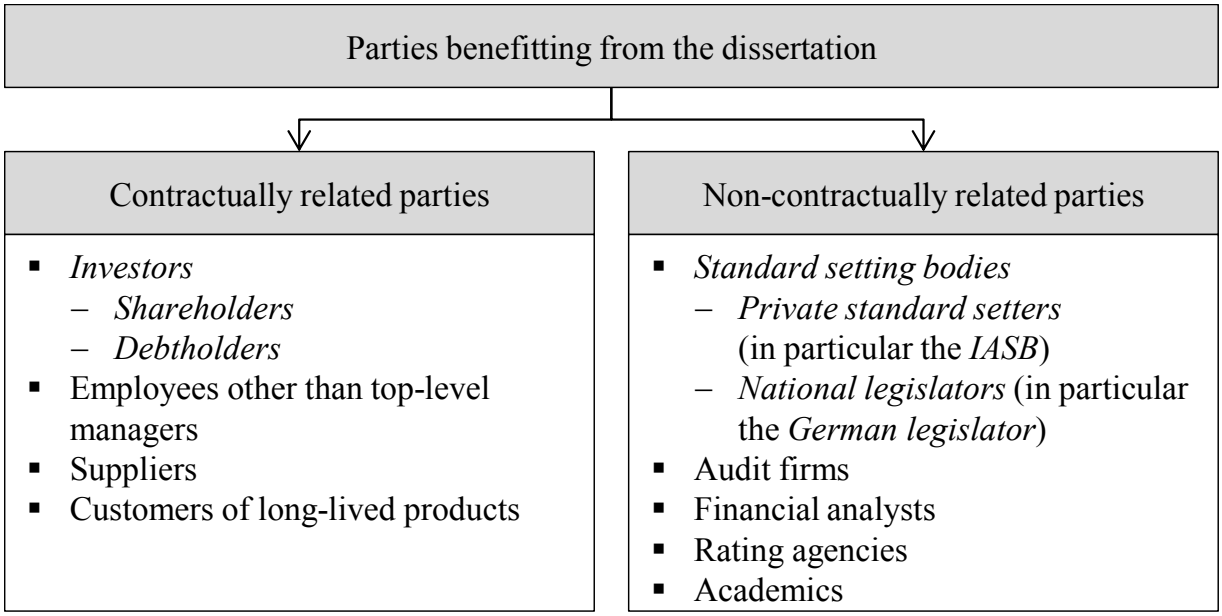

FIGURE 2.1
OVERVIEW OF THE DISSERTATION'S AUDIENCE—CONTRACTUALLY RELATED AND NON-CONTRACTUALLY RELATED PARTIES OF PUBLIC FIRMS

Notes. The figure illustrates the parties that benefit from the dissertation—reference is made to Pellens, et al. (2014), pp. 4-6. Parties being particularly interested in the dissertation's results are in boldface type; own depiction.

2.2.2 Aims

The dissertation establishes four distinct aims. The first and central aim relates to the dissertation's empirical analysis; the remaining aims relate to the discussion of the empirically obtained results. The following outlines the dissertation's aims in detail.

Central Aim (Aim One)

Although many attempts have been made to empirically examine the association between the IFRS introduction and financial statement quality, results in the literature are mixed.[58] Thus, as of today—approximately ten years after the IFRS introduction—the question as to whether the accounting regime change has resulted in benefits for public German firms' investors—namely in an improvement in financial statement quality and ultimately in a reduction in agency costs—is still an open issue, rendering yet another empirical study necessary. As a consequence, the dissertation's first and

[58] For details, see the literature review in Subsection 4.1 below.

central aim is: to empirically examine the association between the IFRS introduction and financial statement quality of public German firms.

Second Aim

However, merely reporting an empirically observed association (or the absence thereof) between the IFRS introduction and financial statement quality does not entirely satisfy firms' investors, for they are ultimately interested in an explanation as to *why* such an association exists or does not exist and, if an association is observed, in an explanation of its direction. Putting it differently, public German firms' investors are ultimately interested in a *causal interpretation* of empirical results. As a consequence, the dissertation's second aim is: to explain why there is or is not an association between the IFRS introduction and financial statement quality of public German firms and, if an association is observed, to explain its direction.

Achieving the dissertation's second aim requires positive accounting theory. Section 8 outlines a suitable theoretical framework and, using this framework, provides an explanation of empirical results obtained by the dissertation's data analysis.

Third Aim

Only public firms preparing consolidated financial statements are currently required to apply the IFRS system. Given the IASB's aspiration to maximize the application of their accounting standards (i.e., to establish their accounting standards as compulsory standards in a maximum number of countries and for a maximum number of firms[59]), the question arises as to whether the IFRS mandate should be extended. The IAS Regulation allows EU member states to extend the IFRS mandate. The German legislator has made a limited extension by allowing private firms to voluntarily prepare consolidated financial statements under the IFRS system.[60] However, by granting this

[59] The IASB intends to establish the IFRS system in as many countries as possible (Barth (2006), p. xii); this mission implicitly contains the ambition to make the IFRS system compulsory for as many types of firms as possible, too.

[60] By doing so, the German legislator extended the German Commercial Code by introducing Section 315a HGB, thereby creating a new version of the Code (German Commercial Code in the version of the Accounting Law Reform Act—*Bilanzrechtsreformgesetz* [*BilReG*]). According to this new version, private firms have the choice to apply the IFRS system voluntarily. Thus, with regard to *consolidated* financial statements, private firms may apply either the IFRS system *or* the HGB system; further, with regard to *unconsolidated* financial statements, private firms may apply either the IFRS system *and* the HGB system

choice to private firms the German legislator abstained from requiring private firms to follow the IFRS system. Thus, further extensions of the IFRS mandate are possible by requiring the application of the IFRS system from, for example:

- public German firms preparing unconsolidated financial statements;
- private German firms (preparing either consolidated or unconsolidated financial statements); or
- public German firms being subject to the law of another jurisdiction due to a listing in a foreign country (e.g., public German firms being listed on a U.S. stock exchange and thus being subject to U.S. law).

Given the possibility of such a mandatory extension of the IFRS mandate, public German firms' investors as well as many non-contractually related parties (e.g., standard-setting bodies and academics) are interested in predicting possible outcomes. As a consequence, the dissertation's third aim is: to predict what would happen if the IFRS mandate were extended to firms currently not required to apply the IFRS system.

Achieving the dissertation's third aim requires positive accounting theory, too. Section 8 outlines a suitable theoretical framework and, using this framework, provides predictions related to an extension of the IFRS mandate.

Fourth Aim

The first three aims of the dissertation are primarily related to public German firms and, more importantly, to public German firms' investors. However, the dissertation aims at benefitting parties that are non-contractually-related to public German firms, too. Specifically, the dissertation aims at contributing to standard-setting issues. Thus, the dissertation's fourth aim is: to make policy recommendations that help standard-setting bodies (e.g., the IASB or the German legislator) develop optimal accounting principles and rules that can ultimately be used to prescribe how accounting practitioners should form their accounting.

Achieving the dissertation's fourth aim requires a normative accounting framework. Section 8 outlines such a framework and, using this framework, derives policy

---

at the same time (parallel preparation of financial statements) or they may apply the HGB system only (Küting, et al. (2013), p. 283).

recommendations for standard-setting bodies and other, non-contractually related parties of public German firms.

Statement of Aims

The following statement summarizes the dissertation's aims:

STATEMENT OF AIMS

The dissertation's first and central aim is:

- to empirically examine the association between the IFRS introduction and financial statement quality of public German firms.

Other aims of the dissertation are:

- to explain—based on the empirical results and using positive accounting theory— why there is or is not an association between the IFRS introduction and financial statement quality of public German firms and, if an association is observed, to explain its direction;
- to predict—based on the empirical results and using positive accounting theory—what would happen if the IFRS mandate were extended to firms currently not required to apply the IFRS system. Such an extension may include
  - public German firms preparing unconsolidated financial statements,
  - private German firms (preparing either consolidated or unconsolidated financial statements), or
  - public German firms being subject to the law of another jurisdiction due to a listing in a foreign country;
- to make—based on the empirical results and using a normative accounting framework—policy recommendations that help standard-setting bodies (e.g., the IASB or the German legislator) develop optimal accounting principles and rules that can ultimately be used to prescribe how accounting practitioners should form their accounting.

3 Conceptual Framework

3.1 The Concept of "Financial Statement Quality"

The dissertation's central aim is to empirically examine the association between the IFRS introduction and financial statement quality of public German firms. For this purpose, an operationalization of the broad concept of *financial statement quality* is needed. Given that the dissertation's primary addressees are fundamental investors, financial statement quality is considered to be high if their informational position will improve. As fundamental investors value investment opportunities and rely on accounting information provided in consolidated financial statements, their informational position improves if consolidated financial statements serve as an accurate anchor in cash flow forecasting. Thus, the main objective of consolidated financial statements is to provide information that helps fundamental investors to properly value investment opportunities and to facilitate investment decision-making.[61]

In practice, investors use two distinct valuation methods to determine the value of their investment: the absolute valuation method and the relative valuation method. The *absolute* valuation method derives the investment's value using a two-step process: forecasting operating cash flow and discounting forecasted operating cash flows using an appropriate discount rate.[62] The *relative* valuation method derives the investment's value by comparing (i.e., benchmarking) the investment to similar investments. The dissertation confines its attention to the absolute valuation method as valuation practitioners, especially in Germany, prefer this method over the relative valuation method.[63] Moreover, when confining its attention to the absolute valuation method, the

---

[61] Stand-alone financial statements also have the objective of determining to what extent earnings may be distributed to shareholders and tax authorities. This objective is frequently denoted as *Zahlungsbemessungsfunktion* in the German literature (Ruhnke & Simons (2012), pp. 5-6; Berndt (2005), p. 1 and pp. 5-10; and Moxter (1984), pp. 98-121). However, as the IFRS introduction only affects consolidated financial statements, the dissertation confines its attention to the decision-usefulness objective, which is also prominently put forward in the IASB Framework (OB2).

[62] Damodaran (2012), pp. 11-25.

[63] For example, practitioners following valuation guidance offered by the German Institute of Public Auditors (Institut der Wirtschaftsprüfer [IDW]) use the relative valuation method only to validate values derived under the absolute valuation method (Institut der Wirtschaftsprüfer (IDW) (2009), notes 143-144).

dissertation only concentrates on the first step: the problem of *forecasting* operating cash flow; the problem of deriving an appropriate discount rate for these cash flows remains unconsidered.

How can consolidated financial statements facilitate the cash flow forecasting process of fundamental investors? Cash flow forecasting requires subjective assumptions about the firm's future economic prospects. Making these assumptions involves the risk of being overly optimistic and ultimately paying too much for the investment or being overly pessimistic and ultimately missing attractive investment opportunities.[64] To mitigate this risk, investors anchor their forecast in *current* financial statements, which contain accounting amounts representing both the firm's performance in the past fiscal year as well as the firm's current financial position at fiscal year-end. As BERNDT notes:

> […] the forecasted development of a company has its "roots" in the past. Information about past events – for example, sales revenues – may not simply be translated into the future. However, without information about past events a benchmark to evaluate forecasts is frequently missing.[65]

Similarly, the IASB FRAMEWORK:

> Information about a reporting entity's past financial performance and how its management discharged its responsibilities is usually helpful in predicting the entity's future returns on its economic resources.[66]

Given that investors resort to current financial statements in the process of valuation, consolidated financial statements only facilitate cash flow forecasting if their accounting amounts are highly *accurate*. As PENMAN puts it:

> Investing, of course, involves speculation about the future, so speculation must be entertained. But particular weight should be given to what is known, to discipline speculation, to keep it in check. Accounting, based on "what we know," anchors a valuation. […] That is, the investor identifies value implied by the accounting and then thinks of adding extra value for speculation. The accounting must be of such quality that the investor can

[64] Penman (2011), pp. 82-88.
[65] Berndt (2005), p. 22; own translation from the German original.
[66] CF.OB16.

> anchor with confidence, of course, so that poses the question of the appropriate accounting.[67]

It follows that the IFRS introduction can only be considered a success if financial statements prepared under the IFRS system result in more accurate cash flow forecasts than financial statements prepared under the HGB system. But: What qualitative requirements need to be fulfilled for accounting amounts to highly accurate? This question will be addressed from both the conceptual and empirical perspective.

Conceptual Perspective—Qualitative Requirements for Financial Statements

From a conceptual perspective, two distinct approaches are available to determine qualitative requirements for accounting amounts: the accounting methods approach and the qualitative characteristics approach. The a*ccounting methods approach* provides insights as to whether accounting amounts prepared under the *accrual basis* or *cash basis* of accounting are more useful in serving as an anchor for investors when forecasting operating cash flow. The *qualitative characteristics approach* provides insights as to whether accounting amounts prepared under the emphasis of the *reliability* or *relevance* characteristic of financial information are more useful in serving as an anchor for investors when forecasting operating cash flow.

1) *The Accounting Methods Approach—The Cash Basis of Accounting versus the Accrual Basis of Accounting*

A firm's management prepares and publicly disseminates various financial statements. Key financial statements are: (1) the balance sheet; (2) the income statement; (3) the statement of cash flows; and (4) the statement of stockholders' equity.[68] However, given the dissertation's focus on the process of forecasting operating cash flow—a flow variable—it confines its attention to the income statement and the statement of cash flows as these financial statements contain flow variables, too.[69]

---

[67] Penman (2011), pp. 9-10.
[68] Horngren, et al. (2014), p. 9.
[69] As will be shown below, one is not restricted to the use of flow variables from the income statement and statement of cash flows when forecasting the flow variable future operating cash flow. Rather, the use of *transformed* balance sheet variables (i.e., stock variables from the balance sheet that are transformed into flow variables by computing the one-period change) is also possible. For simplicity, however, this possibility is ignored in the conceptual discussion of this subsection.

Income can be measured using one of two distinct accounting methods: the cash basis of accounting or the accrual basis of accounting. Depending on the accounting method used, investors base their forecasts either on an income measure provided in the statement of cash flows—for example, net operating cash flow—or on an income measure provided in the income statement—earnings.

Preparing financial statements using the *cash basis* of accounting—that is, emphasizing the cash flow statement—implies recognizing revenues when cash is received from customers and, likewise, incurring expenses when cash is paid to suppliers. On the contrary, preparing financial statements using the *accrual basis* of accounting—that is, emphasizing the income statement—implies recognizing revenues when they are actually earned and, likewise, incurring expenses when they are actually incurred, regardless of the timing of associated payments. To recognize revenues and expenses in this way, accruals are necessary.[70] HORNGREN, SUNDEM, ELLIOT, and PHILBRICK define accruals as adjusting entries that are made at the end of the accounting period to "[…] assign the financial effects of implicit transactions to the appropriate time periods."[71] The authors further note:

> Adjusting entries are at the heart of accrual accounting. Accrue means to accumulate a receivable (asset) or payable (liability) during a given period, even though no explicit transaction occurs. The receivables or payables increase as time passes, even though no physical assets change hands. In order to maintain the equality of the balance sheet equation, as we accumulate the receivable or payable on the balance sheet, we must also recognize a revenue or expense on the income statement.[72]

The private standard-setting bodies in Europe and the U.S.—the IASB and FASB, respectively—provide definitions of the accrual accounting concept as well. As the IASB puts it:

---

[70] The dissertation uses the term accruals in a broad sense; that is, the term not only encompasses entries that accrue cash flows but also those that defer cash flows. Thus, the term accruals used in the context of the dissertation encompasses deferred (unearned) revenues, accrued revenues, deferred expenses, and accrued expenses.

[71] Horngren, et al. (2014), p. 154; the authors define implicit transactions as "[…] events, such as the passage of time, that do not generate source documents or any visible evidence that the event actually occurred […]" (p. 154).

[72] Horngren, et al. (2014), p. 154.

> Accrual accounting depicts the effects of transactions and other events and circumstances on a reporting entity's economic resources and claims in the periods in which those effects occur, even if the resulting cash receipts and payments occur in a different period.[73]

And the FASB:

> Accrual accounting attempts to record the financial effects on an enterprise of transactions and other events and circumstances that have cash consequences for an enterprise in the periods in which those transactions, events, and circumstances occur rather than only in the periods in which cash is received or paid by the enterprise. Accrual accounting is concerned with the process by which cash expended on resources and activities is returned as more (or perhaps less) cash to the enterprise, not just with the beginning and end of that process. It recognizes that the buying, producing, selling, and other operations of an enterprise during a period, as well as other events that affect enterprise performance, often do not coincide with the cash receipts and payments of the period.[74]

At first glance, the choice of the right accounting method does not seem obvious. Thus, one may simply apply both methods, that is, prepare both the income statement and the statement of cash flows and abstain from emphasizing one financial statement over the other. Given that the set of financial statements presented in financial reports are prepared this way, it seems that the question as to what method is more useful to investors is purely academic. As HORNGREN, SUNDEM, ELLIOT, and PHILBRICK put it:

> For many years, accountants debated the merits of accrual-basis versus cash-basis accounting. Supporters of the accrual basis maintained that the cash basis ignores activities that increase or decrease assets other than cash. Supporters of the cash basis pointed out that a company, no matter how well it seems to be doing, can go bankrupt if it does not manage its cash properly. Who is correct? In the end, the debate has been declared a draw. Companies prepare their income statements on an accrual basis, and they also prepare a separate statement of cash flows.[75]

However, preparing both an income statement *and* a statement of cash flows may only serve as a solution when preparing financial reports in general. From the perspective of

---

[73] CF.OB17.
[74] SFAS 1.44.
[75] Horngren, et al. (2014), p. 54.

fundamental investors seeking to forecast operating cash flows by relying on current financial statements as an anchor, one method needs to be emphasized over the other.

Under the accounting methods approach, the accrual basis of accounting seems to be clearly advantageous over the cash basis of accounting as accruals match revenues and expenses; that is, accruals distribute cash flows over time.[76] Matching of revenues and expenses leads to a more complete picture of the firm's past performance as the firm reports *all* revenues earned as well as *all* expenses incurred. Also, matching leads to a more complete picture of the firm's current financial position as it ensures that the firm reports *all* assets acquired and *all* liabilities assumed. This view is shared by many accounting academics, standard setters, and valuation practitioners. For example, RIAHI-BELKAOUI notes:

> […] the *accrual basis of accounting* refers to a form of keeping […] records not only of transactions that result from the receipt and disbursement of cash but also of the amounts that the entity owes others and that others owe the entity. […] At the core of this system is the matching of revenues and expenses.[77]

Similarly, HORNGREN, SUNDEM, ELLIOT, and PHILBRICK:

> Although both cash and accrual bases have their merits, the accrual basis has the advantage of presenting a more complete summary of the entity's value-producing activities. It recognizes revenues as companies earn them and matches costs to revenues.[78]

In a similar vein, DECHOW:

> […] over finite intervals, reporting realized cash flows is not necessarily informative. This is because realized cash flows have *timing and matching problems* that cause them to be a 'noisy' measure of firm performance. To mitigate these problems, generally accepted accounting principles have evolved to enhance performance measurement by using accruals to alter the timing of cash flows recognition in earnings.[79]

---

[76] Riahi-Belkaoui (2005), p. 279.
[77] Riahi-Belkaoui (2005), p. 279; author's emphasis.
[78] Horngren, et al. (2014), p. 54; emphasis added.
[79] Dechow (1994), p. 4; emphasis added.

The IASB and FASB share the academics' view and clearly favor the accrual basis of accounting over the cash basis of accounting. As the IASB puts it:

> […] information about a reporting entity's economic resources and claims and changes in its economic resources and claims during a period provides a better basis for assessing the entity's past and *future performance* than information solely about cash receipts and payments during that period.[80]

The FASB notes:

> [The financial statement users'] interest in an enterprise's *future cash flows* and its ability to generate favorable cash flows leads primarily to an interest in information about its earnings rather than information directly about its cash flows. Financial statements that show only cash receipts and payments during a short period, such as a year, cannot adequately indicate whether or not an enterprise's performance is successful.[81]

And further:

> Information about enterprise earnings and its components measured by accrual accounting generally *provides a better indication* of enterprise performance than information about current cash receipts and payments.[82]

In summary, the accounting methods approach suggests that the accrual basis of accounting is relatively more useful to investors than the cash basis of accounting when forecasting operating cash flow. The dissertation follows this view. An implication of this view is that the dissertation measures changes in financial statement quality resulting from the IFRS introduction by investigating changes in the quality of earnings rather than cash flows. The following statement summarizes this view: One requirement for accounting amounts to serve as a high quality anchor in the process of forecasting operating cash flow is that they are prepared under the accrual basis of accounting; that is, that they are taken from the income statement rather than from the statement of cash flows.

---

[80] CF.OB17; emphasis added.
[81] SFAS 1.43; emphasis added. This statement by the FASB is frequently considered as the starting point of the accounting method discussion.
[82] SFAS 1.44; emphasis added.

Although the accrual basis of accounting seems to be more suitable for investors than the cash basis of accounting, using accruals comes at an expense. As accruals are adjusting entries representing implicit transactions, the question arises as to whether these adjusting entries truly reflect economic reality. Thus, a second requirement for accounting amounts is that accruals themselves are of high quality, but, what constitutes high quality accruals? The qualitative characteristics approach addresses this issue.

2) *The Qualitative Characteristics Approach—Reliability versus Relevance or Stewardship Role versus Valuation Role*

A second approach to determine what constitutes a high-quality anchor for investors when forecasting operating cash flow is to consider two qualitative characteristics of financial information that are commonly put forward in the accounting literature: reliability and relevance. Financial information is *reliable* if it truly reflects economic reality and is thus free from distortions added by managers seeking to maximize their own wealth to the detriment of principals. Reliable financial information may also be described as "representational, faithful, verifiable and neutral"[83] or "objective."[84] DECHOW and SCHRAND state that a "[…] reliable number is one that is verifiable and reasonably free of error or bias. A reliable number involves little estimation or judgment."[85] The IASB FRAMEWORK notes: "Information is reliable when it is complete, neutral and free from error."[86]

Financial information is considered to be *relevant* for investors in forecasting operating cash flow if it is "timely" and has "predictive value".[87] The IASB FRAMEWORK notes that relevant financial information "[…] is capable of making a difference in the decisions made by users."[88]

Determining whether current financial statements should primarily contain reliable or relevant accounting amounts requires an opinion about the role of accounting in general. In the accounting literature, two major roles are commonly put forward: the

[83] Riahi-Belkaoui (2005), p. 190.
[84] Riahi-Belkaoui (2005), p. 223.
[85] Dechow & Schrand (2004), p. 8.
[86] CF.4.38(b), FN 4.
[87] Dechow & Schrand (2004), p. 8.
[88] CF.QC6.

stewardship role of accounting and the valuation role of accounting. The *stewardship* role of accounting emphasizes management's responsibility to prepare financial statements in a way to inform investors about the use of resources entrusted to them. As FLOWER puts it:

> When accounts serve the purpose of demonstrating that someone has properly cared for the resources entrusted to him, they are said to fulfil the stewardship function of accounts […].[89]

And further:

> The [managers] are obliged to make periodic reports to the shareholders. The purpose of these reports is to enable the shareholders to assure themselves that the [managers] have managed the corporation's affairs honestly and efficiently, preserving and, if possible, increasing the funds entrusted to them by the shareholders.[90]

Information prepared under the stewardship concept of accounting emphasizes the importance of information about past transactions.[91] Information about past transactions, in turn, is primarily information about explicit transactions.[92]

The *valuation* role of accounting represents the idea that investors demand information that helps value a firm's equity. As WATTS and ZIMMERMAN put it:

> The [valuation role of accounting] asserts that investors demand information on current and future cash flows and the market value of assets and liabilities […].[93]

---

[89] Flower (2004), p. 34.

[90] Flower (2004), pp. 12-13; for similar definitions provided by other accounting academics see, for example, Riahi-Belkaoui (2005), p. 279; and Watts & Zimmerman (1986), p. 197.

[91] Flower (2004), p. 36.

[92] HORNGREN, SUNDEM, ELLIOT, and PHILBRICK define explicit transactions as follows: "Explicit transactions are observable events, such as cash receipts and disbursements, credit purchases, and credit sales that trigger the majority of day-to-day routine journal entries. Every explicit transaction is prompted by an economic event that has occurred, and we know that the accountant must make an entry to record the event. Entries for these transactions are supported by source documents, for example, sales slips, purchase invoices, employee payroll checks, or other tangible evidence." (Horngren, et al. (2014), p. 154).

[93] Watts & Zimmerman (1986), p. 196.

In the accounting literature, it is common to link the reliability and relevance characteristic of financial information to the stewardship and valuation role of accounting, respectively.[94]

What accounting role should be taken by the dissertation as a basis? The dissertation addresses the stated research problem in an *agency-theoretic* (i.e., contractual) setting and from the perspective of fundamental investors who rely on current financial statements as an anchor when forecasting future cash flows. Thus, the *stewardship* role of accounting and the (related) qualitative characteristic of *reliability* will form the basis for the dissertation's empirical examination. The following quotation from PENMAN underlines this view:

> […] Don't book expected sales; don't speculate about what the firm might be able to do in the future; *tell me what you know, leave the speculation to me*. That is accounting I can anchor on; I can speculate about future revenues and earnings but, to be anchored, I need the accounting to show me that the firm can attract paying customers and can earn a profit from doing so. Indeed, that anchor will help me challenge speculation; a forecast of future sales and earnings is more difficult to justify if the firm cannot find customers now or is making little progress in doing so.[95]

The view taken by the dissertation is contrary to common wisdom put forward by many accounting academics and the private standard-setting bodies such as the IASB and FASB who contend that accounting amounts presented in financial statements should fulfill both the stewardship *and* valuation role and thus should be both reliable *and* relevant.[96] From a fundamentalist's perspective, however, the relevance characteristic is highly problematic. This is because, in practice, achieving the relevance objective implies preparing current financial statements using, to a large extent, management assumptions and estimates, thereby confronting investors with

---

[94] See, for example, Gassen (2008), pp. 3-10; Berndt (2005), pp. 19-23; and Flower (2004), pp. 34-36. It should be noted, however, that the terms *reliability* and *relevance as* well as the terms *stewardship role* and *valuation role* are vaguely defined and not mutually exclusive (Zeff (2013), p. 3; Berndt (2005), p. 23; Watts & Zimmerman (1986), p. 198).

[95] Penman (2011), pp. 168-169; author's emphasis.

[96] Pellens, et al. (2014), p. 7; CF.QC4-QC16. The IASB Framework not only notes that both accounting roles are of importance in accounting but also emphasizes the valuation role over the stewardship role. This is evident from the fact that in the revised version of the framework, the IASB replaced the *reliability* characteristic with the characteristic of *faithful representation*. As a consequence, the two fundamental qualitative characteristics of financial information are now *relevance* and *faithful representation* instead of *relevance* and *reliability*. This change weakens the importance of the *reliability* characteristic.

additional uncertainty as they will not only face the risk of inaccurately forecasting operating cash flow due to their own inaccurate assessment of the firm's future economic prospects, but will additionally face the risk of using an inaccurate anchor for their forecast. Putting it differently, if the anchor on which investors base their valuation on drifts, investors' risk of not arriving at a reasonable firm value will increase. As PENMAN puts it:

> […] valuation […] takes the form
>
> Value = Anchoring accounting value + Speculative value.
>
> That is, the investor identifies value implied by the accounting and then thinks of adding extra value for speculation. The accounting must be of such quality that the *investor can anchor with confidence*, of course, so that poses the question of the appropriate accounting.[97]

In summary, in an agency-theoretic setting and from a fundamentalist's perspective, the qualitative characteristics approach suggests that the accrual basis of accounting is relatively more useful than the cash basis of accounting to investors in the context of cash flow forecasting if accruals are *not set opportunistically* by management (i.e., are to a large extent *reliable*). Thus, the following statement can be made: Another requirement for accounting amounts to serve as a high quality anchor in the process of forecasting operating cash flow is that they are prepared under the emphasis of the stewardship role of accounting that ensures a maximum of reliability.

The presented conceptual discussion has shown that the accrual basis of accounting seems to be more suitable for cash flow forecasting purposes than the cash basis of accounting and that reliable financial information is more suitable for fundamental investors than relevant financial information. Nevertheless, the cash basis of accounting—albeit having the disadvantage of lacking a match of revenues and expenses—has its merits, too. The obvious advantage of cash flows over earnings is that cash flow measures are not prepared using a large amount of management assumptions and estimates and, thus, have a high degree of objectivity.[98] Obviously,

---

[97] Penman (2011), p. 10; emphasis added.

[98] A certain degree of discretion for management arises, however, from the fact that some cash flows (e.g., interest and dividend payments) may either be allocated to the operating or financing section of the statement of cash flows. Also, cash flows may lack objectivity in the presence of fraudulent behavior. The

the noted advantage of cash flows is simultaneously the disadvantage of accruals. As a consequence of the fact that both accounting methods have their conceptual advantages and disadvantages, the question as to whether the accrual basis of accounting is more suitable for investors when forecasting operating cash flow is ultimately empirical. The following presents a brief review of relevant empirical work.

Empirical Perspective—Qualitative Requirements for Current Financial Statements to Serve as a Useful Anchor in Cash Flow Forecasting

Table 3.1 presents an overview of key empirical studies measuring the relative usefulness of the accrual and cash basis of accounting. Panel A presents key studies in the academic field of *value relevance*.[99] Value relevance studies examine the association between earnings and stock returns. As stock prices—and thus stock returns—are closely related to future cash flow,[100] a brief review of value relevance studies is helpful to highlight the importance of earnings over cash flow when forecasting operating cash flow. Panel B presents key studies investigating the relative usefulness of the accrual and cash basis of accounting by *explicitly* analyzing whether current earnings or current cash flows lead to more accurate forecasts of future cash flows. Panel A shows that the majority of empirical value relevance studies arrive at the conclusion that there is a strong association between stock returns and earnings, thereby *implicitly* establishing that the accrual basis of accounting is superior to the cash basis of accounting in forecasting operating cash flow. Panel B shows that empirical evidence related to the usefulness of earnings in forecasting cash flow confirms this insight to a large extent.

dissertation, however, does not further investigate these matters and considers cash flows as (quasi-)objective measures of income.

[99] Value relevance research is a broad field in empirical accounting research. The dissertation does not intend to provide a full review of the field but confines its attention to a few, outstanding studies.

[100] Given the absolute valuation method discussed above, stock prices and thus stock returns result from discounting future cash flows (see also Kim & Kross (2005), p. 754).

TABLE 3.1
OVERVIEW OF SELECTED STUDIES INVESTIGATING THE RELATIVE USEFULNESS OF THE ACCRUAL AND CASH BASIS OF ACCOUNTING

Study[a]	Superiority of the accrual basis of accounting?	Remarks
Panel A: selected studies implicitly investigating the relative usefulness of the accrual and cash basis of accounting in the context of "value relevance of earnings"		
Ball & Brown (1968)[101]	Yes	The study establishes the link between earnings and stock returns and thus establishes the usefulness of the accrual basis of accounting for valuation purposes in general.[102]
Beaver & Dukes (1972)	Yes	
Bowen, Burgstahler, & Daley (1987)	Yes	
Wilson (1987)	No	
Ali (1994)	No	
Dechow (1994)	Yes	
Harris, et al. (1994)	Yes	The authors focus on German firms.
Cheng, Liu, & Schaefer (1996)	No	
Sloan (1996)	No	
Francis & Schipper (1999)	Yes	
Lev & Zarowin (1999)	Yes	The authors find that although earnings are more useful than cash flows, earnings' usefulness has been declining (see also Ryan & Zarowin (2003)).
Kim & Kross (2005)	Yes	The authors find results in contrast to Lev & Zarowin (1999) and Ryan & Zarowin (2003).

[101] For a discussion of this seminal paper, see, for example, Ball & Brown (2014).
[102] In a similar vein, see Beaver (1968) and the early work of M. H. MILLER and F. MODIGLIANI (Miller & Modigliani (1966)).

(CONTINUED)

Study[a]	Superiority of the accrual basis of accounting?	Remarks
Panel B: selected studies explicitly investigating the relative usefulness of the accrual and cash basis of accounting in the context of cash flow forecasting		
Gombola & Ketz (1983)	No	
Bowen, Burgstahler, & Daley (1986)	No	Studies suffer from data restrictions (Finger (1994), p. 211).
Greenberg, Johnson, & Ramesh (1986)	Yes	
Thode, Drtina, & Largay Iii (1986)	No	
Wilson (1986)	Yes	The accrual component of earnings is superior to the cash component if total accruals are considered.
Finger (1994)	No	The study's findings are twofold: (1) cash flows are superior to earnings when considering their absolute usefulness; (2) cash flows remain superior when considering their relative usefulness as long as a short-term view is considered; in the long-term, cash flows and earnings are equivalent in forecasting operating cash flow. *In summary, there is no support that the accrual basis is unanimously superior to the cash basis*.
Hodgson & Stevenson-Clarke (2000)	Yes	The authors distinguish between small and medium-sized firms on the one hand and large corporations on the other hand.
Dechow, Kothari, & Watts (1998)	Yes	The authors not only empirically test whether accruals or cash flow better predict future cash flow, but also develop a theoretical model that explains why earnings are superior to cash flows in valuation.
Lev, Li, & Sougiannis (2010)	Yes	

(CONTINUED)

Notes. The table presents selected studies suggesting that the accrual basis of accounting is relatively more useful in forecasting operating cash flow than the cash basis of accounting. Panel A presents studies that establish the usefulness of earnings in general by showing that earnings are strongly associated with stock returns. (As stock returns are closely related to future cash flows, the panel implicitly suggests that the accrual basis of accounting is relatively more advantageous.) Panel B presents studies explicitly showing that current earnings are superior to current cash flow in forecasting operating cash flow.

[a] It is by no means intended to provide a comprehensive overview of all studies dealing either explicitly or implicitly with the relative usefulness of earnings and cash flows. Instead, key studies are presented to gain additional support for the choice of earnings over cash flow as an explanatory variable for future cash flow in the empirical part of the dissertation is justified. For a comprehensive review see, for example, Lev (1989) and the discussion of Lev's paper in Patell (1989).

Summary

Forecasting operating cash flow may be conducted by anchoring either on current operating cash flows or current earnings. The question as to what variable should be used as an input is directly related to the question as to whether the cash basis of accounting or the accrual basis of accounting should be emphasized. The conceptual and empirical discussion above has shown that the accrual basis of accounting is relatively more useful for investors when forecasting operating cash flow. As a consequence, the dissertation proxies the broad concept of financial statement quality using the more specific concept of *earnings quality* and defines earnings quality as the predictive power of earnings with regard to forecasting operating cash flow (high predictive power means high earnings quality and vice versa).

Empirically examining earnings' predictive power with regard to forecasting operating cash flow (henceforth simply: earnings' predictive power) requires the use of an earnings-based cash flow forecasting model. As several types of such a model are conceivable, a choice is required. The following subsection develops a cash flow forecasting model that is suitable for the purpose of the dissertation.

3.2 Types of Earnings-Based Cash Flow Forecasting Models[103]

The previous subsection has established that cash flow forecasts should be anchored in current earnings rather than in current operating cash flow. By definition, earnings consist of two components: cash flow and accruals.[104] Thus, two questions arise: (1) Should the explanatory variable—current earnings—be used in the aggregate form or decomposed into its components: current operating cash flow and current accruals? (2) If a disaggregation of earnings is useful, should the accruals component of earnings be decomposed into separate accrual components, too? Using the aggregate form of a variable implies assigning equal weights to its components and thus making the assumption that each component has the same effect on future operating cash flow.[105] As this assumption is rather strong, it seems that disaggregation of earnings (and further disaggregation of accruals) will likely yield higher predictive power than using the variable's aggregate form from a conceptual perspective.

The following will briefly discuss the different types of earnings-based cash flow forecasting models that may be used in the analysis. Specifically, three types of models will be discussed: (1) a *fully aggregated* model with current aggregate earnings as the only explanatory variable; (2) a *semi-disaggregated* model with components of current earnings—current operating cash flow and current aggregate accruals—as the explanatory variables; and (3) a *fully disaggregated* model with current operating cash flow and current accrual components as the explanatory variables.

Type 1—Fully Aggregated Model

A simple form of a cash flow forecasting model is one in which future operating cash flow is explained with current aggregate earnings and other factors. (Other factors capture unobservable variables that affect future operating cash flow other than earnings.) Figure 3.1 illustrates the model:

---

[103] Note that the following discussion is on the conceptual level. The discussion's aim is to develop a suitable form of a cash flow forecasting model. The specific form being used in the dissertation's empirical analysis will be detailed in Subsection 6.3.3.3.

[104] Dechow & Schrand (2004), p. 3 and pp. 16-25.

[105] In the accounting literature, components of earnings are frequently classified into transitory components and persistent components. By using aggregate earnings one fails to assign a lower (higher) weight to transitory (persistent) components, thereby reducing earnings' predictive power (Wrede (2009), pp. 15-16; Dechow & Schrand (2004), p. 16).

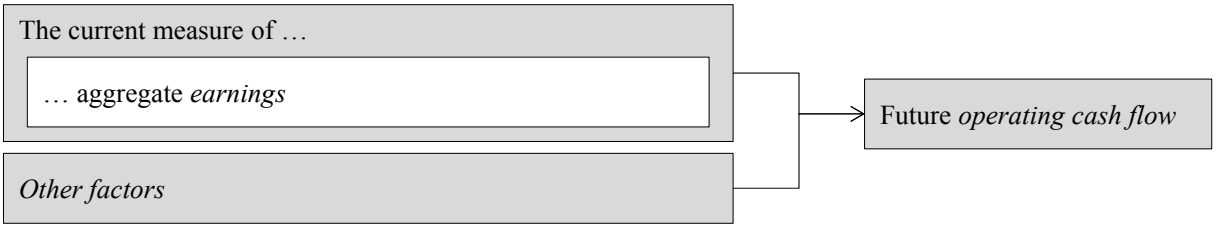

FIGURE 3.1
EARNINGS-BASED CASH FLOW FORECASTING MODEL WITH CURRENT AGGREGATE EARNINGS AS THE EXPLANATORY VARIABLE

Notes. The figure illustrates the aggregated cash flow forecasting model; own depiction.

As noted, this model may not explain future operating cash flow very well as the aggregate form of earnings likely masks the individual effect of the variable's components on the explained variable, future operating cash flow.

Type 2—Semi-Disaggregated Model

In the semi-disaggregated model, future operating cash flow is explained with current operating cash flow, current aggregate accruals, and other factors. Figure 3.2 illustrates the model:

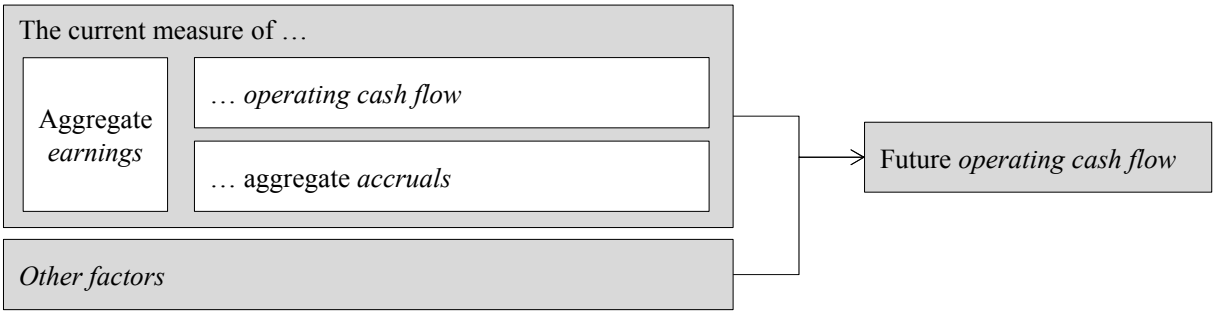

FIGURE 3.2
EARNINGS-BASED CASH FLOW FORECASTING MODEL WITH CURRENT OPERATING CASH FLOW AND CURRENT AGGREGATE ACCRUALS AS EXPLANATORY VARIABLES

Notes. The figure illustrates the disaggregated cash flow forecasting model; own depiction.

This model likely yields better results in explaining future operating cash flow as different weights can be given to the earnings components. However, the accrual component of earnings is still in the aggregate form.

Type 3—Fully Disaggregated Model

In the fully disaggregated model, operating cash flow is explained with current operating cash flow, current accrual components, and other factors. Figure 3.3 illustrates the model:

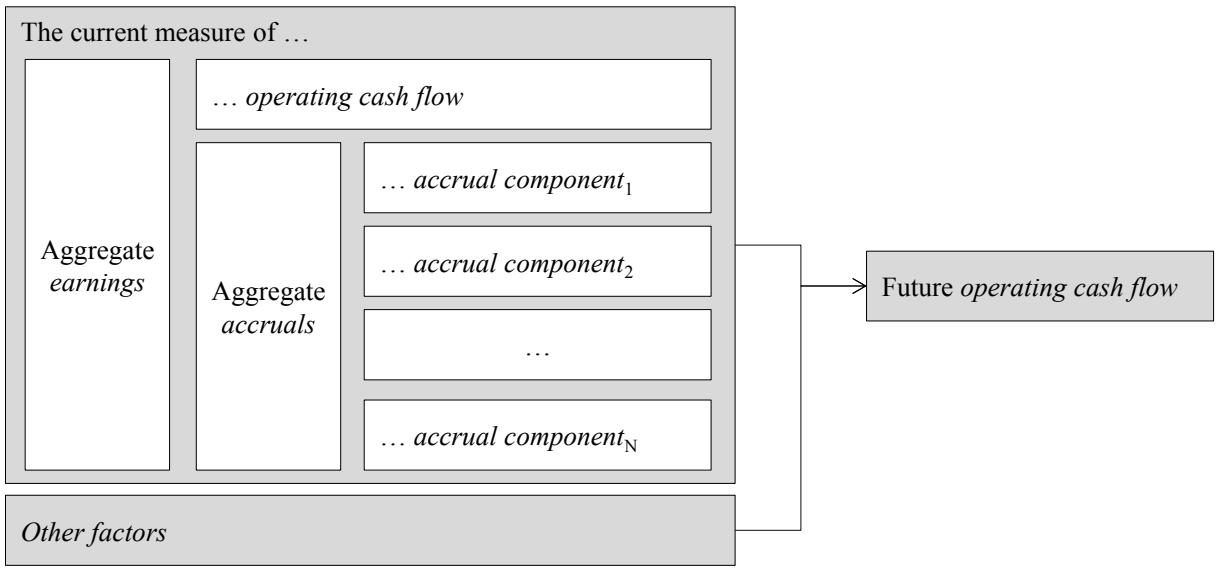

FIGURE 3.3
EARNINGS-BASED CASH FLOW FORECASTING MODEL WITH CURRENT OPERATING CASH FLOW AND CURRENT DISAGGREGATED ACCRUAL AS EXPLANATORY VARIABLES

Notes. The figure illustrates the disaggregated cash flow forecasting model with disaggregated accruals; own depiction.

As noted, from a conceptual view disaggregation should yield more accurate predictions of future operating cash flow than aggregation. Nevertheless, addressing the two questions posed above is ultimately an empirical matter. A considerable number of empirical studies has analyzed the relative advantage of disaggregation over aggregation. Table 3.2 presents an overview of key studies.

TABLE 3.2
OVERVIEW OF SELECTED STUDIES INVESTIGATING THE RELATIVE PREDICTIVE POWER OF AGGREGATED AND DISAGGREGATED EARNINGS WITH REGARD TO FORECASTING OPERATING CASH FLOW

Study	Are disaggregated earnings superior to aggregated earnings?
Chia & Czernkowski (1997)	Yes
Barth, Beaver, Hand, & Landsman (1999)	Yes
Barth, et al. (2001)	Yes
Al-Attar & Hussain (2004)	Yes
Barth & Hutton (2004)	Yes
Homburg & Wrede (2007) and Wrede (2009)	Yes

Notes. The table presents key studies investigating the relative advantage of the use of disaggregated earnings over aggregated earnings in cash flow forecasting models. Some of the studies presented also investigate whether a further disaggregation of earnings by using disaggregated accruals yields even higher predictive power.

The table shows that there is unanimity among the key studies selected that the use of disaggregated earnings yields higher predictive power with regard to forecasting operating cash flow than the use of aggregate earnings. Some of the studies presented have also investigated the question as to whether the accruals component should be decomposed as well if the use of disaggregated earnings is warranted,[106] finding that a further disaggregation of the model yields even higher predictive power. (The rationale for the result is identical to the rationale for the use of disaggregated earnings: disaggregating accruals allows the assignment of lower (higher) weights to transitory (persistent) accruals.)

When using the fully disaggregated cash flow forecasting model the question arises as to whether a detected change in the model's predictive power is attributable to a change in the quality of the cash flow component alone, to a change in the quality of the accrual components alone, or to a change in the quality of both components. In the latter case, the changes may even offset each other, thereby leading to the false conclusion that no change in earnings quality has occurred when in fact both components have changed. The dissertation takes the view that any change in the quality of earnings is entirely captured by the accruals component; that is, the quality

[106] For example, Al-Attar & Hussain (2004), pp. 861-903; Homburg & Wrede (2007), pp. 875-910; and Wrede (2009).

of the cash flow component is considered to be constant in the chosen sample period. This is because accruals, rather than cash flows, reflect management's opportunistic use of discretionary accrual choices provided by GAAP. Thus, when referring to the term "earnings quality", the dissertation implicitly refers to the term "accruals quality" only.[107]

In summary, when empirically examining changes in earnings' predictive power the dissertation uses a *disaggregated* earnings-based cash flow forecasting model (henceforth simply: cash flow forecasting model) with current operating cash flow and various current accrual components serving as explanatory variables. Moreover, the dissertation interprets a change in the model's predictive power in the sense that the change is entirely driven by a change in the quality of the accrual components rather than by a change in the model's cash flow component.

[107] Equating earnings quality with accruals quality is common in the accounting literature. See, for example, Schipper & Vincent (2003), pp. 97-110; Christensen, Frimor, & Şabac (2013), p. 258; and Penman (2013), pp. 591-594. There is a considerable amount of empirical work in the accounting literature dealing with the issue of accruals quality. This observation indicates that accruals are considered to be the key determining factor of earnings quality. Key studies dealing with accruals quality include: Healy (1985), pp. 85-107; DeAngelo (1986); pp. 400-420; DeAngelo (1988), pp. 3-36; Dechow & Sloan (1991), pp. 51-89; Jones (1991), pp. 193-228, and Dechow & Dichev (2002), pp. 35-59. For an in-depth review of these studies, see Ronen & Yaari (2008), pp. 389-432; for a discussion of Dechow & Dichev (2002), see McNichols (2002), pp. 61-69.

4 Research Question, Literature Review, and Contributions

4.1 Research Question

The dissertation examines the association between the IFRS introduction and financial statement quality of public German firms. The previous section has provided insights into two issues: (1) financial statement quality is best proxied using earnings quality; and (2) earnings quality is defined as the ability to predict operating cash flow. It was further shown that empirically measuring a change in earnings' predictive power requires the use of a disaggregated, earnings-based cash flow forecasting model. Based on the insights gained, the dissertation's research question is as follows:

RESEARCH QUESTION STATEMENT
Does earnings' predictive power *change* following the IFRS introduction for public German firms when measuring earnings' predictive power using a disaggregated, earnings-based cash flow forecasting model?

4.2 Literature Review

Many empirical studies have examined the association between the IFRS introduction and financial statement quality. However, despite the fact that earnings' predictive power is a theoretically-grounded and, thus, useful proxy for financial statement quality, these studies focus on other proxies. The following provides an overview of key studies[108] and reports their main findings. The purpose of the literature review is twofold: (1) to show that empirical financial accounting research has failed thus far to appreciate the usefulness of earnings' predictive power as a proxy for financial statements quality (and thus to underscore the relevance of the dissertation's research

[108] It is not intended to provide a comprehensive literature review as several of these already exist (see, for example, ICAEW Financial Reporting Faculty (2014); Brüggemann, et al. (2013); Tarca (2012); Pope & McLeay (2011); Brown (2011); and Soderstrom & Sun (2007)). Note that the review in the dissertation confines its attention to studies examining the impact of the IFRS introduction on financial statement *quality*; studies dealing with the IFRS introduction's impact on the *comparability* of accounting amounts across countries are not reviewed (key studies in this field are: Brochet, Jagolinzer, & Riedl (2013); Barth, et al. (2012); Yip & Young (2012); and, with regard to cross-border investments reacting to changes in comparability, Beneish, Miller, & Yohn (2015); Amiram (2012); Brüggemann, Daske, Homburg, & Pope (2012); and DeFond, Hu, Hung, & Li (2011)).

question); and (2) to highlight the fact that empirical evidence on the IFRS effect is still mixed, even ten years after the accounting policy change.

The extant body of empirical financial accounting literature operationalizes the broad concept of *financial statement quality* using different proxies and may generally be divided into two streams: (1) studies operationalizing financial statement quality using capital market-related proxies; and (2) studies operationalizing financial statement quality using earnings management-related proxies. In the first stream of literature, key proxies of capital market-related variables include the cost of capital, market liquidity, and analyst earnings forecast accuracy. In the second stream of literature, key proxies of earnings management-related variables include earnings smoothing, the timeliness of loss recognition, and aggressive accrual reporting.[109] Panel A and Panel B of Table 4.1 report the studies and main findings from the first and second stream of literature, respectively.

The table shows that empirical results are mixed. Panel A suggests that the majority of studies dealing with capital market-related proxies finds a positive IFRS effect; Panel B, on the contrary, suggests that the majority of studies dealing with earnings management-related proxies finds a negative IFRS effect. The dissertation takes the view that earnings management-related proxies are generally more informative as they do not suffer from distortions frequently associated with capital market-related proxies. Key drawbacks of these proxies are: (1) the link between changes in GAAP and changes in capital market variables is only indirect as firms use GAAP to prepare accounting amounts, which, in turn may or may not be associated with capital market variables; and (2) capital market variables may be significantly distorted during economic booms or turmoil. Thus, when evaluating the outcome of IFRS-related literature, the dissertation focuses on Panel B.

From Panel B, two findings are notable: (1) the majority of studies find a deterioration of financial statement quality following the IFRS introduction; and (2) only a few

[109] The fact that accruals reflect earnings management behavior has well been established in the literature (see, for example, DeAngelo (1986); Jones (1991); Dechow, Sloan, & Sweeney (1995); McNichols & Wilson (1988); McNichols (2000); and Stolowy & Breton (2004). For a discussion, see Ronen & Yaari (2008); and Healy & Wahlen (1999).

studies measure changes in financial statement quality by looking at earnings' predictive power. As the dissertation will use this particular proxy in the empirical analysis, this constitutes a considerable contribution to the empirical financial accounting literature. The following subsection provides a discussion of why the use of the earnings' predictive power proxy is a contribution and highlights other contributions the dissertation makes.

TABLE 4.1
OVERVIEW OF SELECTED STUDIES INVESTIGATING THE IMPACT OF THE IFRS INTRODUCTION ON FINANCIAL STATEMENT QUALITY

		Improvement after IFRS introduction?		
Proxy	Study	Yes or No?	Explanation	Remarks
Panel A: capital market-related proxies for financial statement quality				
Cost of capital	Daske, et al. (2013)	Yes	Decrease in the cost of capital after IFRS adoption	The finding is only applicable to 'serious adopters'.
— " —	Leuz & Verrecchia (2000)	Yes	Decrease in the cost of capital after voluntary IFRS adoption or voluntary US GAAP adoption	The study looks at the information asymmetry component of the cost of capital—proxied using the bid-ask spread and the trading volume; the study includes US GAAP firms; for a summary of the study, see also Sackley (2002).
Cost of equity capital	Li (2010)	Yes	Decrease in the cost of equity capital after IFRS adoption	Result depends on legal enforcement and is thus country-specific.
— " —	Daske, et al. (2008)	No	Increase in the cost of capital after IFRS adoption	Caveat: only early evidence is provided.
— " —	Daske (2006)	No	No decrease in the cost of equity capital after the IFRS adoption	The study focuses on voluntary adopters.
— " —	Cuijpers & Buijink (2005)	No	No decrease in the cost of equity capital after IFRS adoption	

(CONTINUED)

		Improvement after IFRS introduction?		
Proxy	Study	Yes or No?	Description of result	Remarks
Panel A: continued				
Cost of implied equity capital	Kim, Shi, & Zhou (2014)	Yes	Decrease in the implied cost of equity capital after the IFRS adoption	
Cost of debt capital	Florou & Kosi (2013)	Mixed results	(1) Decrease in the cost of debt capital for public bonds (decrease in bond-yield spreads) after the IFRS adoption; (2) No decrease in the cost of debt capital for private loans (no decrease in loan spreads) after the IFRS adoption	Results are country-specific.
— " —	Kim, Tsui, & Yi (2011)	Yes	(1) Lower loan rates for IFRS adopters; (2) More favorable non-price terms for IFRS adopters (3) More foreign lenders for IFRS adopters	
Market liquidity	Daske, et al. (2008)	Yes	Increase in market liquidity after the IFRS adoption	The finding is country-specific; caveat: only early evidence is provided.

(CONTINUED)

		Improvement after IFRS introduction?		
Proxy	Study	Yes or No?	Description of result	Remarks
Panel A: continued				
Analyst earnings forecast accuracy	Horton, et al. (2013)	Yes	Analyst forecast accuracy increases after IFRS adoption	Increase is particularly pronounced for mandatory adopters.
— " —	Glaum, Baetge, Grothe, & Oberdörster (2013)	Yes	— " —	The authors focus on disclosure quality.
— " —	Ashbaugh & Pincus (2001)	Yes	— " —	
— " —	Byard, Li, & Yu (2011)	Yes	— " —	The increase depends on the enforcement environment.
— " —	Tan, Wang, & Welker (2011)	Yes	Analyst forecast accuracy increases after IFRS adoption	Caveat: authors note that the other factors that may drive the result cannot fully be separated from the IFRS introduction.
Value relevance	Barth, et al. (2012)	Yes	Value relevance gap between IFRS and US GAAP accounting amounts declines after IFRS adoption	
— " —	Aharony, Barniv, & Falk (2010)	Yes	Value relevance increases after the IFRS adoption	The authors focus on goodwill, research and development, and revaluation of equipment.
— " —	Horton & Serafeim (2010)	No	Value relevance decreases after the IFRS adoption	Only UK firms are considered.

(CONTINUED)

		Improvement after IFRS introduction?		
Proxy	Study	Yes or No?	Description of result	Remarks
Panel A: continued				
Value relevance	Paananen & Lin (2009)	No	Value relevance decreases after the IFRS adoption	The finding refers to value relevance of mandatory adopters relative to voluntary adopters; the study's focus is on Germany.
Market reaction to IFRS adoption	Armstrong, et al. (2010)	Yes	Market reaction increases	Finding depends on the level of financial statement quality prior to the IFRS announcement.
Information spillover effects	Chen, Young, & Zhuang (2013)	Yes	Spillover effects increase after the IFRS adoption	
Investment efficiency	Schleicher, Tahoun, & Walker (2010)	No	Investment efficiency decreases after the IFRS adoption	Investment efficiency is proxied using investment-cash flow efficiency (also denoted as capital investment efficiency; see also Biddle & Hilary (2006)).
Abnormal return volatility	Landsman, Maydew, & Thornock (2012)	No	Abnormal return volatility increases after the IFRS adoption	

(CONTINUED)

		Improvement after IFRS introduction?		
Proxy	Study	Yes or No?	Description of result	Remarks
Panel B: earnings management-related proxies for financial statement quality				
Earnings smoothing	Ahmed, et al. (2013)	No	Earnings smoothing increases	Results are country-specific with regard to the level of enforcement.
— " —	Capkun, Collins, & Jeanjean (2013)	No	— " —	The authors take the fact that standards change over time into account.
— " —	Chen, Tang, Jiang, & Lin (2010)	No	— " —	
— " —	Christensen, et al. (2008)	No	— " —	
— " —	Barth, et al. (2008)	Yes	Earnings smoothing decreases	
— " —	Hung & Subramanyam (2007)	Yes	Earnings smoothing decreases	The study's focus is on Germany.
— " —	van Tendeloo & Vanstraelen (2005)	No	Earnings smoothing increases	The study's focus is on Germany; the increase is moderate if the firm has a Big4 audit firm.
Timeliness of loss recognition	Ahmed, et al. (2013)	No	Reduction in the timeliness of the recognition of losses	
— " —	Chen, et al. (2010)	No	— " —	

(CONTINUED)

		Improvement after IFRS introduction?		
Proxy	Study	Yes or No?	Description of result	Remarks
Panel B: continued				
Timeliness of loss recognition	Jeanjean & Stolowy (2008)	No	Reduction in the timeliness of the recognition of losses	The study's focus is on France.
— " —	Christensen, et al. (2008)	No	— " —	
— " —	Barth, et al. (2008)	Yes	Increase in the timeliness of the recognition of losses	The study's focus is on voluntary adopters, thereby suffering from self-selection bias.
Meeting or beating of earnings targets	Ahmed, et al. (2013)	Mixed results	No change of the proxy after the IFRS adoption	
— " —	Chen, et al. (2010)	Yes	Less earnings management to meet or beat earnings targets	
Earnings' predictive power with regard to forecasting cash flow	Li & Sougiannis (2014)	Yes	Predictive power improves after the IFRS introduction	The result is country-specific as it depends on the level of legal enforcement; the study has not been published in a scholarly journal and is thus in an early stage of development.
— " —	Jarva & Lantto (2012)	Yes	Predictive power improves after the IFRS introduction	The result is only moderate; the study's focus is on Finland, resulting in a very small number of observations (N<100).

(CONTINUED)

		Improvement after IFRS introduction?		
Proxy	Study	Yes or No?	Description of result	Remarks
Panel B: continued				
Earnings' predictive power with regard to forecasting cash flow	Atwood, et al. (2011)	Mixed results	Predictive power does not change after the IFRS introduction	The authors use data from US GAAP firms and firms following local GAAP.
Aggressive accrual reporting	Ahmed, et al. (2013)	No	Accrual reporting more aggressive	
— " —	Callao & Jarne (2010)	No	— " —	
— " —	Chen, et al. (2010)	Yes	Accrual reporting less aggressive	
— " —	van Tendeloo & Vanstraelen (2005)	No	Accrual reporting more aggressive	

Notes. The table presents selected studies investigating the impact of the IFRS introduction on financial statement quality, which is operationalized using various proxies. Panel A presents studies using capital market-related proxies; Panel B presents studies using earnings management-related proxies.

4.3 Contributions

The dissertation makes contributions to the empirical financial accounting literature with regard to three distinct issues: (1) the research design choice; (2) the data; and (3) the way the empirical results are interpreted. The following discusses each of these issues in turn.

Contributions with Regard to the Research Design Choice

1) *Use of Earnings' Predictive Power as a Proxy for Financial Statement Quality*

There are two distinct streams of literature relevant to the dissertation's empirical analysis. The first stream addresses the question as to whether the IFRS introduction has resulted in an improvement in financial statement quality by using both capital market-related and earnings management-related proxies.[110] The second stream addresses the question as to what type of cash flow forecasting model yields highest predictive power by first determining the relative usefulness of the accrual and cash basis of accounting and then the relative usefulness of aggregation and disaggregation of earnings.[111]

Studies in the first stream of literature arrive at mixed results. Although this stream makes a contribution to the accounting literature by investigating the IFRS effect using a large variety of proxies, their major drawback is the failure to use *earnings' predictive power* as a proxy for financial statement quality. Given the importance of the accrual basis of accounting in general and the importance of cash flow forecasting for fundamental investors in particular, it is surprising that this proxy has been widely ignored when attempting to measure the IFRS effect. Studies in the second stream of literature arrive at the result that current earnings have superior predictive power relative to current cash flows and that a disaggregation further increases earnings' predictive power. Although this stream makes a contribution to the accounting

[110] Key studies in this stream are: Ahmed, et al. (2013); Daske, et al. (2013); Horton, et al. (2013); Barth, et al. (2012); Armstrong, et al. (2010); Barth, et al. (2008); Christensen, et al. (2008); and Daske, et al. (2008). For details, see the literature review in Subsection 4.2 and Table 4.1.

[111] Key studies in this stream are: Wrede (2009); Homburg & Wrede (2007); Al-Attar & Hussain (2004); and Barth, et al. (2001). For details, see Subsection 3.2 and Table 3.2.

literature in general by highlighting the usefulness of disaggregated earnings, their major drawback is that they do not apply their insights to *GAAP-specific* research questions. Specifically, these studies do not use a cash flow forecasting model as a measurement tool to detect changes in financial statement quality resulting from the IFRS introduction. Given that cash flow forecasting models constitute a powerful tool to measure changes in the quality of earnings and that these models are widely used by valuation practitioners[112], this lack of application is surprising, too.

Given these studies' major drawbacks, combining both streams of literature seems natural. Astonishingly, however, there are almost no studies in the extant body of IFRS-related literature actually using a cash flow forecasting model as a measurement tool to detect changes in financial statement quality following the IFRS introduction.[113] This lack of studies constitutes a considerable gap in the empirical financial accounting literature. Thus, the dissertation's first and main contribution is to close the gap by utilizing a cash flow forecasting model as a measurement tool to detect changes in earnings' predictive power following the IFRS introduction.

2) *Use of a Difference-in-Differences Design*

Many studies investigating the effect of the IFRS introduction exclusively focus on public firms and thus employ a research design that abstains from using a control group.[114] The dissertation takes the view that insights about the effect of the IFRS introduction will greatly be enhanced when not only focusing on firms being subject to the new accounting principles and rules (i.e., public firms) but when additionally focusing on firms that were *not* subject to them (i.e., private firms). Thus, when empirically examining the association between the IFRS introduction and financial statement quality, the dissertation takes *private* German firms explicitly into account. Specifically, the dissertation employs a *difference-in-differences* design in which

[112] For example, cash flow forecasting models are widely used by valuation practitioners when valuing firms in the context of insolvencies or in the context of initial public offerings (Wrede (2009), pp. 1-2). Moreover, banks rely heavily on cash flow forecasting models when evaluating a firm's creditworthiness; here, cash flow forecasting models are particular important when evaluating non-listed firms (Wrede (2009), pp. 2-3).

[113] I am only aware of three studies: Li & Sougiannis (2014); Jarva & Lantto (2012); and Atwood, et al. (2011). The study by Jarva & Lantto (2012) suffers from the limitation that the analysis is restricted to Finland and thus based on a very small number of observations (N < 100); the study by Li & Sougiannis (2014) has not been published in a scholarly journal and is thus in an early stage of development. Given these limitations, the only study comparable to the dissertation is Atwood, et al. (2011).

[114] For example, Atwood, et al. (2011), pp. 103-121.

public German firms and private German firms serve as the treatment group and control group, respectively. Such a design is more powerful than a design in which only the treatment group is considered as it ultimately allows drawing causal inferences about the effect of the IFRS introduction.[115] Thus, a second contribution of the dissertation is to investigate the IFRS-related research question using a difference-in-differences design.

3) *Measurement of Changes in Earnings' Predictive Power using a Residual Model*

A difference-in-differences design requires the creation of four distinct subsamples, representing four distinct groups of firms: (1) the treatment group before the treatment; (2) the treatment group after the treatment; (3) the control group before the treatment; and (4) the control group after the treatment.[116] Given that four distinct groups are considered, the design requires a measure that allows detecting changes in earnings' predictive power between the groups. One approach is to compare R-squared measures resulting from the estimation of the cash flow forecasting model for each group.[117] Another approach is to use the mean prediction error, root mean square prediction error, or a similar metric.[118] A third approach is to analyze the cash flow forecasting model's *residuals* using a separate regression model (i.e., a residual model). This approach implies regressing the squared residuals obtained from the estimation of the cash flow forecasting model on dummy variables representing different states of interest (e.g., the treatment group before the treatment; the treatment group after the treatment etc.) and on other control variables. I am not aware of any empirical studies in accounting using this approach in the context of a difference-in-differences design. Thus, by using a residual model when determining changes in earnings' predictive power the dissertation makes a third contribution to the literature.

---

[115] For an in-depth discussion of the merits of the difference-in-differences design in comparison to other available research designs, see Subsection 6.3.4.1.3.

[116] See Subsection 6.3.4.1.3 for details.

[117] This approach is taken by Li & Sougiannis (2014) in the first part of their analysis. However, the R-squared measures are not compared using a statistical test.

[118] This approach is taken by Li & Sougiannis (2014) in the second part of their analysis. (The metrics used are based on Lev, et al. (2010), pp. 779-807.)

4) *Comparison of R-squared Measures using a Statistical Test*

Given that many studies compare R-squared measures obtained from different regressions (e.g., studies comparing R-squared measures from different subsamples in the context of a difference-in-differences design) it is surprising that a statistical test, that allows determining the statistical significance of detected R-squared differences, is usually not employed.[119] The dissertation compares R-squared measures using a statistical test, thereby making a fourth contribution to the literature.

Contributions with Regard to the Data Used

5) *Use of Deutsche Bundesbank's Proprietary USTAN Database*

Many studies use data conveniently provided by commercial databases. While this approach is cost-efficient and feasible, a general concern is that data quality may be limited. The following limitations may arise: (1) databases may not provide measures for specific accounting variables, in particular accruals, thereby forcing researchers to proxy these variables using measures that are related to these variables but not actually representing them[120]; (2) databases may be biased toward large firms[121]; and (3) databases may contain erroneous values as personnel of database providers may not have accounting-specific knowledge, in particular with regard to IFRS, thereby being prone to making data entry mistakes if judgment is needed.[122]

The dissertation uses Deutsche Bundesbank's USTAN database. The database, which was specifically established for the purpose of creating a data set for IFRS-specific research, contains highly accurate accounting amounts covering both public and private German firms. The database has become available to the research community only recently and has thus not widely been used in empirical financial accounting

[119] As noted, Li & Sougiannis (2014) simply compare R-squared values without using a statistical test. An exception to the rule that R-squared values are compared without the use of a statistical test is Harris, et al. (1994). Olkin & Finn (1995) highlight the fact that a statistical test is rarely employed in social science research at all (p. 156).
[120] Schmitting & Wöhrmann (2013), p. 555.
[121] Brüggemann, et al. (2013), p. 2; Christensen, Lee, & Walker (2007), p. 358; and ICAEW Financial Reporting Faculty (2014), p. 9.
[122] Schmitting & Wöhrmann (2013), p. 555.

research.[123] Thus, by using this database, the dissertation makes a fifth contribution to the literature.

6) *Concentration on German Firms*

Many studies investigate the effect of the IFRS introduction using a cross-section of countries in which the IFRS system became mandatory in the past.[124] While this approach allows an analysis of the cross-sectional variance and thus yields a certain degree of external validity of empirical results, there are two major drawbacks to this approach: (1) cross-sections oftentimes contain countries with local accounting systems that are similar to the IFRS system (e.g., Anglo-Saxon countries such as Australia, the U.K., and South Africa[125]), thereby masking the true effect of the IFRS introduction; (2) financial statement quality is not only driven by the quality of accounting standards but also by the quality of the institutional environment; thus, using a country cross-section adds more noise to empirical results than only using a single country. The dissertation takes the view that the use of countries with fundamentally different local accounting systems greatly enhances the validity of IFRS measurement results. As Germany is generally considered as a country with a fundamentally different local accounting system[126], focusing on this country constitutes a sixth contribution to the literature.[127]

7) *Inclusion of Voluntary and Mandatory Adopters*

Many studies using public firm data restrict their attention to voluntary IFRS adopters when analyzing public firms in the context of the IFRS introduction.[128] The exclusive use of these adopters, however, makes a generalization of results difficult due to self-selection issues (e.g., incentives being unrelated to the IFRS introduction but affecting financial statement quality).[129] The dissertation makes a seventh contribution to the

---

[123] García Lara, García Osma, & Belén Gill de Albornoz (2006) show that the choice of the database significantly affects the results of studies in empirical financial accounting research (pp. 426-454).
[124] For example, Barth, et al. (2008), p. 488; and Ashbaugh & Pincus (2001), p. 422.
[125] See, for example, Barth, et al. (2008), p. 488.
[126] Küting, et al. (2013).
[127] There are, nevertheless, studies focusing on only one country, in particular on Germany (e.g., Paananen & Lin (2009); Hung & Subramanyam (2007); and van Tendeloo & Vanstraelen (2005)). However, relative to the extant body of cross-sectional studies, these studies constitute a minority in the literature.
[128] For example, Barth, et al. (2008), pp. 467-498.
[129] Horton, et al. (2013), p. 391.

literature by taking both voluntary and mandatory IFRS adopters into account, thereby achieving a high degree of generalizability of empirical results.

Contributions with Regard to the Interpretation of Empirical Results

8) *Interpretation of Empirical Results using an Agency-Theoretic Framework*

Many studies examining the association between the IFRS introduction and financial statement quality only provide a narrow discussion of empirical results. That is, these studies fail to view their results in a broader economic framework. A common economic framework is the principal-agent theory and the related information asymmetry theme. Thus, these studies fail to view their results in an explicit information asymmetry setting.[130] The dissertation makes an eighth contribution to the literature by articulating an agency-theoretic framework and by using this framework to evaluate its empirical results, thereby explaining the broader meaning of the results. Moreover, the dissertation uses an agency-theoretic framework to predict what would happen if the IFRS mandate were extended to firms currently not subject to it.

9) *Derivation of Normative Policy Recommendations from the Empirical Results*

Given that many researchers believe that research cannot inform policy makers[131], policy recommendations are rare in empirical accounting papers. The dissertation takes the view that empirical research may very well inform policy makers and thus makes a ninth contribution to the literature by interpreting empirical results in the light of standard-setting. This approach helps national legislators and private standard-setting bodies to develop *optimal* accounting principles and rules that can ultimately be used to prescribe how accounting practitioners should form their accounting.

The following statement summarizes the dissertation's contributions to the empirical financial accounting literature:

[130] Horton, et al. (2013), p. 390.
[131] See the discussion in Section 8.

STATEMENT OF CONTRIBUTIONS

The dissertation's main contribution is:

- to utilize a cash flow forecasting model as a measurement tool to detect changes in earnings' predictive power following the IFRS introduction.

Other contributions are:

- the use of a difference-in-differences design;
- the use of a residual model when measuring changes in the cash flow forecasting model's prediction error;
- the use of a statistical test to determine whether differences between R-squared measures from regressions on different subsamples are significant;
- the use of a high-quality and rarely used IFRS-specific database (i.e., Deutsche Bundesbank's USTAN data base);
- the exclusive use of German data;
- the inclusion of both voluntary and mandatory adopters into the data sample;
- the interpretation of empirical results in an agency-theoretic setting; and
- the derivation of policy recommendations from the empirical results.

As noted earlier, the dissertation uses a cash flow forecasting model to measure the IFRS effect. The model's set of explanatory variables consist of current cash flow and various components of current accruals. Thus, at this point the question arises: what accruals should be used for the model? The next section addresses this issue.

5 Development of the Economic Model and Research Hypotheses

5.1 Development of the Economic Model

5.1.1 Key Accounting Issues and Related Accruals

To identify accruals suitable for the cash flow forecasting model, the dissertation (1) identifies key accounting issues that are generally considered of importance to accounting practitioners; (2) outlines for each of these issues whether the IFRS system provides, relative to the HGB system, a larger or smaller amount of discretionary accrual choices to management; and (3) identifies suitable discretionary accruals[132] capturing the differences between the IFRS and HGB system identified in the second step.[133] Key accounting issues discussed are:

- business combinations;
- revaluation of property, plant, and equipment;
- provisioning;
- revenue recognition; and
- inventory valuation.

In the following, these accounting issues will briefly be discussed.

---

[132] CHRISTENSEN, FRIMOR, and SABAC define non-discretionary and discretionary accruals as follows: "Non-discretionary accruals are driven by a firm's business model, by its operating environment, and by accounting policies that do not allow managerial discretion; discretionary accruals, in contrast, are those controlled by managers[…]." (Christensen, Frimor, et al. (2013), p. 258; based on Francis, Olsson, LaFond, & Schipper (2005), pp. 295-327.)

[133] As noted in Subsection 2.1, there are fundamental differences between the HGB and IFRS system. Differences are particularly pronounced with regard to the measurement of assets and liabilities as the HGB system emphasizes historical cost accounting whereas the IFRS system emphasizes fair value accounting. The consequence of the difference in the emphasis of these two measurement concepts is that management assumptions and estimates are limited (extensive) in financial statements prepared under the HGB system (IFRS system).

5.1.1.1 *Business Combinations*

Business combinations usually play an important role when preparing consolidated financial statements. Thus, the question arises as to whether their accounting treatment in the HGB system differs from the accounting treatment in the IFRS system. Given that accounting rules concerning business combinations are complex, addressing the question requires a focus on key aspects.[134] The following discussion confines its attention to *share deal* business combinations and to issues concerning the measurement of *goodwill* and *intangible assets* in years following first-time consolidation.

With regard to the measurement of goodwill and intangible assets in years following the business combination, the following significant difference between the HGB and IFRS system exists: Under the HGB system, goodwill and intangible assets are generally considered having a finite life and are amortized in an orderly fashion (i.e., over a finite time period).[135] On the contrary, the IFRS system considers goodwill and certain intangible assets (e.g., company trademarks) as having an *indefinite life* and requires management to subject them to an (at least) annual impairment test (impairment-only approach).[136]

The fact that the IFRS system favors the impairment-only approach means that the management of IFRS firms has significantly more discretion than the management of HGB firms. This is because determining whether impairment is required, and, if so, determining the amount of impairment, requires the extensive use of Level 3 fair values.

The impairment test for goodwill in the IFRS system is conducted on the level of a cash generating unit: the unit's carrying amount is compared to its recoverable amount, which is computed using either the concept of *fair value less costs of disposal* or the concept of *value in use*. Goodwill is impaired if the unit's carrying amount is higher than the recoverable amount. The impairment test for intangible assets with an

---

[134] For a comprehensive discussion of business combinations, especially with regard to IFRS 3, see, for example, Lüdenbach, et al. (2014), pp. 1961-2116; and Ernst & Young LLP (2015), pp. 563-674.
[135] Section 301(3)(1) HGB.
[136] For details with regard to the *impairment-only approach*, see IAS 36; Lüdenbach, et al. (2014), pp. 497-621; and Ernst & Young LLP (2015), pp. 1397-1503.

indefinite life is very similar to the impairment test for goodwill; the concepts of *fair value less costs of disposal* and *value in use* apply, too.

At first sight, it seems that the two measurement methods of goodwill—amortization in an orderly fashion and impairment-only approach—are equally prone to opportunistic discretionary accrual choices by management. Discretion with regard to amortization in an orderly fashion arises from the fact that the remaining useful lifetime of goodwill and intangible assets needs to be estimated; discretion with regard to amortization under the impairment-only approach arises from the fact that the amortization amount of goodwill and intangible assets with indefinite life depends on the computed recoverable amount, which, in turn, is derived using Level 3 inputs. Although discretion is required under both amortization approaches, the dissertation takes the view that amortization in an orderly fashion as prescribed by HGB is prone to *significantly less* opportunistic management behavior compared to the impairment-only approach prescribed by the IFRS system as the number of management assumptions and estimates to be made under the impairment-only approach when deriving Level 3 fair values is significantly larger than the number of management assumptions and estimates to be made under the approach prescribed by HGB.[137]

In summary, the discussion has shown that, relative to the HGB system, the IFRS system grants management a significantly larger amount of discretion with regard to the measurement of goodwill and intangible assets in years following first-time consolidation. For the empirical analysis of the dissertation, a variable is required that captures this difference. Given that discretion in the context of the accounting treatment of business combinations affects the amortization of goodwill and intangible assets, a suitable variable for the empirical analysis is *amortization expense*. As a consequence, the dissertation uses amortization expense as one explanatory variable in the cash flow forecasting model.

[137] The view follows Schmidt (2012), p. 225 and p. 229.

5.1.1.2 *Revaluation of Property, Plant, and Equipment*

With regard to recognition and measurement at recognition, the accounting treatment for property, plant and equipment is to a large extent similar in both accounting systems. A moderate difference, however, exists with regard to the measurement after recognition: Under the HGB system, property, plant, and equipment is measured after recognition at adjusted historical cost; that is, at historical cost less accumulated depreciation and, if applicable, impairment losses.[138] Under the IFRS system, management may choose between the adjusted historical cost method and the revaluation method.

The revaluation method in the IFRS system allows management to measure property, plant, and equipment at a revalued amount, which is "[the asset's] fair value at the date of the revaluation less any subsequent accumulated depreciation and subsequent accumulated impairment losses."[139] Thus, the IFRS system grants management a larger amount of discretion with regard to the measurement of property, plant, and equipment after recognition due to the fact that it provides management with the option to choose between the adjusted historical cost method and the revaluation method. However, in accounting practice this difference does not affect German firms' accounting amounts dramatically as the option is rarely exercised.[140] Nevertheless, the difference in the treatment of property, plant, and equipment is taken into account in the dissertation's empirical analysis by using the accrual *depreciation expense* as an explanatory variable in the cash flow forecasting model.

5.1.1.3 *Provisioning*

Accounting practitioners frequently face the question as to when to recognize and how to measure provisions. HGB accounting rules concerning provisions differ moderately from IFRS rules.[141] A key difference with regard to *recognition* of provisions is: The HGB system requires the recognition of *provisions for expenses* related to

---

[138] Section 253(3) HGB; see also Hayn & Waldersee (2014), p. 152.
[139] IAS 16.31; for a detailed discussion of IAS 16, see Lüdenbach, et al. (2014), pp. 719-734.
[140] Lüdenbach, et al. (2014), p. 389.
[141] The dissertation confines its attention to provisions other than pension and tax provisions; a classification of provisions is found in Section 266(3)(B) HGB.

maintenance and removal of overburden.[142] The IFRS system does not allow the recognition of these types of provisions.[143] This difference suggests that the HGB system provides *more* discretion than the IFRS system.

Key differences with regard to the *measurement* of provisions are:

- The HGB system provides a de facto choice with regard to the *discounting* of future payments arising from provisions with a duration of *less* than one year.[144] (Future payments arising from provisions with a duration of *more* than one year are always to be discounted.[145]) The IFRS system generally requires discounting for all types of provisions.[146] This difference suggests that the HGB system provides *more* discretion than the IFRS system.
- With regard to the choice of the *interest rate* to be used in the course of discounting provisions, the HGB system requires the use of an average market interest rate provided by Deutsche Bundesbank and thus a rate that is comparable across firms. The IFRS system, on the contrary, requires management to compute an appropriate interest rate individually.[147] This difference suggests that the HGB system provides *less* discretion than the IFRS system.

In summary, there are some moderate differences with regard to the treatment of provisions between the HGB and IFRS system. Even though the HGB system provides more discretion with regard to some types of provisions (e.g., maintenance) and with regard to discounting, the dissertation takes the view that the larger amount of discretion granted by IFRS with regard to the calculation of interest rates *clearly outweighs* the larger amount of discretion granted by HGB with regard to the other issues. Therefore, the dissertation concludes that with regard to provisioning, the IFRS system grants, in sum, more discretion than the HGB system. Consequently, the dissertation captures these differences in management discretion using the accrual *provisions* in the set of the cash flow forecasting model's explanatory variables.

---

[142] Section 249(1)(1) HGB: *Rückstellungen für im Geschäftsjahr unterlassene Aufwendungen für Instandhaltung, die im folgenden Geschäftsjahr innerhalb von drei Monaten, oder für Abraumbeseitigung, die im folgenden Geschäftsjahr nachgeholt werden*.
[143] Melcher, David, & Skowronek (2013), p. 32.
[144] Melcher, et al. (2013), p. 127.
[145] Section 253(2)(1) HGB.
[146] Melcher, et al. (2013), p. 127; IAS 37.45. One may only abstain from discounting if the time value of money is negligible.
[147] Melcher, et al. (2013), p. 135.

5.1.1.4 *Revenue Recognition*

Another important and controversially debated accounting issue is the question as to how and, more importantly, when revenues should be recognized. With regard to revenue recognition, some moderate differences between the HGB and IFRS system exist. Key differences relate to the following two issues: (1) the conditions that need to be fulfilled to recognize revenue in general; and (2) the conditions that need to be fulfilled to recognize revenue in the context of construction contracts (i.e., contracts that extend beyond a fiscal year).[148] With regard to general conditions for revenue recognition, the following difference exists: The HGB system is more restrictive than the IFRS system by generally only allowing recognition if the seller has fulfilled contractual obligations and, thus, has *realized* gains arising from transactions.[149] On the contrary, the IFRS system regularly allows revenue recognition even if the seller has not fulfilled contractual obligations.

In the IFRS system, key conditions that need to be met to recognize revenue are (1) "[…] the entity has transferred to the buyer the *significant risks and rewards* of ownership of the goods […]"; (2) "[…] the amount of revenue can be *measured reliably* […]"; and (3) "[…] it is *probable* that the economic benefits associated with the transaction will flow to the entity […]"[150] As can be seen from these conditions, the IFRS system uses several undefined and "soft" terms such as "significant risks and rewards", "measured reliably", and "probable", thereby granting management a certain amount of discretion when recognizing revenue.

With regard to conditions for revenue recognition in the context of *construction contracts*, the HGB system is more restrictive than the IFRS system, too. Generally speaking, there are two competing revenue recognition methods concerning construction contracts: the completed contract method and the percentage of completion method. The *completed contract* method requires construction to be

---

[148] Revenue recognition in the IFRS system is codified in IAS 11 (specific rules concerning construction contracts), IAS 18 (general rules), and IFRS 15. Note that the dissertation is not concerned with the new standard, IFRS 15, which replaces IAS 11 and IAS 18, as the new standard applies to fiscal years beginning in 2014 and the dissertation's sample period ends in 2013.

[149] The realization principle is codified in Section 252(1)(4) HGB.

[150] IAS 18.14; emphases added. The standard lists more conditions; the dissertation, however, confines its attention to these key issues.

completed before any revenue is recognized; the *percentage of completion* method allows recognition of revenue in proportion to the work completed. A difference between the HGB and IFRS system is: The HGB system generally does not allow the use of the percentage of completion method and requires the use of the completed contract method.[151] On the contrary, the IFRS system requires the use of the percentage of completion method, thereby granting management a considerable amount of discretion in the revenue recognition process. Discretion arises particularly with regard to the estimation of the contract's total revenue and the estimation of the stage of completion at the end of the fiscal year.[152]

In summary, the discussion has shown that, relative to the HGB system, the IFRS system grants management a significantly larger amount of discretion with regard to the recognition of revenues in general and particularly in the context of construction contracts. In the empirical analysis, the accrual *accounts receivable* is taken as a proxy for opportunistic management behavior in the context of revenue recognition. Accounts receivable are a suitable proxy as a (usually) constant portion of revenues is not collected in cash in a given fiscal year and thus assigned to accounts receivable.[153]

5.1.1.5 ***Inventory Valuation***

With regard to the treatment of inventory, several commonalities and some moderate differences between the HGB and IFRS system exist. Key commonalities are: (1) at recognition, both systems prescribe the historical cost method when measuring inventory; (2) at measurement after recognition, both systems generally prescribe the individual measurement of inventories[154]; and (3) at measurement after recognition, both systems require the use of the *lower of cost and net realizable value* method. With regard to the measurement in subsequent years, however, some moderate differences exist:

- Under the HGB system, management has a choice between several simplifying cost

[151] Hayn & Waldersee (2014), p. 120. The authors note, however, that in rare cases the percentage of completion method may be warranted if restrictive conditions are met (p. 216).
[152] Lüdenbach, et al. (2014), p. 958.
[153] For an accounting-theoretic treatment of the constant portion of revenues being uncollected at the end of the fiscal year, refer to Dechow, et al. (1998), p. 136; and Barth, et al. (2001), p. 31.
[154] Section 252(4)(1) HGB; IAS 2.23; for a discussion, see Lüdenbach, et al. (2014), pp. 923-947.

methods for inventories (i.e., weighted average costs, first-in, first-out, and last-in, last-out). Under the IFRS system, management has such a choice, too (weighted average costs and first-in, first-out methods). While the existence of a choice on both sides suggests that there are no differences in the amount of management discretion granted by accounting rules, it is worth noting that German income tax law limits the choices granted by HGB so that management of firms following HGB has de facto less discretion than management of firms following IFRS.[155]

- Under the HGB system, the standard cost method is generally used. Under the IFRS system, management regularly uses both the standard cost method and the retail cost method.

The IASB describes the *standard cost method* as follows:

> "Standard costs take into account normal levels of materials and supplies, labour, efficiency and capacity utilisation. They are regularly reviewed and, if necessary, revised in the light of current conditions."[156]

And the *retail method*:

> "The retail method is often used in the retail industry for measuring inventories of large numbers of rapidly changing items with similar margins for which it is impracticable to use other costing methods. The cost of the inventory is determined by reducing the sales value of the inventory by the appropriate percentage gross margin. The percentage used takes into consideration inventory that has been marked down to below its original selling price."[157]

From the provided description of the two methods it can be inferred that the retail method provides a certain amount of discretion to management—especially with regard to the application of an "appropriate percentage gross margin". Given that the retail method is generally not used under HGB, the IFRS system provides more discretion with regard to cost methods allowed.

In summary, the discussion has shown that the IFRS system provides a moderately larger amount of discretion to management with regard to inventory valuation. Thus,

---

[155] Recall that the dissertation's sample period primarily comprises years before the enactment of the BilMoG in 2010. Thus, the authoritative principle (*Maßgeblichkeitsprinzip*), which links financial reporting and tax reporting, is relevant for German firms when preparing financial statements.

[156] IAS 2.21.

[157] IAS 2.22.

the dissertation uses the accrual *inventory* as an explanatory variable in the cash flow forecasting model.

5.1.2 Final Specification of the Economic Model

General Considerations and Chosen Variables

The dissertation examines the association between the IFRS introduction and financial statement quality of public German firms by focusing on earnings' predictive power and by using a cash flow forecasting model that relates one-year-ahead operating cash flow—the explained variable—to current operating cash flow and current accrual components—the explanatory variables. An IFRS effect is detected if the prediction error of the model changes. (More precisely, a positive IFRS effect—meaning that the IFRS introduction improved financial statement quality—is detected if the prediction error declines, and vice versa.)

The previous subsection identified accruals being particularly suitable for the measurement of changes in earnings' predictive power (an accrual is particularly suitable if it captures differences in the amount of discretion granted by the two accounting systems). These accruals are: amortization expense, depreciation expense, provisions, accounts receivable and inventory. In addition, the previous section has argued that accounting research has shown that the three working capital accruals accounts receivable, inventory, and accounts payable explain future operating cash flow particularly well as a group[158] and that the accrual component accounts payable should be added to the list of accruals above even though the variable does not directly reflect differences in management discretion between the HGB and IFRS system. It was also noted above that balance sheet accruals (i.e., provisions, accounts receivable, inventory, and accounts payable) are only considered in the form of the one-period change as the explained variable—operating cash flow—is a flow variable whereas balance sheet accruals are stock variables.[159]

[158] Dechow, et al. (1998); and Barth, et al. (2001).
[159] See Subsection 6.2.3 for details.

In summary, the dissertation's cash flow forecasting model has the following variables: (1) operating cash flow—a variable serving as both the explained variable and an explanatory variable—; (2) depreciation expense; (3) amortization expense; (4) the one-period change in provisions; (5) the one-period change in accounts receivable; (6) the one-period change in inventory; and (7) the one-period change in accounts payable. Figure 5.1 depicts the economic specification of the cash flow forecasting model used in the dissertation.

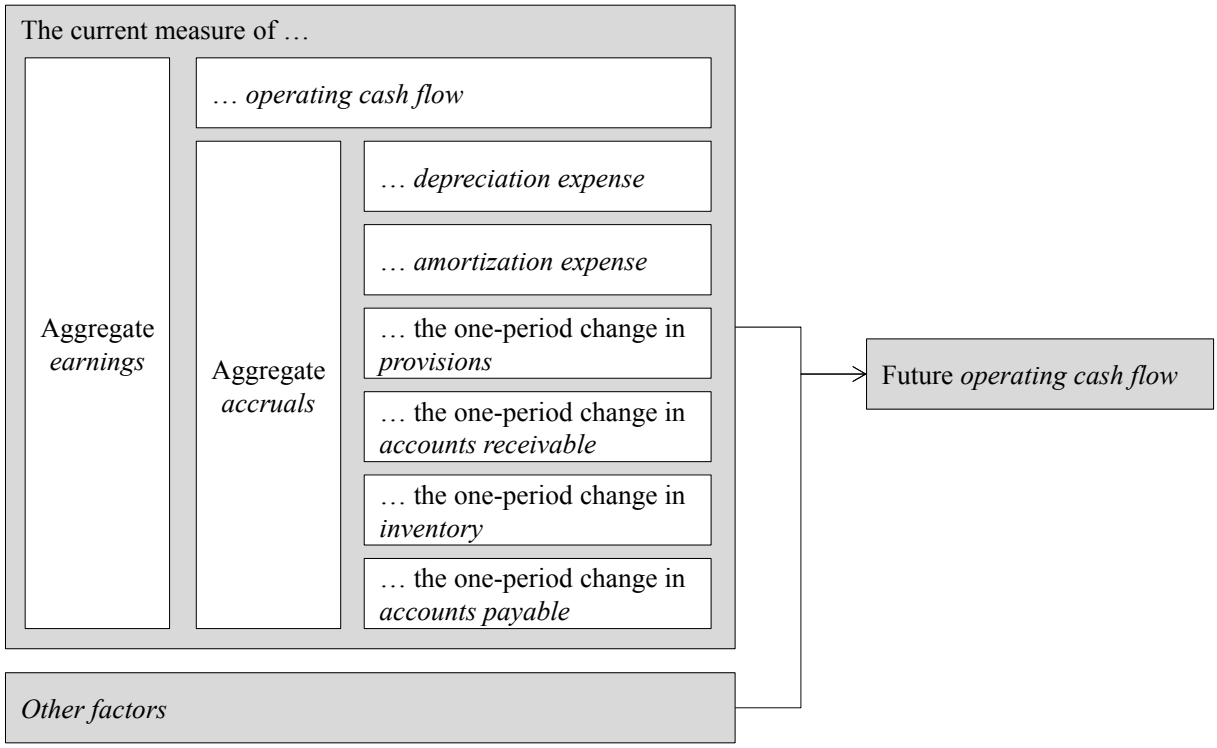

FIGURE 5.1
ECONOMIC SPECIFICATION OF THE CASH FLOW FORECASTING MODEL

Notes. The figure illustrates the economic specification cash flow forecasting model used in the dissertation; own depiction.

The cash flow forecasting model may also be expressed using the following functional expression:

$$OCF_{it+1} = f(OCF_{it}, DEPR_{it}, AMORT_{it}, \Delta PROV_{it}, \Delta AR_{it}, \Delta INV_{it}, \Delta AP_{it}) \qquad [5.1]$$

where subscript $i = 1,2,\ldots,N$ denotes firms; subscript $t = 1,2,\ldots,T$ denotes years; *OCF* is operating cash flow; *DEPR* is depreciation expense; *AMORT* is amortization

expense; $\Delta PROV$ is the one-period change in provisions; ΔAR is the one-period change in accounts receivable; ΔINV is the one-period change in inventory; and ΔAP is the one-period change in accounts payable.[160]

Expected Signs

The expected direction of the explanatory variables' association with one-year-ahead cash flow depends on the specific variable considered. Table 5.1 shows how each explanatory variable is expected to be associated with one-year-ahead cash flow and provides a discussion of the economic rationale behind each expected association. The table shows that the dissertation expects current operating cash flow, the current change in accounts receivable, and the current change in inventory to be positively associated with one-year-ahead operating cash flow whereas it expects current depreciation and amortization expense, the current change in provisions, and the current change in accounts payable to be negatively associated to one-year-ahead operating cash flow.

[160] The balance sheet accruals provisions, accounts receivable, inventory, and accounts payable explain future operating cash flow only when considered in the form of the one-period change as cash flow is a flow variable and these balance sheet accruals are stock variables. See Subsection 6.2.3 for details on how to transform variables into analyzable measures.

TABLE 5.1
EXPECTED DIRECTION OF THE ASSOCIATION BETWEEN EACH OF THE CASH FLOW FORECASTING MODEL'S EXPLANATORY VARIABLES WITH ONE-YEAR-AHEAD OPERATING CASH FLOW

Variable[a] in period t	Expected Direction	Remarks
OCF	+	A firm's operating cash flow is determined by its business model. As business models are persistent, there is a positive association between a firm's operating cash flow in period t and in period t+1.
DEPR and *AMORT*[161]	-	The association between depreciation expense and one-year-ahead operating cash flow is not obvious at first sight. The dissertation takes a *ceteris paribus view* of the depreciation effect on one-year-ahead operating cash flow. Under this view, investments are assumed to be constant. If investments are constant, a large amount of depreciation and amortization expense in period t indicates that previously purchased assets were overvalued and will not generate the expected level of one-year-ahead operating cash flow. This view is particularly compelling in the context of the dissertation as it uses data from *consolidated* financial statements. The consolidated balance sheet likely contains a large amount of intangible assets and acquired goodwill—items for which a valuation is challenging and based on management assumptions and estimates. As a consequence, a higher than expected future depreciation expense and subsequent lower operating cash flow is common.[162] Thus, under the ceteris paribus view the association between depreciation and amortization expense and one-year-ahead operating cash flow is expected to be negative.[163]

[161] The accruals *depreciation expense* and *amortization expense* are considered together as the rationale for the expected direction of the association between each of these two accruals and future operating cash flow is the same. For this reason, the dissertation does not use two distinct measures in the empirical part but one common measure to proxy both accruals at the same time.

[162] An alternative view is to consider depreciation and amortization expense as a proxy for past investments. Under this view, depreciation expense in period t reflects investments in property, plant, and equipment in period t-1. A large amount of investments (and thus a large amount of depreciation in the subsequent period) leads to higher operating cash flow in period t+1 when previous investments pay off. This view is put forward in Homburg & Wrede (2007), p. 885; and Wrede (2009), p. 25.

[163] An alternative view is to consider depreciation and amortization expense as a proxy for past investments. Under this view, depreciation expense / amortization expense in period t reflects investments in property, plant, and equipment in period t-1. The argument goes that (1) large investments in period t-1 lead to large amounts of depreciation expense / amortization expense in period t, which, in turn, (3) lead to higher operating cash flow in period t+1 when previous investments pay off. This view is put forward in Homburg & Wrede (2007), p. 885; and Wrede (2009), p. 25.

(CONTINUED)

Variable[a] in period t	Expected Direction	Remarks
$\Delta PROV$	-	A net increase in provisions in period t will likely result in a cash outflow (negative cash flow from operations) in period t+1, and vice versa. Example: A firm recognizing a warranty provision is likely to experience a cash outflow to meet the warranty claims.
ΔAR	+	A net increase in accounts receivable in period t will likely result in a cash inflow (positive cash flow from operations) in period t+1, and vice versa. Example: A firm has credit sales that are debited to accounts receivable; customers will pay their bills in future periods.
ΔINV	+	A net increase in inventory in period t will likely result in a cash inflow (positive cash flow from operations) in period t+1, and vice versa. Example: A firm increases inventory in expectation of strong demand in future periods. If demand expectations are met, revenues and thus operating cash flow will increase.[164]
ΔAP	-	A net increase in accounts payable in period t will likely result in a cash outflow (negative cash flow from operations) in period t+1, and vice versa. Example: A firm receives deliveries from suppliers on credit and pays its bills in future periods.

Notes. The table outlines the rationale for the expected association between each of the cash flow forecasting model's accruals and future operationg cash flow.
[a] *OCF* is operating cash flow; *DEPR* is depreciation expense; *AMORT* is amortization expense; $\Delta PROV$ is the one-period change in provisions; ΔAR is the one-period change in accounts receivable; ΔINV is the one-period change in inventory; ΔAP is the one-period change in accounts payable.

5.2 Development of Research Hypotheses

As outlined in Subsection 2.1, the IFRS system grants management a significantly larger amount of discretion than the HGB system. Thus, the following question arises: what kind of discretionary accrual choices are expected from management when management is confronted with a new GAAP allowing a significantly larger amount of discretion than the GAAP they adhered to before? The accounting literature provides

[164] One may argue that an increase in inventory is a sign that the firm has difficulties selling its products. In this case, a negative association between a change in inventory and future operating cash flow will be expected (see Wrede (2009), p. 25). The dissertation does not follow this rationale.

two conflicting views addressing this question: the informational view and the opportunistic behavior view.[165] The *informational* view holds that management uses the larger amount of discretion granted by GAAP to report accounting amounts which more accurately reflect underlying economic transactions.[166] The *opportunistic behavior* view, on the contrary, holds that management takes advantage of the larger amount of discretion granted by opportunistically reporting accounting amounts at their benefit.

The dissertation's empirical analysis is conducted in an agency-theoretic setting as the object of investigation—the public German firm and their investors—is confronted with agency problems resulting from the corporate organizational form. As a consequence, the dissertation assumes that agents (i.e., managers) seek to maximize their own wealth instead of the wealth of principals, thereby following the opportunistic behavior view and hypothesizing that the IFRS introduction leads to opportunistic rather than to informative discretionary accrual choices. Putting it differently, the dissertation hypothesizes that the IFRS introduction leads to a decrease in earnings' predictive power.

Sub-hypotheses

As noted earlier, accruals capture differences between the HGB and IFRS system with regard to the amount of discretion granted to management. However, as Subsection 5.1.1 has shown, the magnitude of these differences varies from accounting issue to accounting issue and thus from accrual to accrual. For example, the difference between the HGB and IFRS system with regard to the accounting issue business combinations and the related accrual amortization expense was found to be significant whereas the difference between the HGB and IFRS system with regard to the accounting issue revaluation of property, plant, and equipment and the related accrual depreciation expense was found to be only moderate. This insight leads to a separation of the total set of accruals in various subsets. The dissertation considers the following subsets:

---

[165] Badertscher, Collins, & Lys (2012), pp. 330-331.

[166] The informational view is widely held by academics and standard setters. It implies that financial reports should not only contain information about past transactions but also an assessment of the firm's future economic prospects undertaken by management (Kühnberger (2014), p. 5; Pellens, et al. (2014), p. 7; Watts & Zimmerman (1986), p. 197; and Barth (2006), p. 81).

- accrual subset one: provisions;
- accrual subset two: depreciation expense, amortization expense, accounts receivable, and inventory; and
- accrual subset three: accounts payable.

Accrual subset one contains provisions only; an accrual for which moderate differences between the HGB and IFRS system with regard to management discretion were identified. Accrual subset two contains depreciation expense, amortization expense, accounts receivable, and inventory; accruals for which significant differences between the HGB and IFRS system with regard to management discretion were identified.[167] Accrual subset three contains accounts payable only; an accrual for which no differences between the HGB and IFRS system with regard to management discretion were identified.

The fact that the magnitude of differences between the HGB and IFRS system varies from accrual to accrual translates into varying expectations about the magnitude of the change in earnings' predictive power following the IFRS introduction. Specifically, it is expected that earnings' predictive power

- declines by *less* than the decline under the central hypothesis when considering accrual subset one;
- declines by *more* than the decline under the central hypothesis when considering accrual subset two; and
- does *not* change when considering accrual subset one.

Based on these expectations, the dissertation formulates four sub-hypotheses. Unlike the central hypothesis, these sub-hypotheses are not concerned with the change in the *level* of earnings' predictive power following the IFRS introduction, but with the change in earnings' predictive power relative to the change exhibited under the central hypothesis.

---

[167] Strictly speaking, significant differences were only found for amortization expense and accounts receivable whereas for depreciation expense and inventory only moderate differences were found. However, the dissertation considers the accruals amortization expense and accounts receivable to be particularly important and thus dominant in accrual subset two as their underlying accounting issues, business combinations and revenue recognition, are subject to considerable controversy.

The dissertation's research hypotheses are summarized as follows:

STATEMENT OF RESEARCH HYPOTHESES
The dissertation's central research hypothesis is as follows: ▪ Earnings' predictive power *decreases* following the IFRS introduction for public German firms when measuring earnings' predictive power using a disaggregated, earnings-based cash flow forecasting model and the *full* set of accruals (i.e., depreciation expense, amortization expense, provisions, accounts receivable, inventory, and accounts payable). The following are sub-hypotheses: ▪ Earnings' predictive power exhibits a *relatively smaller decline*, compared to the decline under the central research hypothesis, when using accrual subset *one* (i.e., provisions only). ▪ Earnings' predictive power exhibits a *relatively larger decline*, compared to the decline under the central research hypothesis, when using accrual subset *two* (i.e., depreciation expense, amortization expense, accounts receivable, and inventory). ▪ Earnings' predictive power *does not change* when using accrual subset *three* (i.e., accounts payable only).

6 Research Method

6.1 Overview

From a methodological point of view, the IFRS introduction in Germany is a *natural experiment*. WOOLDRIDGE describes such an experiment as follows:

> A natural experiment occurs when some exogenous event—often a change in government policy—changes the environment in which […] firms […] operate. A natural experiment always has a control group, which is not affected by the policy change, and a treatment group, which is […] affected by the policy change. […] control and treatment groups in natural experiments arise from the particular policy change.[168]

Given that the IFRS introduction is a natural experiment (henceforth simply: experiment), studying the effect of that accounting policy change on financial statement quality requires the use of an experimental research method. A method is considered as experimental if two conditions are met: (1) a (statistical) test is performed for both the time period before *and* after the policy change (i.e., a pretest and a posttest is performed); (2) a (statistical) test is performed for both cross-sectional units that are subject to the policy change *and* cross-sectional units which are not subject to the policy change (i.e., a test is performed for both the treatment group and the control group).[169] In the context of the dissertation, the application of the experimental research method leads to the following four distinct states of interest:

- state of interest 1: *public* firms *before* the IFRS introduction;
- state of interest 2: *public* firms *after* the IFRS introduction;
- state of interest 3: *private* firms *before* the IFRS introduction; and
- state of interest 4: *private* firms *after* the IFRS introduction.

---

[168] Wooldridge (2013), p. 441; emphasis added. A natural experiment may also be denoted as *quasi-experiment*. As opposed to a true experiment, a natural or quasi-experiment does not *randomly* assign cross-sectional units (e.g., firms) to groups (Shadish, Cook, & Campbell (2002), p. 104; Wooldridge (2013), p. 441). The IFRS introduction is a natural experiment as the IAS Regulation assigns firms to groups based on their listing status—a characteristic they had prior to the policy change. (For a discussion of natural or quasi-experiments, see also Babbie (2013), pp. 289-299 and pp. 367-371; Shadish, et al. (2002), pp. 13-17; and Meyer (1995), pp. 151-152.)

[169] Shadish, et al. (2002), pp. 103-105; if both conditions are met, it will be possible to derive causal inferences.

The aim of the experimental method is to understand the *effect* of, and thus draw causal inferences about, a treatment. The effect of a treatment is the difference between the state that results from the treatment and the state that would have prevailed if the treatment had not occurred. Thus, it is necessary to gain both factual and counterfactual knowledge. *Factual knowledge* is derived from observable data about the treatment group under the treatment. *Counterfactual knowledge* is knowledge about the unobservable condition of the treatment group if the treatment had not occurred. As SHADISH, COOK, and CAMPBELL put it, counterfactual knowledge is

> […] knowledge of what *would have happened* to [firms] if they simultaneously had not received treatment. An **effect** is the difference between what did happen and what would have happened.[170]

In the context of the dissertation, investigating the above-mentioned four states of interest allows drawing causal inferences about the IFRS introduction's effect on earnings' predictive power.[171]

Data

To implement the method, public and private firms' data need to be collected. Generally speaking, one may collect firm data organized in the form of cross-sectional data, time series data, or panel data. *Cross-sectional data*, by definition, are static as they do not contain a time component and, thus, generally do not allow causal interpretations of observed relations between variables. Likewise, *time-series data* are of limited use, too, as no variation in the cross-section can be observed. Given these limitations, it appears that pooling cross-sectional data over time (i.e., collecting a time series for each cross-sectional unit) is ideal to establish causality as pooled cross-sectional data capture both differences in firm characteristics between the treatment

[170] Shadish, et al. (2002), p. 5; authors' emphases.

[171] The quasi-experimental research method is widely used in empirical studies aiming at developing causal interpretations of observed phenomena. The application of the method in the dissertation is primarily based on Babbie (2013), pp. 271-293; Shadish, et al. (2002), pp. 1-153; and Cook & Campbell (1979), pp. 1-146). See also the early work of R. A. FISHER (Fisher (1950a), pp. 1-25).

and control group *at a point in time* as well as *over time*; that is, pooled cross-sectional data capture the dynamics of a policy change.[172]

Pooling cross-sectional data over time may be achieved using one of two distinct approaches: (1) the independently pooled cross-sectional *data* approach; or (2) the panel data approach. The *independently pooled cross-sectional* data approach draws a random sample of *N* firms before and after the policy change.[173] The *panel data* approach, on the contrary, draws a random sample only *before* the policy change and thus collects "[…] repeated measures over time from the same units of observations […]"[174] A consequence of non-random sampling in periods after the policy change under the panel data approach is that "[…] observations are not independently distributed across time."[175] Despite this drawback, panel data are nevertheless considered to be advantageous over pooled cross-sectional data as their advantage—the possibility to observe the same cross-sectional units over time—clearly outweighs their drawback.[176] As a consequence, the dissertation uses a panel data set with public and private German firms before and after the IFRS introduction. Subsection 6.2 discusses the data in detail.

Measuring Changes in Earnings' Predictive Power following the IFRS Introduction

The dissertation is concerned with the association between the IFRS introduction and changes in the predictive power of earnings with regard to forecasting operating cash flow and examines this association using an earnings-based cash flow forecasting

---

[172] Another advantage of pooled cross-sectional data over cross-sectional data and time-series data is that pooling observations increases the sample size as the pooled sample consists of *N* cross-sectional units observed over *T* time periods. (Ployhart & Vandenberg (2010), pp, 94-96; Kennedy (2003), p. 302; Hsiao (2005), pp. 144-154).

[173] Wooldridge (2013), pp. 432-433.

[174] Ployhart & Vandenberg (2010), p. 97. Panel data, also denoted as longitudinal data, are widely used to examine the success of policy changes. For a comprehensive discussion of panel data, see, for example, Baltagi (2014); Hsiao (2014); Baltagi (2013); Mátyás & Sevestre (2008); Hsiao (2005), pp. 143-154; and Nerlove (2002).

[175] Wooldridge (2013), p. 433. Another disadvantage of panel data is that cross-sectional units may fall out of the sample over time—a process denoted as *attrition* (Wooldridge (2013), p. 473; Babbie (2013), p. 110). For example, if cross-sectional units represent firms, the number of firms in the sample may decline over time due to bankruptcy, mergers, or acquisitions. Attrition leads to unbalanced panels. Nevertheless, as long as the reason for attrition is random (i.e., is not related to the sample selection process), unbalanced panels do not cause methodological problems (Baltagi (2013), p. 187).

[176] The violation of the independence assumption may easily be accounted for using standard econometric techniques such as serial correlation-robust standard errors (see, for example, Wooldridge (2013), pp. 417-420).

model in the context of multiple linear regression analysis. In multiple linear regression analysis, the cash flow forecasting model is concretized by a multiple linear regression model[177] in which future operating cash flow is explained by a set of measures representing explanatory variables and an idiosyncratic error term.

The predictive power of the cash flow forecasting model is reflected in the variance of future operating cash flow. Thus, measuring the model's change in predictive power requires an analysis of the change in the variance of future operating cash flow—more precisely, an analysis of the change in the proportion of future operating cash flow's explained variance to its unexplained variance.

To analyze the change in the variance of future operating cash flow, the dissertation takes a two-step approach. In a first step, the dissertation estimates the cash flow forecasting model itself; in a second step, the dissertation analyses the cash flow forecasting model's *residuals* that result from step one.

1) *Step one—estimation of the cash flow forecasting model*

Estimation of the cash flow forecasting model is conducted by calibrating the cash flow forecasting model to the overall sample as well as to four distinct subsamples which represent the above-mentioned states of interest. From this calibration procedure, the following five samples emerge:

- sample 1: overall sample;
- sample 2: *public* firms *before* the IFRS introduction;
- sample 3: *public* firms *after* the IFRS introduction;
- sample 4: *private* firms *before* the IFRS introduction; and
- sample 5: *private* firms *after* the IFRS introduction.

The purpose of estimating the cash flow forecasting model for all these samples is twofold: (1) to investigate whether the cash flow forecasting model is useful in explaining future cash flow under each of the above-mentioned states of interest as well as under all of the states of interest together (i.e., to investigate whether the cash

[177] Backhaus, Erichson, Plinke, & Weiber (2010), pp. 55-118; Winker (2010), p. 136.

flow forecasting model is correctly specified with regard to each of the above-mentioned samples); and (2) to generate residuals.

Estimating the cash flow forecasting model requires an exact specification. A key concern in the specification of a regression model is cross-sectional (i.e., firm-specific) unobserved heterogeneity. *Cross-sectional unobserved heterogeneity* means that the postulated economic model (and thus the specific, econometric regression model) omits important variables affecting the explained variable.[178] If one does not account for these omitted variables, parameter estimates will become biased and inconsistent. As KENNEDY puts it:

> In any cross-section there is a myriad of unmeasured explanatory variables that affect the behavior of the […] firms […] being analyzed. (Heterogeneity means that these micro units are all different from one another in fundamental unmeasured ways.) Omitting these variables causes bias in estimation.[179]

The dissertation takes firm-specific unobserved heterogeneity into account by scaling all accounting measures using total assets.[180] Although this procedure accounts for firm-specific differences in general, it may not be sufficient to fully account for firm-specific unobserved heterogeneity as two distinct groups of firms, namely public and private firms, are under investigation. Although firm-specific unobserved heterogeneity within each group may be eliminated using the scaling procedure, heterogeneity across the two groups may still be present, rendering the use of firm fixed effects in the econometric model necessary. To determine whether these firm fixed effects are needed, the dissertation performs a statistical test of differences in firm-size.

2) *Step two—analysis of the cash flow forecasting model's residuals*

The second step of the analysis of the change in the variance of future operating cash flow comprises the analysis of the cash flow forecasting model's residuals, which represent the unexplained portion of future operating cash flow.

---

[178] Wooldridge (2013), p. 444; Baltagi (2013), pp. 6-11; Kennedy (2003), p. 302.
[179] Kennedy (2003), p. 302.
[180] See Subsection 6.2.

The dissertation analyzes the model's residuals using three distinct research designs. These designs are: (1) the one-group pretest-posttest design; (2) the static-group posttest design; and (3) the difference-in-differences design. Of these three designs, only the difference-in-differences (DID) design is truly experimental as it covers all of the above-mentioned states of interest at the same time. The other two designs are limited to a subset of these states of interest and are therefore denoted as pre-experimental. Given that the DID design represents the experimental method and thus allows drawing causal inferences about the IFRS effect, the dissertation is primarily concerned with the DID design—the two pre-experimental designs only serve the purpose of providing a first indication as to whether there is an IFRS effect at all or not.[181]

To analyze the regression model's residuals under the three mentioned research designs, two analysis approaches are available: (1) the goodness-of-fit approach; and (2) the residual model approach. The *goodness-of-fit* approach analyzes residuals using goodness-of-fit measures such as the R-squared; the *residual model* approach, on the contrary, analyzes residuals using a separate regression model for the purpose of explaining the cash flow forecasting model's residuals. This model will be denoted as *residual model*. Specifically, a residual model is a regression model in which the explained variable is a vector of squared residuals—obtained from the estimation of the cash flow forecasting model itself—and the key explanatory variables are dummy variables representing the above-mentioned states of interest.

Generally speaking, one may analyze the regression model's residuals under each of the three research designs—the one-group pretest-posttest design, the static-group posttest design, and the DID design—using either one of the two approaches. The dissertation, however, confines its attention to only one approach for each design. Specifically, the dissertation (1) uses the goodness-of-fit approach only under the two

[181] Pre-experimental research designs may only provide a first indication of the IFRS effect as they do not fulfill both of the conditions outlined above simultaneously (i.e., they either lack a pretest or lack a control group). Putting it differently, pre-experimental research designs only allow causal inference to a limited extent. Despite these limitations, pre-experimental methods are widely used in empirical work (Shadish, et al. (2002), p 104).

pre-experimental designs; and (2) uses the residual model approach only under the DID design.[182]

German Setting

The dissertation focuses on German firms. This is because there are fundamental differences between the HGB system and the IFRS system; these differences render the German setting particularly useful in an analysis of the effect of the IFRS introduction on financial statement quality. The following explains the rationale behind the use of the German setting.

The IAS Regulation's mandate leads to a change in the accounting environment in which public EU firms operate and, as a result, to an increase in accounting costs. The magnitude of this accounting cost increase depends on the magnitude of the change in the accounting environment; which, in turn, depends on the degree of similarity of incumbent, local accounting systems with the IFRS system.

The degree of similarity of incumbent, local accounting systems with the IFRS system differs across EU member states. Thus, firms in some EU countries are confronted with a larger accounting cost increase than firms in other countries. To determine the differences in the degree of similarity of local accounting systems with the IFRS system across EU countries, it is useful to examine some basic characteristics of the countries' overall legal systems.

A legal system may either be classified as a common-law system or as a code-law system.[183] In countries with a *common-law* legal system, investor protection rights are relatively strong. Thus, investors do not need to be in close contact with managers to obtain information but rely on *publicly* available financial reports. On the contrary, in countries with a *code-law* legal system, investor protection rights are relatively weak and principals and agents are more closely related; typically, the dissemination of

[182] The reason for this focus is that the dissertation is primarily concerned with the DID design. Thus, the relatively more sophisticated approach—the residual model—will be used for the implementation of the DID design.

[183] See, for example, Soderstrom & Sun (2007), pp. 675-702; Burgstahler, Hail, & Leuz (2006), pp. 983-1016; Leuz, Nanda, & Wysocki (2003), pp. 505-527; Ball, Kothari, & Robin (2000), pp. 1-51; La Porta, Lopez-de-Silanes, & Shleifer (1999), pp. 471-517; La Porta, Lopez-de-Silanes, Shleifer, & Vishny (1998), pp. 1113-1155; Joos & Lang (1994), p. 141-168; Frost (1994), p. 169-175.

information through private channels is of great importance.[184] In the accounting literature, the United Kingdom (U.K.) is frequently presented as an example of a common-law EU country whereas Germany is frequently presented as an example of a code-law EU country.[185]

Common-law countries are typically considered as having a rules-based accounting system whereas code-law countries are typically considered as having a principles-based accounting system. A key characteristic of *principles-based* accounting systems is the existence of a conceptual framework containing abstract and general qualitative characteristics that serve as a basis for the application of specific accounting rules. That is, these systems require "[…] the appropriate exercise of professional judgment […]"[186] when applying accounting principles and rules to specific business transactions. As a consequence, principles-based accounting systems have limited complexity. On the contrary, *rules-based* accounting systems have a high degree of complexity as they aim at providing detailed, business transaction-specific regulations with regard to the treatment of assets, liabilities, revenues, and expenses.[187] A rules-based accounting system has the advantage of limiting interpretation by the practitioner and making financial reports across firms comparable. However, a rules-based system is costly to apply due to the large amounts of specific rules that need to be taken into account by a firm. Another disadvantage is the high frequency of changes. As the regulatory body aims at covering every specific business transaction that may occur and the business environment changes constantly, frequent changes of accounting rules are common.

Relative to the principles-based accounting systems in code-law countries such as Germany, the IFRS system is a complex, rules-based accounting system.[188] In

---

[184] Ball, et al. (2000), p. 1-51.

[185] See, for example, Soderstrom & Sun (2007), p. 678; Burgstahler, et al. (2006), p. 989 (the authors refer to common-law [code-law] countries as outsider [insider] economies); Leuz, et al. (2003), p. 507; Ball, et al. (2000), pp. 1-51. On the contrary, La Porta, et al. (1998) consider Germany as a country in between the two extremes of pure common-law / code-law orientation (p. 1116). Nevertheless, the dissertation classifies Germany into the group of code-law countries.

[186] Schipper (2003), p. 62; see also Nobes (2005), p. 25.

[187] Küting, et al. (2013), p. 1.

[188] Küting, et al. (2013), pp. 1-5. Note that the IASB as well as many scholars consider the IFRS system being principles-based. This is because the IFRS system is usually benchmarked against the U.S. GAAP accounting system. The dissertation, however, benchmarks the IFRS system against the HGB system and thus comes to the conclusion, following Küting, Pfitzer, and Weber, that the IFRS system is rules-based.

common-law countries—such as the U.K.—local accounting principles and rules resemble the IFRS system. As a result, the IFRS introduction only leads to a *moderate increase* in accounting costs. On the contrary, in common-law countries—such as Germany—local accounting principles and rules are significantly different from the IFRS system. As a result, the IFRS introduction leads to a *substantial increase* in accounting costs.[189] In fact, for the latter group of countries, the IAS Regulation's mandate implies "[…] one of the largest regulatory experiments in financial reporting ever undertaken […]"[190]

In summary, the preceding discussion has shown that differences between the IFRS system and local accounting systems of EU member states are most significant when looking at code-law countries with principles-based accounting systems and that one of the most prominent examples of a code-law EU country is Germany. As a consequence, when empirically examining the association between the IFRS introduction and changes in financial statement quality, the dissertation confines its attention to the German setting.

Organization of the Section

The remainder of this section is organized as follows:

- Subsection 6.2 describes the data, sample, and measures used in the analysis;
- Subsection 6.3 details how changes in earnings' predictive power following the IFRS introduction will be tested. Specifically, the subsection outlines how the cash flow forecasting model will be estimated and how the cash flow forecasting model's residuals will be analyzed using the three research designs and the two analysis approaches mentioned above;
- Subsection 6.4 summarizes and provides an interim conclusion.

[189] Brochet, et al. (2013), p. 1373; for a detailed analysis on differences in accounting systems, see also Bae, Tan, & Welker (2008), pp. 593-628.
[190] Christensen, et al. (2007), 342.

6.2 Data, Sample Description, and Measures

6.2.1 Data

To empirically examine the stated research hypotheses, the dissertation uses two (unbalanced) panel data sets (henceforth collectively referred to as the *original data set*) provided by Deutsche Bundesbank's USTAN database.[191] This database is unique among databases containing accounting-specific information about German firms; the USTAN database contains archival firm data on a high level of detail and covers a large number of firms and fiscal years. Specifically, the original data set covers N = 8,526 public[192] and private German firms, T = 27 years (ranging from 1987 through 2013) and NT = 52,590 firm-year observations.[193] The USTAN database provides both firm-specific master data items and financial accounting data items from the total population of German firms.[194] *Master data items* include identifiers of firms, fiscal years, accounting systems followed,[195] industry affiliation, and size. *Financial accounting data items* include all possible balance sheet and income statement data items from audited, consolidated financial statements.

The original data set should not be used in the empirical analysis without making adjustments for the following reasons: (1) it contains erroneous data records; (2) it contains dispensable data records (i.e., data records that are error-free but nevertheless not needed in the analysis; and (3) it contains variables denominated in an outdated unit of measurement. To address these issues, various adjustments to the original data set are made, which result in a new data set (final data set) that will be used in the dissertation's empirical analysis. The following explains the adjustments that were made to the original data set and provides a comparison of the original data set with

---

[191] These data sets are: *konzerne8713_bal.dta* and *USTAN_Konzernukn_anonym.dta*.
[192] Public firms include both voluntary and mandatory adopters.
[193] Note that the number of firm-year observations does not equal the product of the number of firms and years. This is because the panel data set is unbalanced.
[194] Data items provided by the USTAN database are organized under Deutsche Bundesbank's chart of accounts (see Deutsche Bundesbank (2014)). Financial accounting data items are measured in thousands of Euros or Deutsche Mark, depending on the time period considered.
[195] Deutsche Bundesbank provides two indicators related to the accounting system followed. The first indicator informs about the accounting system followed—HGB, IFRS, or U.S.-GAAP; the second indicator relates to HGB firms only and informs about whether financial accounting data were taken from tax reports, financial reports, or standard reports.

the final data set. Also, a discussion of possible sample selection bias issues in the final data set is presented.

Adjustments to the Original Data Set

1) *Deletion of Erroneous Data Records*

Firms with more than one identifier. The original data set contains firms with more than one firm identifier (i.e., redundant firm identifiers). This is because Deutsche Bundesbank occasionally allocated a new identifier to firms after the occurrence of major business events (e.g., mergers, acquisitions, and changes of the legal form). Data records with redundant firm identifiers are identified and matched (i.e., redundant data records are merged based on the firm identifier) to ensure that each firm in the data set has one unique identifier.

Accounting system followed—duplicated records in adoption years. The original data set contains several duplicated data records for firms that have adopted a new accounting system (e.g., firms that have switched from the HGB system to the IFRS system). Duplicated records are particularly frequent in 2005 as the year marks the switch from HGB to IFRS for many public German firms. Public German firms subject to the new accounting rules had to provide both pro-forma, previous-year IFRS accounting numbers as well as actual, current-year IFRS accounting numbers in the first year of IFRS adoption; duplicated records result from the fact that both sets of accounting numbers were erroneously assigned to the same year. For example, a firm adopting IFRS in 2005 may have two IFRS data records assigned to that year—one data record representing the pro-forma 2004 IFRS accounting numbers prepared to facilitate the comparison with the actual 2005 IFRS accounting numbers, and one data record representing the actual HGB accounting numbers. Table 6.1 illustrates the case. Duplicated data records are identified and deleted.

TABLE 6.1
ILLUSTRATION OF THE DATA RECORD DUPLICATION ERROR WITH REGARD TO IFRS ADOPTION YEARS

Firm ID	Firm	Year	Accounting system followed
1	Example AG	2003	HGB
1	Example AG	2004	HGB
1	*Example AG*	*2005*	*HGB**
1	*Example AG*	*2005*	*IFRS*
1	Example AG	2006	IFRS

Notes. The table illustrates how data records were duplicated in the course of the data selection process.
* This entry represents the duplicated data record; that is, the pro-forma IFRS entry being erroneously labeled as *HGB* entry.

Accounting system followed—firms switching several times. The original data set contains several data records related to firms switching from HGB to IFRS and back to HGB. Moreover, some data records even indicate that firms switch to IFRS several times. These apparently erroneous data records are identified and deleted.

2) *Deletion of Dispensable Data Records*

Accounting system followed—firms following U.S.-GAAP. The original data set contains firms following U.S.-GAAP. As this accounting system is not in the focus of the dissertation, U.S.-GAAP-related data records are identified and deleted.

Industry affiliation—financial services firms and holding firms. In the empirical accounting literature, firms from the financial services industry (e.g., banks, insurance companies, private equity companies, and real estate companies) as well as holding firms are typically excluded from analysis due to unique accounting rules that deviate significantly from accounting rules applicable to industrial firms. As a consequence, data records related to financial services firms and holding firms are identified and deleted.

3) *Conversion of Variables Denominated in an Outdated Unit of Measurement*

The original data set contains data records prepared in years prior to the introduction of the Euro. Thus, several accounting variables are denominated in Deutsche Mark.

These data records are identified and Deutsche Mark-denominated accounting amounts are converted into Euros using the historical exchange rate.

Comparison of the Original Data Set with the Final Data Set

The final data set contains approximately 90 percent of the original data set's data records. Specifically, the final data set covers N = 7,163 public and private German firms and NT = 47,303 firm-year observations. Table 6.2 contrasts the two data sets by reporting the number of firms, years, and firm-year observations of each.

TABLE 6.2
NUMBER OF FIRMS, YEARS, AND FIRM-YEAR OBSERVATIONS IN THE ORIGINAL AND FINAL DATA SET

Data set	N (1)	T (2)	NT[a] (3)
Original	8,526	27	52,590
Final	7,163	27	47,303
In percent of original data set	84.0	100.0	89.9

Notes. The table reports the number of firms (N), number of years (T), and number of firm-year observations (NT) of the original data set provided by Deutsche Bundesbank's USTAN database (*konzerne8713_bal.dta* and *USTAN_Konzernukn_anonym.dta*) and the final data set, which is obtained after making adjustments to the original data set.
[a] Note that the number of firm-year observations is not equal to the product of the number of firms and the number of years as the panel data set is unbalanced.

Possible Sample Selection Bias Issues in the Final Data Set

Sample selection bias in the final data set may impede the validity of the empirical results. The issue of sample selection bias has been widely discussed in the economics and finance literature.[196] The following two types of sample selection bias are particularly relevant for the dissertation: (1) survivorship bias; and (2) time-period bias. In the following, each type of bias will briefly be discussed in turn.

[196] See, for example, Dimson, Marsh, & Staunton (2002), pp. 34-45. For the role of sample selection bias in empirical work see, for example, Fung & Hsieh (2004), p. 3; Jorion & Goetzmann (1999), p. 955; Shumway & Warther (1999), p. 2361; Brown, Goetzmann, & Ross (1995), p. 854; Kothari, Shanken, & Sloan (1995), p. 186; Fama & French (1992), p. 429.

1) *Survivorship Bias*

This form of bias will occur if a sample only contains firms in existence as of the date the sample is drawn. A sample suffering from survivorship bias is of limited use for the dissertation as the association of future operating cash flow with current operating cash flow and current accruals may differ between firms having been in the sample throughout the entire sample period (i.e., firms that are economically successful) and firms having left the sample at some point (i.e., firms that are economically unsuccessful). Thus, to ensure the validity of the empirical results it is desirable to select a sample without survivorship bias.

The dissertation avoids survivorship bias in the sample selection process by not requiring firms having accounting data available for the whole sample period. As noted earlier, the final data set takes the form of an unbalanced panel; that is, the sample contains firms with differing numbers of years of available accounting data. As a result, the sample contains both firms currently in existence and firms that were discontinued in the past due to the occurrence of significant firm events (e.g., mergers, acquisitions, or bankruptcy).

2) *Time-Period Bias*

This form of bias relates to the choice of the sample period. Time-period bias may be present if structural economic changes affecting the association between the one-year-ahead operating cash flow and current earnings occur in the chosen time period. For example, the dissertation's sample period, ranging from 1987 through 2013, includes the 2008/2009 financial crisis. If the financial crisis—or any other structural economic change—has a disproportionate effect on the cash flow forecasting model's variables, the model's predictive power will be affected, rendering test results less informative. However, the dissertation takes the view that if structural economic changes occur, they will affect each of the cash flow forecasting model's variables proportionately, thereby leaving the relation between these variables and thus the cash flow forecasting model's *predictive power* unaffected.[197] Moreover, the dissertation takes the view that if structural economic changes occur, they will affect firms in the treatment group and

[197] Despite this assumption, the dissertation nevertheless includes year fixed effects in the regression model.

control group proportionately. Thus, time-period bias is not a concern in the dissertation.[198]

6.2.2 Sample Description

To interpret the dissertation's empirical results, a deep understanding of the final data set is important. As noted above, the data set provided by the USTAN database contains various master data items that allow an in-depth analysis of the sample at hand with regard to several aspects. The aspects addressed in this subsection are:

- the distribution of firms and firm-year observations across firm-type;
- the distribution of firms and firm-year observations across legal form;
- the distribution of firms and firm-year observations across industry;
- the distribution of firm-year observations across years;
- the distribution of public firms' IFRS adoption years;
- the most frequent IFRS adoption year(s) within each industry; and
- the distribution of overall and HGB-specific firm-year observations across accounting system followed and firm-type, respectively.

Distribution of Firms and Firm-Year Observations across Firm-Type

Table 6.3 reports absolute and relative frequencies of sample firms with regard to their firm-type. Panel A shows that private firms are overrepresented as 6,367 out of 7,163 firms (88.9 percent) are private, whereas only 796 out of 7,163 firms (11.1 percent) are public. Corresponding to this finding, Panel B shows that observations related to private firms outnumber observations related to public firms (41,180 out of 47,303, or 87.1 percent, versus 6,123 out of 47,303, or 12.9 percent, respectively.

[198] As will be detailed below, the dissertation uses a treatment group and control group of firms to test whether changes in earnings' predictive power occurred as a result of the IFRS introduction.

TABLE 6.3
ABSOLUTE AND RELATIVE FREQUENCIES OF FIRMS AND FIRM-YEAR OBSERVATIONS ACROSS FIRM-TYPE

Firm-type	# (1)	% (2)
Panel A: firms		
Public	796	11.1
Private	6,367	88.9
Total	*7,163*	*100.0*
Panel B: firm-year observations		
Public	6,123	12.9
Private	41,180	87.1
Total	*47,303*	*100.0*

Notes. The table reports absolute (#) and relative (%) frequencies of firms (Panel A) and firm-year observations (Panel B) across firm-type. Data source: Deutsche Bundesbank's USTAN database.

Distribution of Firms and Firm-Year Observations across Legal Form

Table 6.4 reports the distribution of absolute and relative frequencies of firms (Panel A) and firm-year observations (Panel B) across legal form. In addition, Figure 6.1 illustrates the distribution of absolute frequencies of firms and firm-year observations across legal form.

The table and figure show that the sample is dominated by a few legal forms, namely privately owned corporations, limited liability companies (LLCs), and limited partnerships with a LLC as the personally liable shareholder. These three legal forms account for almost 90 percent of the number of firms and firm-year observations, respectively.

TABLE 6.4
ABSOLUTE AND RELATIVE FREQUENCIES OF FIRMS AND FIRM-YEAR OBSERVATIONS ACROSS LEGAL FORM

Legal form[a]	# (1)	%[b] (2)
Panel A: firms		
Privately owned corporation (1)	1,594	22.3
Publicly owned corporation (2)	50	0.7
Limited liability company, LLC (3)	2,822	39.4
Association (4)	69	1.0
Limited partnership with a LLC being the personally liable shareholder (5)	1,931	27.0
Limited partnership (6)	307	4.3
Unlimited liability company forms (7, 8, and 9)	390	5.5
Total	*7,163*	*100.0*
Panel A: firm-year observations		
Privately owned corporation (1)	12,392	26.2
Publicly owned corporation (2)	289	0.6
Limited liability company, LLC (3)	16,610	35.1
Association (4)	596	1.3
Limited partnership with a LLC as the personally liable shareholder (5)	13,287	28.1
Limited partnership (6)	2,082	4.4
Unlimited liability company forms (7, 8, and 9)	2,047	4.3
Total	*47,303*	*100.0*

Notes. The table reports absolute (#) and relative (%) frequencies of firms (Panel A) and firm-year observations (Panel B) across legal form. Data source: Deutsche Bundesbank's USTAN database.

[a] Legal form names are based on Deutsche Bundesbank's classification; numbers in parentheses relate to the Deutsche Bundesbank legal form identifier. Corporations include stock corporations, partnerships limited by shares, and mining-related labor unions predominantly owned privately. Stock corporation = AG; partnership limited by shares = KGaA; mining-related labor union = bergrechtliche Gewerkschaft; limited liability company, LLC = GmbH; association = Genossenschaft; limited partnership with a LLC as the personally liable shareholder = GmbH & Co. KG; limited partnership = KG; unlimited liability company = OHG or Einzelkaufmann.

[b] Percentages do not add up to 100.0 due to rounding.

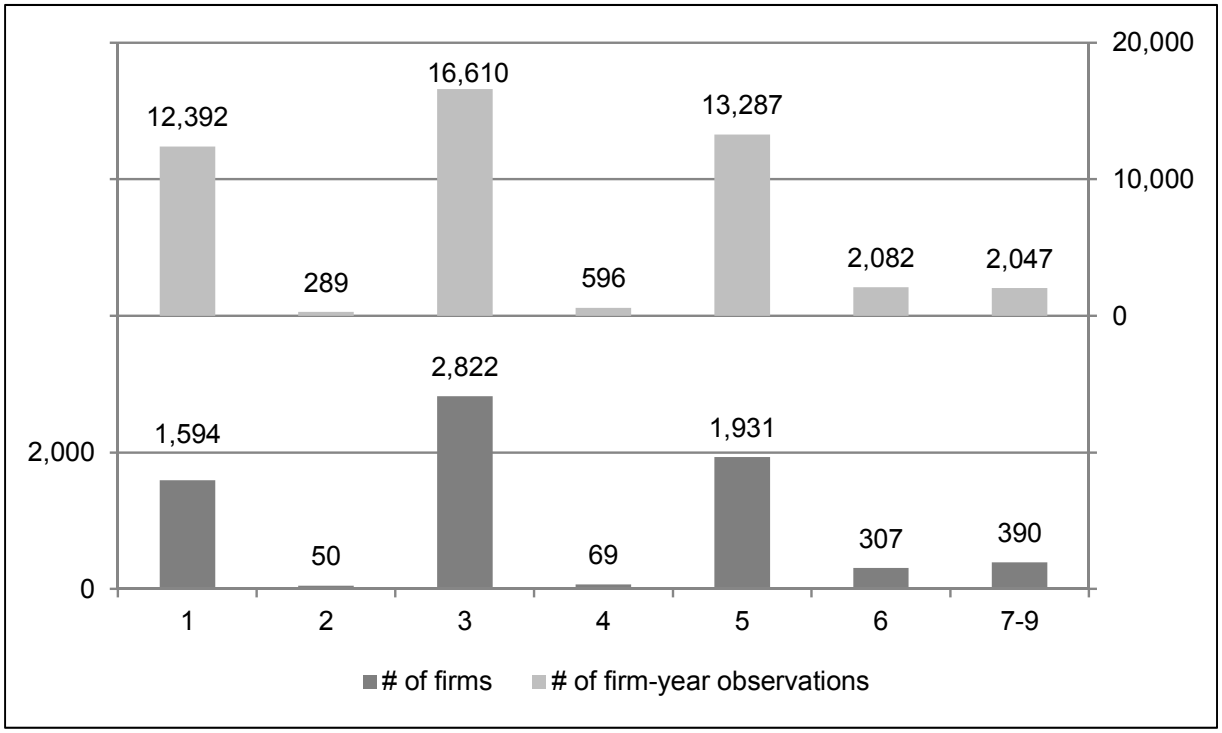

FIGURE 6.1
ABSOLUTE FREQUENCIES OF FIRMS AND FIRM-YEAR OBSERVATIONS ACROSS LEGAL FORM

Notes. The figure reports absolute frequencies of firm-year observations (top panel) and firms (bottom panel) across legal form. Numbers on x-axis represent Deutsche Bundesbank's legal form identifier (see Table 6.4 for details). Data source: Deutsche Bundesbank's USTAN database; own depiction.

Distribution of Firms and Firm-Year Observations across Industry

As noted earlier, firms from the financial services industry as well as holding firms are deleted from the sample. Deutsche Bundesbank classifies firms into fourteen distinct industry categories based on its "WZ" code.[199] As this classification is rather detailed, the dissertation groups several industries together. The following seven industry groups emerge:

- agriculture;
- mining & energy;
- manufacturing;
- construction;
- trade;

[199] "WZ" is short for „Wirtschaftszweig".

- service; and
- other.

Table 6.5 reports the distribution of absolute and relative frequencies of firms (Panel A) and firm-year observations (Panel B) across industry. In addition, Figure 6.2 illustrates the distribution of absolute frequencies of firms and firm-year observations across industry.

The table and figure show that the sample is dominated by a few industries, namely manufacturing, trade, and service. These three industries account for more than 90 percent of the number of firms and firm-year observations.

TABLE 6.5
ABSOLUTE AND RELATIVE FREQUENCIES OF FIRMS AND FIRM-YEAR OBSERVATIONS ACROSS INDUSTRY

Industry[a]	# (1)	%[b] (2)
Panel A: firms		
Agriculture	68	0.9
Mining & Energy	252	3.5
Manufacturing	3,758	52.5
Construction	333	4.6
Trade	1,701	23.7
Service	1,041	14.5
Other	10	0.1
Total	*7,163*	*100.0*
Panel B: firm-year observations		
Agriculture	403	0.9
Mining & Energy	1,961	4.1
Manufacturing	25,909	54.8
Construction	2,274	4.8
Trade	11,150	23.6
Service	5,561	11.8
Other	45	0.1
Total	*47,303*	*100.0*

Notes. The table reports absolute (#) and relative (%) frequencies of firms (Panel A) and firm-year observations (Panel B) across industry. Data source: Deutsche Bundesbank's USTAN database.
[a] Industry names are based on Deutsche Bundesbank's classification.
[b] Percentages do not add up to 100.0 due to rounding.

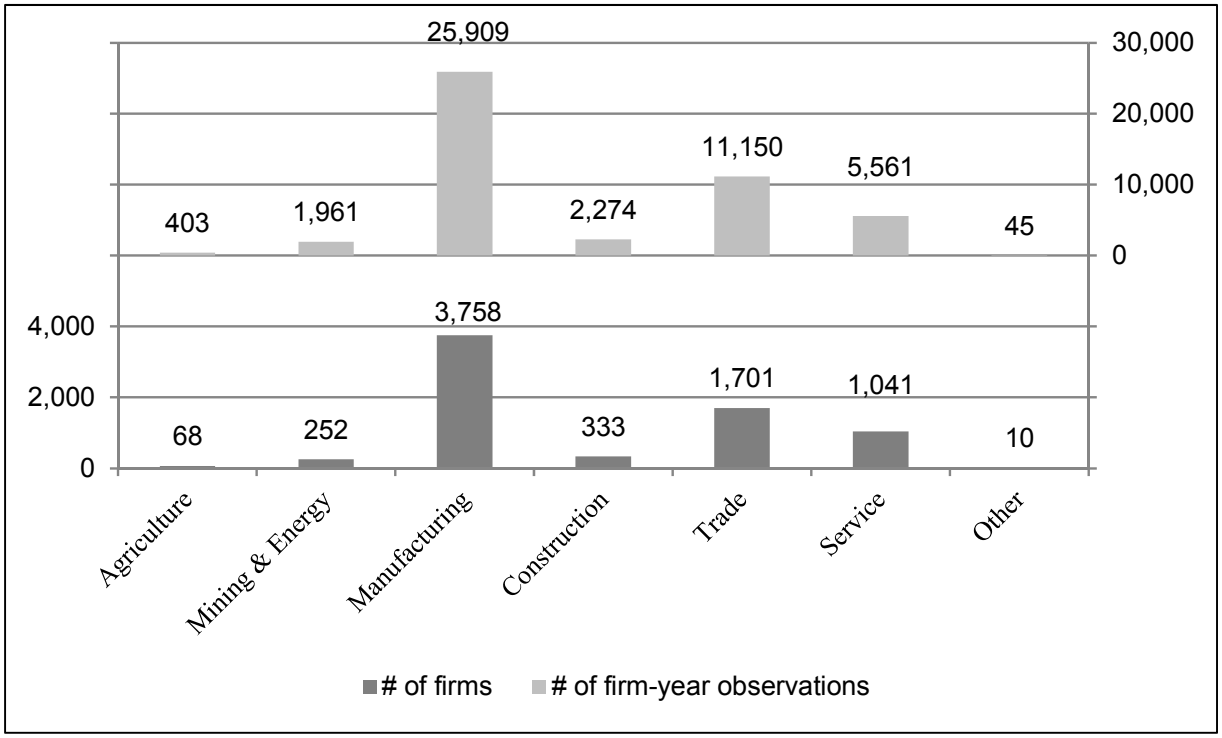

FIGURE 6.2
ABSOLUTE FREQUENCIES OF FIRMS AND FIRM-YEAR OBSERVATIONS ACROSS INDUSTRY

Notes. The figure reports absolute frequencies of firm-year observations (top panel) and firms (bottom panel) across industry. Data source: Deutsche Bundesbank's USTAN database; own depiction.

Distribution of Firm-Year Observations across Years

Table 6.6 reports the distribution of absolute and relative frequencies of firm-year observations across years. In addition, Figure 6.3 illustrates the distribution of absolute frequencies of firm-year observations across years. The table and figure show the following:

- the sample includes 27 fiscal years, ranging from 1987 through 2013;
- the number of firm-year observations is roughly equally distributed across years with a moderate bias toward later years;
- despite the fact that 2005 is the year in which public German firms were required to adopt the IFRS system according to the IAS Regulation, only a moderate amount of firm-year observations relate to 2005 (1,985 out of 47,303 or 4.2 percent); (In fact, 18,532 out of 47,303 firm-year observations or 39.2 percent fall into years after 2005.)
- 2009 is the year with the highest number of firm-year observations (3,321 out of 47,303 or 7.0 percent).

TABLE 6.6
ABSOLUTE AND RELATIVE FREQUENCIES OF FIRM-YEAR OBSERVATIONS ACROSS YEARS

Year	# (1)	% (2)
1987	1,010	2.1
1988	1,188	2.5
1989	1,216	2.6
1990	1,324	2.8
1991	1,422	3.0
1992	1,494	3.2
1993	1,571	3.3
1994	1,650	3.5
1995	1,633	3.5
1996	1,570	3.3
1997	1,487	3.1
1998	1,422	3.0
1999	1,459	3.1
2000	1,519	3.2
2001	1,550	3.3
2002	1,639	3.5
2003	1,739	3.7
2004	1,893	4.0
2005	1,985	4.2
2006	2,271	4.8
2007	2,773	5.9
2008	3,213	6.8
2009	3,321	7.0
2010	2,953	6.2
2011	2,393	5.1
2012	1,562	3.3
2013	46	0.1
Total	*47,303*	*100.0*

Notes. The table reports absolute (#) and relative (%) frequencies of firm-year observations across years. Data source: Deutsche Bundesbank's USTAN database.

The fact that many firm-year observations fall into years after 2005 does not mean that most public German firms switched to the IFRS system after that year. To determine the year in which most public German firms switched to the new accounting regime, an analysis of the distribution of IFRS adoption years is helpful.

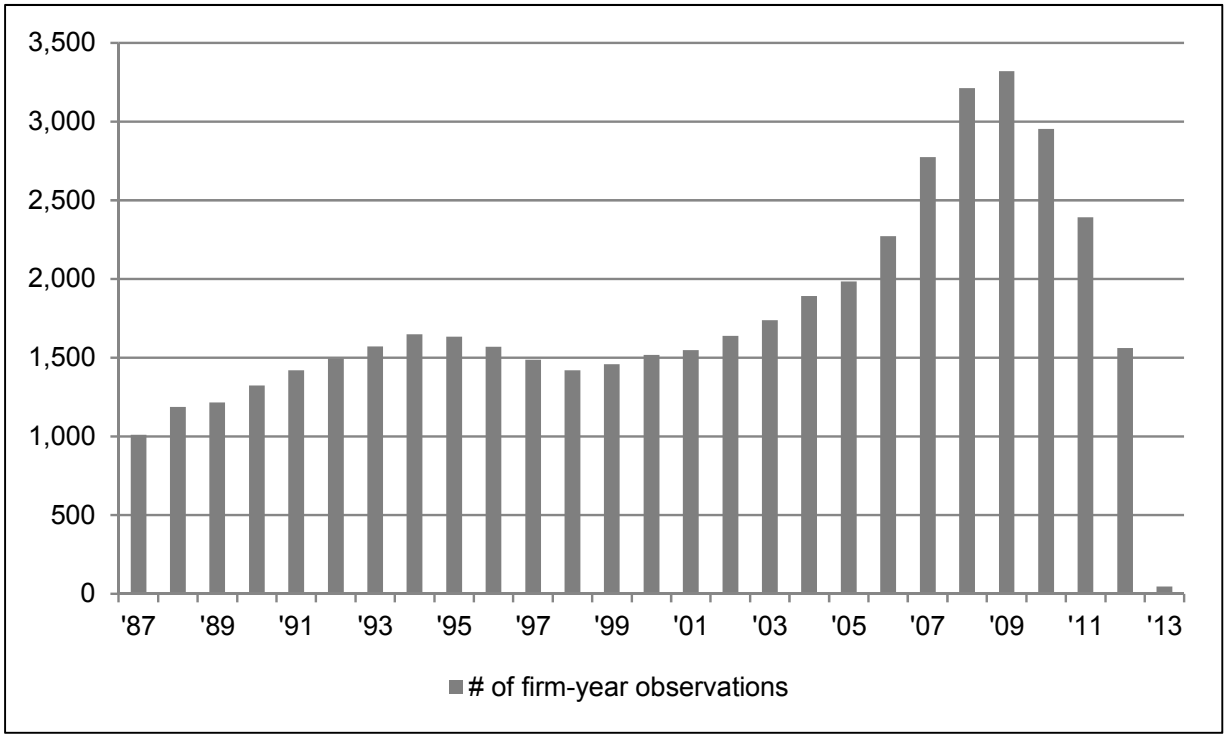

FIGURE 6.3
ABSOLUTE FREQUENCIES OF FIRM-YEAR OBSERVATIONS ACROSS YEARS

Notes. The figure reports absolute frequencies of firm-year observations across years. Data source: Deutsche Bundesbank's USTAN database; own depiction.

Distribution of Public Firms' IFRS Adoption Years

Table 6.7 reports the distribution of absolute and relative frequencies of public firms across IFRS adoption years. In addition, Figure 6.4 illustrates the distribution of absolute frequencies of public firms across IFRS adoption years. The table and figure show the following:

- public firms in the sample adopted the IFRS system at different times;
- the largest amount of firms in the sample (130 out of 796 or 16.3 percent) adopted the IFRS system in 2005;
- 348 out of 796 firms (43.7 percent) adopted the IFRS system prior to 2005 (i.e., are voluntary adopters);
- 216 out of 796 firms (27.1 percent) adopted the IFRS system in 2006 or 2007 (i.e., are adopters that had the option of adopting the IFRS system later as they were only listed on the debt capital market); and
- 102 out of 796 firms (12.8 percent) adopted the IFRS system after 2007 (i.e., are adopters that only adopted the IFRS system when switching from the private firm category to the public firm category).

TABLE 6.7
ABSOLUTE AND RELATIVE FREQUENCIES OF PUBLIC FIRMS' IFRS ADOPTION YEARS

IFRS adoption year	# (1)	%[a] (2)
1997	2	0.3
1998	19	2.4
1999	51	6.4
2000	28	3.5
2001	39	4.9
2002	46	5.8
2003	39	4.9
2004	124	15.6
2005	130	16.3
2006	93	11.7
2007	123	15.5
2008	65	8.2
2009	33	4.1
2010	4	0.5
Total	*796*	*100.0*

Notes. The table reports absolute (#) and relative (%) frequencies of public firms across IFRS adoption years. Data source: Deutsche Bundesbank's USTAN database.
[a] Percentages do not add up to 100.0 due to rounding.

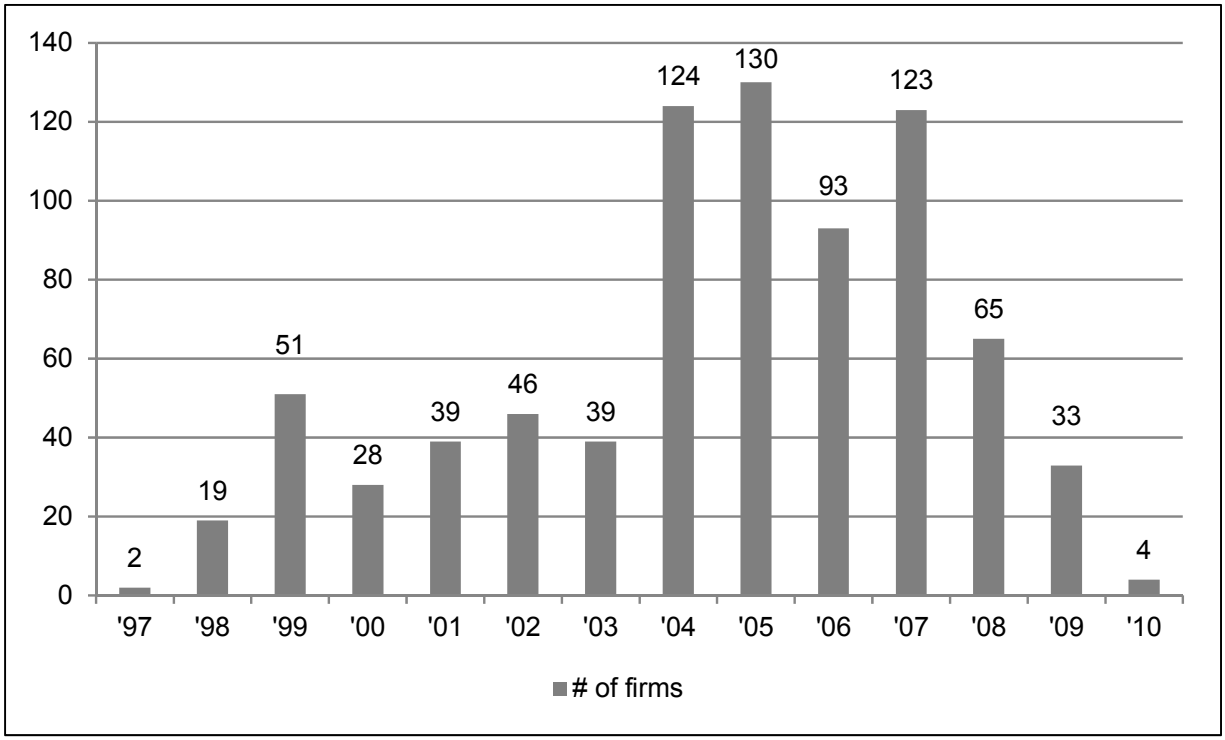

FIGURE 6.4
ABSOLUTE FREQUENCIES OF PUBLIC FIRMS' IFRS ADOPTION YEARS

Notes. The figure reports absolute frequencies of public firms' IFRS adoption years. Data source: Deutsche Bundesbank's USTAN database; own depiction.

Most Frequent IFRS Adoption Year(s) within each Industry

Dividing the overall sample into subsamples requires information as to whether observations belong to public or private firms, as well as information as to whether observations fall into the pre-event or post-event period. Naturally, there is no information about the latter issue available for private firms as these firms did not adopt the IFRS system. As a consequence, a hypothetical variable representing private firms' IFRS adoption year(s) needs to be constructed. Private firms' hypothetical IFRS adoption year(s) are assigned based on public firms' actual IFRS adoption year(s); industry-specific differences in IFRS adoption year(s) are taken into account. Table 6.8 reports public firms' most frequent IFRS adoption year(s) within each industry.

TABLE 6.8
MOST FREQUENT IFRS ADOPTION YEAR(S) WITHIN EACH INDUSTRY

Industry	Most frequent IFRS adoption year(s)
Agriculture	2005
Mining & Energy	2003 and 2006
Manufacturing	2005
Construction	2006
Trade	2004
Service	2007
Other	NA

Notes. The table reports the most frequent IFRS adoption year(s) within each industry. Data source: Deutsche Bundesbank's USTAN database.

Distribution of Overall and HGB-specific Firm-Year Observations across Accounting System Followed and Firm-Type, respectively

The sample may further be described by looking at the distribution of firm-year observations across accounting systems followed (i.e., IFRS or HGB) and firm-type (i.e., public or private). Furthermore, as only public firms adopt the IFRS system, only these firms contribute both HGB and IFRS observations to the sample. (Private firms only contribute HGB observations to the sample.) Thus, it is of interest whether the number of HGB and IFRS observations of public firms is roughly equally distributed (i.e., whether the number of years for each public firm before and after the IFRS introduction is roughly equal). Moreover, it is of interest to analyze the distribution of

HGB observations with regard to firm-type. Table 6.9 reports the distribution of firm-year observations.

TABLE 6.9
ABSOLUTE AND RELATIVE FREQUENCIES OF OVERALL AND HGB-SPECIFIC FIRM-YEAR OBSERVATIONS ACROSS ACCOUNTING SYSTEM FOLLOWED AND FIRM-TYPE

Type of firm-year observation	# (1)	% (2)
Panel A: breakdown of all firm-year observations across accounting system		
IFRS	3,585	7.6
HGB	43,718	92.4
Total	*47,303*	*100.0*
Panel B: breakdown of HGB-specific firm-year observations across firm-type		
Public	2,538	5.8
Private	41,180	94.2
Total	*43,718*	*100.0*

Notes. The table reports absolute (#) and relative (%) frequencies of firm-year observations. Panel A provides a breakdown of all firm-year observations; Panel B provides a breakdown of HGB-specific firm-year observations. Data source: Deutsche Bundesbank's USTAN database.

Panel A reports the breakdown of *all* firm-year observations with regard to the accounting system followed. The sample contains 3,585 (7.6 percent) IFRS firm-year observations and 43,718 (92.4) HGB firm-year observations, respectively. Thus, observations prepared under the HGB system are overrepresented. Panel B reports the breakdown of *HGB-specific* firm-year observations with regard to firm-type. Public firms and private firms contribute 2,538 (5.8 percent) and 41,180 (94.2 percent) of the HGB firm-year observations in the sample, respectively.

6.2.3 Measures

As noted above, the final data set provides numerous financial accounting data items representing all kinds of accounting variables; to operationalize the cash flow forecasting model's variables, the dissertation uses several of these items. The following describes what financial accounting data items (raw measures) are selected from the final data set and how they are transformed to arrive at measures usable in the empirical analysis. Table A.1 in the Appendix provides a summary of accounting variables, Deutsche Bundesbank raw measures and transformation procedures.

Selection of Raw Measures

When selecting raw measures appropriately representing the cash flow forecasting model's accounting variables, the following cases occur: (1) an accounting variable is represented by exactly one raw measure (e.g., inventory); (2) an accounting variable is represented by several raw measures (e.g., provisions); (3) several accounting variables are represented by only one raw measure (e.g., depreciation and amortization expense); and (4) an accounting variable not represented by any raw measure (e.g., operating cash flow). In the first case, the raw measure matching the accounting variable is used. In the second case, several raw measures are combined to arrive at a single raw measure representing the accounting variable in question. In the third case, the single raw measure representing several accounting variables is used. In the fourth case, a suitable raw measure is computed based on other available raw measures. The following discusses the cash flow forecasting model's accounting variables and their associated raw measures in turn.

Operating cash flow. The USTAN database does not provide a raw measure representing operating ash flow. Thus, a raw measure needs to be computed based on other available raw measures. The operating cash flow raw measure is computed using the indirect method. That is, the computation begins with net income, adds back depreciation and amortization expense, and adds back or subtracts, depending on the sign, changes in working capital accounts (accounts receivable, inventory and accounts payable), changes in provisions, changes in other accruals, and changes in other items.[200]

Depreciation and amortization expense. The USTAN database provides only one raw measure for both depreciation expense and amortization expense. To operationalize the two variables, the raw measure *ap156* („Abschreibungen auf Sachanlagen, immaterielle Vermögensgegenstände des Anlagevermögens und Ingangsetzungsaufwendungen") is used. This measure represents depreciation and amortization of long-term tangible and intangible assets. To avoid collinearity with the

[200] Other accruals are special accruals related to assets ("Aktive Rechnungsabgrenzungsposten [ARAPs]") and special accruals related to liabilities ("Passive Rechnungsabgrenzungsposten [PRAPs]"). ARAPs (PRAPs) are subtracted from (added back to) net income; other items ("Sonderposten mit Rücklageanteil") relate to equity and debt capital and are either added or subtracted, depending on their sign.

variable inventory, depreciation expense of current assets (e.g., financial assets and inventory) is ignored.[201]

Provisions. The USTAN database provides several raw measures representing provisions. To operationalize the variable, the measures *ap108* ("Sonstige kurzfristige Rückstellungen") and *ap126* ("Sonstige langfristige Rückstellungen") are used. These measures represent short-term and long-term provisions arising from the operating business; raw measures representing tax provisions or pension provisions are ignored.[202]

Accounts receivable. The USTAN database provides several measures representing accounts receivable arising from transactions with both external parties and related parties (e.g., associated companies, subsidiaries and shareholders). To operationalize the variable, the data items *ap049* ("Forderungen aus Lieferungen und Leistungen")—related to the former category—and *ap207* („Von Pos. 051, 052 und 053 auf Lieferungen und Leistungen entfallende Beträge")—related to the latter category are used.

Inventory. The USTAN database provides several raw measures representing components of inventory. These components are: raw materials, work-in-progress inventory, finished goods inventory, and prepayments. To operationalize the accounting variable inventory, the summary measure *ap059* ("Vorräte") is used.

Accounts payable. The USTAN database provides several measures representing accounts payable. To operationalize the variable, the measures *ap098* ("Verbindlichkeiten aus Lieferungen und Leistungen") and *ap114 (*„Verbindlichkeiten aus Lieferungen und Leistungen") are used. These measures represent short-term and long-term accounts payable.[203]

---

[201] The ignored data items are: *ap158* („Abschreibungen auf das Umlaufvermögen, soweit nicht in Pos. 173 enthalten") and *ap173* („Abschreibungen auf Finanzanlagen und auf Wertpapiere des Umlaufvermögens").

[202] The ignored data items are: *ap105* („Steuerrückstellungen"), *ap106* („Rückstellungen für latente Steuern") and *ap124* („Rückstellungen für Pensionen und ähnliche Verpflichtungen").

[203] The two measures have the exact same official name in Deutsche Bundesbank's chart of accounts. However, from the context it is evident that the former measure refers to short-term accounts payable and the latter measure refers to long-term accounts payable.

Total assets. Raw measures need to be scaled before being used in the empirical analysis.[204] For scaling purposes, the dissertation uses the variable *total assets*. To operationalize total assets, the raw measure *ap088* ("Bilanzsumme") is used.

Transformation of Selected Raw Measures into Analyzable Data

The raw measures provided by the USTAN database cannot be used in the empirical analyses without transformation. Transformation is necessary for the following reasons: (1) some raw measures represent flow variables (i.e., variables relating to a *period of time*) whereas other raw measures represent stock variables (i.e., variables relating to a *point in time*)[205]—as the cash flow forecasting model's explained variable, one-year-ahead operating cash flow, is a flow variable, all explanatory variables need to be flow variables, too; (2) firms in the sample differ with regard to size; and (3) the data sample contains outliers and missing values. The following discusses each of these issues in turn and outlines the procedures undertaken to transform raw measures into analyzable data.

1) *Transformation of Stock Variables into Flow Variables*

Raw measures taken from the USTAN database come from different financial statements: the statement of cash flows, the income statement, and the balance sheet. By definition, the statement of cash flows and the income statement contain flow variables, whereas the balance sheet contains stock variables. As a result, some measures need to be transformed. Specifically, as the explained variable—one-year-ahead operating cash flow—is a flow variable, some explanatory stock variables need to be transformed in flow variables. These variables are: provisions, accounts receivable, inventory, and accounts payable.

The dissertation transforms stock variables into flow variables by means of first-differencing; that is, by computing the variables' one-period change in the level. For

[204] Scaling is one step in the raw measure transformation process which is described in detail below.
[205] The fundamental distinction between stock and flow variables was first made in the early work of I. FISHER (see Fisher (1896), p. 514).

example, the one-period change in the stock variable *accounts receivable* for a given firm in a given period, ΔAR_{it}, is $\Delta AR_{it} = (AR_{it} - AR_{it-1})$.[206]

2) *Scaling*

Sample firms differ with regard to size. As a result, large firms are likely to have a disproportionate influence on the data set and the regression results. To mitigate potential measurement errors resulting from size differences across firms, the dissertation scales accounting variables using lagged total assets.[207] Thus, all *explanatory* variables are scaled using the *one-period lag* of total assets, TA_{it-1}, whereas the *explained* variable, is scaled using *current* total assets, TA_{it}. For example, scaling the one-period change in accounts receivable, ΔAR_{it}, yields $(\Delta AR_{it} / TA_{it-1}) = ([AR_{it} - AR_{it-1}] / TA_{it-1})$; scaling one-year-ahead operating cash flow, OCF_{it+1}, yields (OCF_{it+1} / TA_{it}). This scaling method is based on the assumption that the ratio of cash flow to the one-period lag of total assets follows an autoregressive process of the first order.[208]

The scaling procedure ensures that size differences across firms do not affect regression results. The procedure, however, does not distinguish between size differences across firm *groups*. As noted in Subsection 6.1, size differences across firm groups can be eliminated by using firm fixed effects in the regression model. To determine whether firm-fixed effects are necessary, the dissertation performs a statistical test of differences in firm-size between public and private firms.[209]

---

[206] This transformation, however, comes at an expense. When computing the one-period change in the level of stock variables, the oldest observation of each firm is lost, thereby reducing the total number of firm-year observations in the sample.

[207] Alternative scaling variables frequently used in the accounting literature are average total assets (see, for example, Sloan (1996), p. 294; Barth, et al. (2001), p. 37) and the number of shares outstanding (see, for example, Garrod & Hadi (1998), p. 615; Al-Attar & Hussain (2004), p. 873). The dissertation confines its attention to the scaling variable *lagged total assets*; using average total assets may result in endogeneity; using the number of shares outstanding is unfeasible due to the large amount of private firms in the sample.

[208] For a definition of an autoregressive progress see, for example, Greene (2012), pp. 949-950. An alternative approach is to scale using the one-period lag of total assets for both the explained variable and the explanatory variables. In this case, one makes the assumption that only the variable *cash flow* rather than the ratio of *cash flow* to the *one-period lag of total assets* follows an autoregressive process of the first order.

[209] See Subsection 6.3.

3) *Winsorization*

Raw measures taken from the USTAN database contain outliers and missing values that may distort regression results. To mitigate the influence of outliers, raw measures are winsorized at the 1st and 99th percentiles of their distribution.[210] To account for missing values, the dissertation uses appropriate dummy variables in the regression model.

6.3 Measuring Changes in Earnings' Predictive Power

6.3.1 Overview

Testing the economic model formulated in Equation [5.1] requires both an exact *econometric* specification (i.e., the specification of a regression model) and the choice of a suitable estimation method. As noted above, the cash flow forecasting model will be tested empirically using a two-step approach: (1) estimation of the cash flow forecasting model itself; and (2) analysis of the cash flow forecasting model's residuals. Subsection 6.3.2 discusses appropriate estimation methods and related assumptions for the test of the cash flow forecasting model. Subsection 6.3.3 addresses the question as to how the cash flow forecasting model should be specified under each of the stated research hypotheses. Subsection 6.3.4 discusses research designs and analysis approaches suitable for the analysis of the cash flow forecasting model's residuals.

6.3.2 Estimation Methods and Related Assumptions

6.3.2.1 *Estimation Methods*

To estimate the unknown parameters of the hypothesis-specific regression models, the dissertation uses two estimation methods: (1) the ordinary least squares estimation method; and (2) the generalized method of moments. The ordinary least squares (OLS)

[210] Winsorization of variables does not eliminate outliers but assigns a smaller weight to them by replacing them with the nearest values that are not considered to be outliers. This method is usually considered to be advantageous over the elimination of outliers (Tukey (1962), p. 18; and Dixon (1960), pp. 385-391).

estimation method aims at minimizing the sum of the squared residuals; its use in empirical work involving multiple linear regression models is a common practice.[211] In the context of the dissertation, however, using the OLS estimation method alone would not be sufficient. This is because the dissertation's cash flow forecasting model is dynamic.

A model is *dynamic* if the set of explanatory variables contains at least one lagged explained variable.[212] A lagged explained variable is correlated with the error term and thus endogenous, rendering OLS estimators of a model's parameters biased and inconsistent.[213] Here, the cash flow forecasting model's set of explanatory variables contains current operating cash flow, a variable representing the one-period-lag of the explained variable. Thus, current operating cash flow is an endogenous explanatory variable. To overcome the endogeneity problem, the dissertation uses the generalized method of moments (GMM) estimator. The GMM estimator is unbiased and consistent as it is derived using (exogenous) instrumental variables that are correlated with the endogenous explanatory variable but are uncorrelated with the error term.[214]

The endogeneity problem is only present in the cash flow forecasting model; the residual model does not suffer from endogeneity. Thus, the dissertation uses the GMM estimation method when estimating the cash flow forecasting model (step 1) and the OLS estimation method when estimating the residual model (step 2).

---

[211] Backhaus, et al. (2010), p. 67.
[212] Bond (2002), p. 15.
[213] Baltagi (2013), p. 155. Specifically, as the endogenous explanatory variable is not uncorrelated with the error term anymore, one of the assumptions underlying multiple linear regression analysis—no serial correlation—is violated (see below for a detailed discussion).
[214] The theoretical foundations of the GMM estimation method were primarily developed by L. P. HANSEN (Hansen (1982), pp. 1029-1054; see also Hansen & Singleton (1982), pp. 1269-1286), who bases his reasoning on the moments estimation method developed in the early work of K. PEARSON (Pearson (1936), pp. 34-59). For a further discussion of the method and instrumental variables, see, for example, Angrist & Pischke (2009), pp. 113-218; Roodman (2009b), pp. 135-158; Davidson & MacKinnon (2004), pp. 311-347; Baum, Schaffer, & Stillman (2003), pp. 3-11; and the early work of J. D. SARGAN (Sargan (1958), pp. 393-415).

6.3.2.2 ***Related Assumptions***

Using a regression model requires that several assumptions—frequently denoted as *classical linear model assumptions*[215]—are satisfied. These assumptions are:[216]

- linearity;
- random sampling;
- no perfect collinearity;
- zero conditional mean;
- homoscedasticity;
- normality; and
- no serial correlation.

The validity of the first four assumptions ensures that an estimator is linear and unbiased. An estimator is *linear*, if it "[…] is a linear function of the outcomes on the dependent variable."[217] An estimator is *unbiased* if its "expected value (or mean of its sampling distribution) equals the population value (regardless of the population).[218] Adding the fifth assumption ensures that an estimator is not only linear and unbiased but also the *best* (i.e., the efficient) estimator among all possible estimators. An estimator is *efficient* if it has the smallest variance among all other linear and unbiased estimators.[219] Thus, the first five assumptions—frequently referred to as *Gauss-Markov assumptions*—ensure that an estimator is the *best linear unbiased estimator* among all other possible estimators.[220] Adding the sixth assumption ensures that an estimator is also consistent. An estimator is *consistent* if its distribution becomes closer to the true population parameter as the sample size N gets larger.[221] The

---

[215] Wooldridge (2013), p. 111.
[216] The discussion of assumptions is primarily based on Wooldridge (2013) pp. 64-158. In his book, the author discusses the assumption underlying the multiple linear regression analysis in the context of OLS estimation applied to cross-sectional data. The dissertation, however, uses both the OLS and GMM estimation method and panel data. Nevertheless, the author's discussion is feasible in the context of the dissertation as OLS assumptions similarly apply to GMM estimation. Moreover, the dissertation's panel data set resembles a cross-sectional data set as it is short, that is, consists of a large number of firms, N, and only a small number of years, T.
[217] Wooldridge (2013), p. 846.
[218] Wooldridge (2013), p. 854.
[219] Wooldridge (2013), p. 839.
[220] Wooldridge (2013), p. 108 and p. 124.
[221] Wooldridge (2013), pp. 757-758.

following discusses each of these assumptions in turn. If an explicit test of an assumption is necessary, I will outline the approach employed for the test.

Linearity

The first assumption "[…] simply defines the multiple linear regression […] model."[222] Without this assumption, an entirely different econometric method would be required. The dissertation specifies its econometric models (Equations [6.7], [6.8], [6.9], and [6.10] below) based on the linear economic model in Equation [5.1]; the economic model, in turn, is the result of cogent accounting theory. Thus, the first assumption is satisfied; a specific test will not be conducted.

Random Sampling

The second assumption means that the population model is estimated using a random sample with *N* observations.[223] The assumption implies that the sample can actually be used in a regression model. The dissertation uses a random sample of German firms drawn in different periods of time from the universe of all German firms. Thus, the second assumption is satisfied; a specific test will not be conducted.

No Perfect Collinearity

The third assumption states: "[…] none of the independent variables is constant, and there are no *exact linear* relationships among independent variables."[224] If the assumption is violated, an estimator will not be a best linear unbiased estimator. Specifically, if the assumption is violated, the result of a t-test on the significance of estimates will be distorted. To detect significant multicollinearity among the explanatory variables in the cash flow forecasting model, I conduct three analyses: (1) a graphical analysis of pairwise correlation using scatter plots; (2) a statistical analysis of pairwise correlation using (pairwise) correlation coefficients; and (3) a statistical analysis of full (i.e., non-pairwise) correlation using variance inflation factors.

[222] Wooldridge (2013), p. 79.
[223] Wooldridge (2013), p. 80.
[224] Wooldridge (2013), p. 80; author's emphasis.

1) *Graphical Analysis of Pairwise Correlation using Scatter Plots*

Scatter plots of pairs of explanatory variables give a first indication of the degree of correlation. I analyze scatter plots for 15 pairs of variables:

- operating cash flow with each accrual variable (i.e., with depreciation and amortization expense, the change in provisions, and the change in the three working capital accruals—five pairs);
- depreciation and amortization expense with the remaining accrual variables (i.e., with the change in provisions and the change in the three working capital accruals—four pairs);
- the change in provisions and the change in the three working capital accruals (three pairs);
- the change in accounts receivable with the change in inventory and the change in accounts payable (two pairs); and
- the change in inventory with the change in accounts payable (one pair).

Figure 6.5, Figure 6.6, and Figure 6.7 present scatter plots of pairs of explanatory variables. Figure 6.5 presents scatter plots of the explanatory variable operating cash flow with each of the other explanatory variables. Figure 6.6 presents scatter plots of the explanatory variable depreciation and amortization expense with each of the other explanatory variables except operating cash flow. Figure 6.7 presents scatter plots of the explanatory variable change in provisions with the changes in the three working capital accruals (i.e., with the change in accounts receivable, inventory, and accounts payable) and scatter plots of the change in accounts receivable with the change in inventory and the change in accounts payable and a scatter plot of the change in inventory with the change in accounts payable.

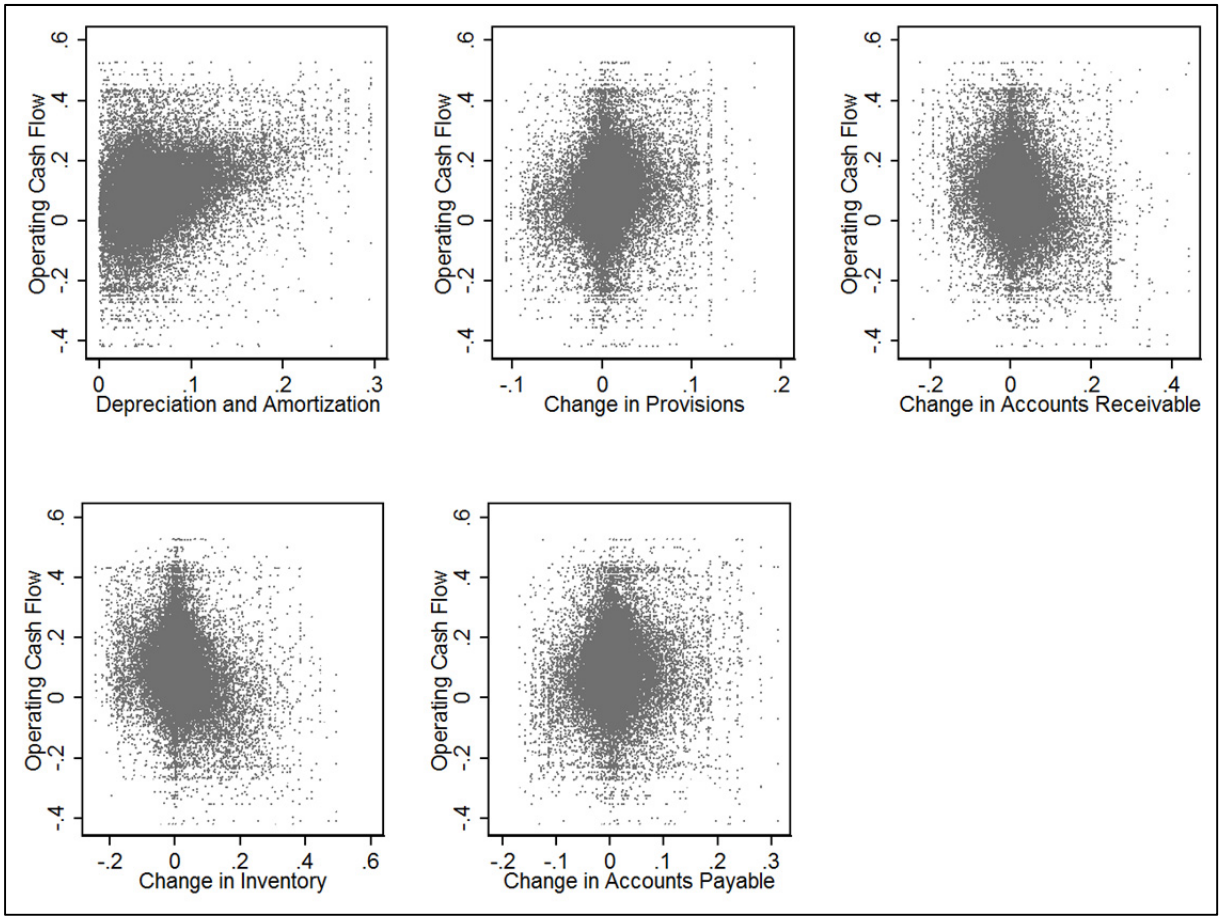

FIGURE 6.5
SCATTER PLOTS OF OPERATING CASH FLOW WITH THE REMAINING EXPLANATORY VARIABLES IN THE CASH FLOW FORECASTING MODEL

Notes. The figure shows scatter plots of operating cash flow with the remaining explanatory variables in the earnings-based cash flow forecasting model. Data source: Deutsche Bundesbank's USTAN database; own depiction.

The scatter plots show that the explanatory variables do not seem to be linearly related. Thus, significant multicollinearity does not seem to be a problem in the data. (The only exception to this conclusion may be the scatter plot of operating cash flow with depreciation and amortization expense. Here, a weak positive relation may be present.) To confirm the preliminary conclusions drawn from the graphical analysis, a statistical test is necessary.

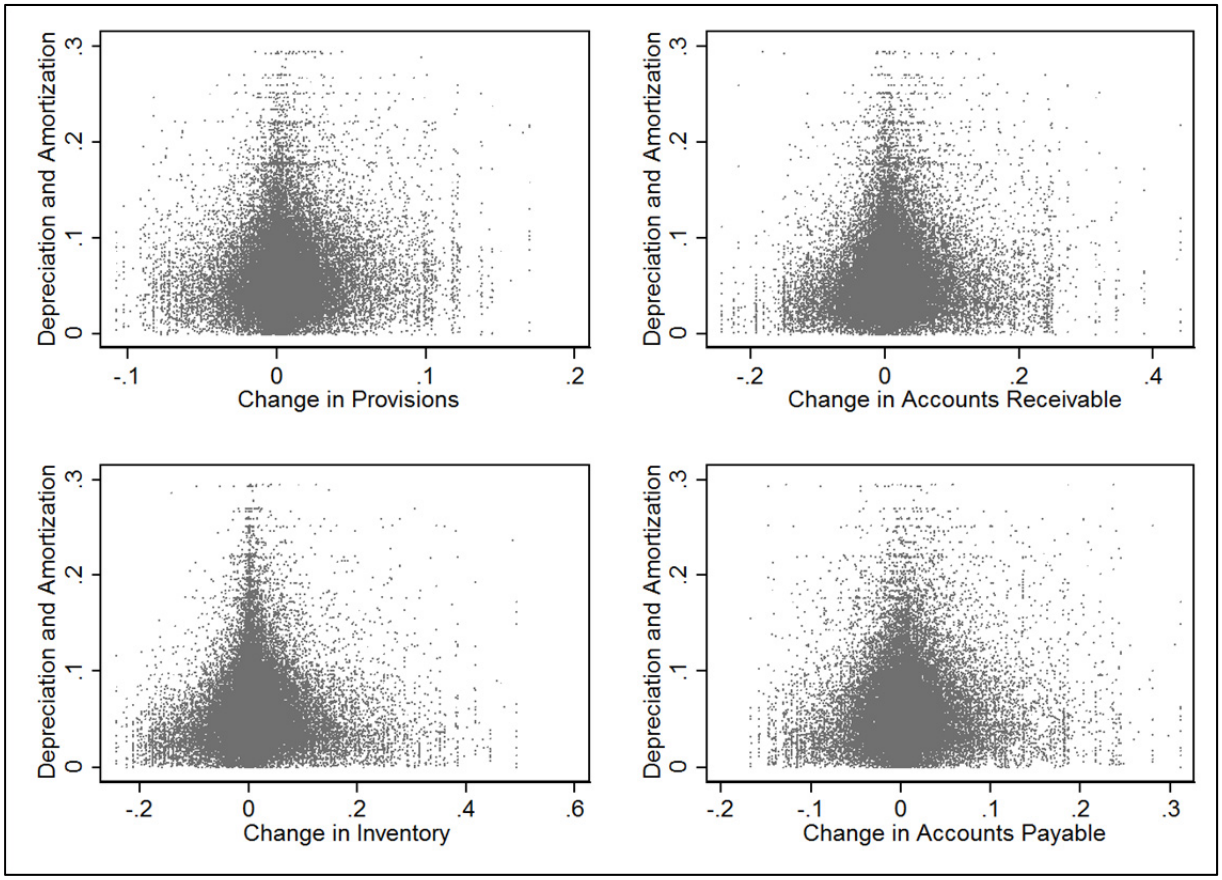

FIGURE 6.6
SCATTER PLOTS OF DEPRECIATION AND AMORTIZATION WITH THE REMAINING EXPLANATORY VARIABLES IN THE CASH FLOW FORECASTING MODEL

Notes. The figure shows scatter plots of depreciation and amortization with the remaining explanatory variables in the earnings-based cash flow forecasting model. Data source: Deutsche Bundesbank's USTAN database; own depiction.

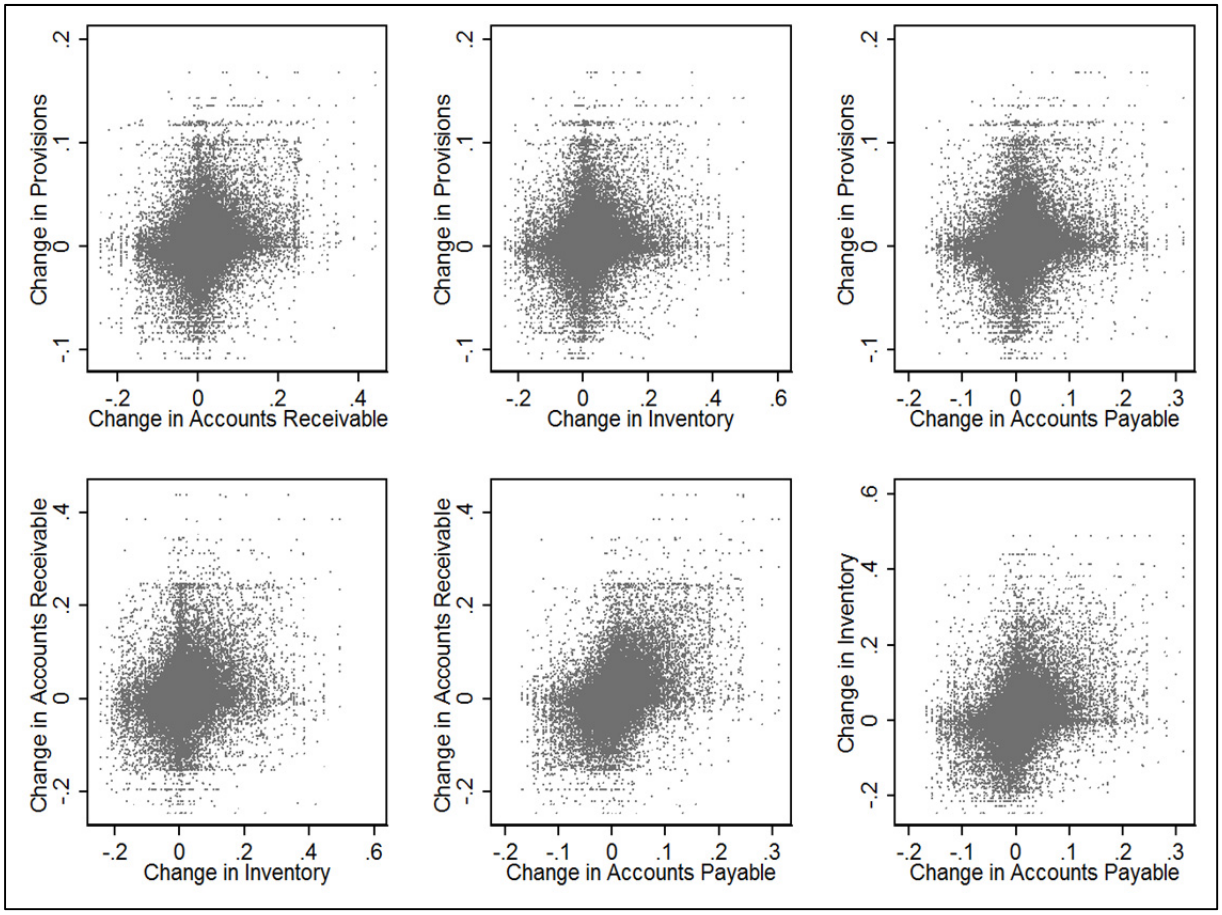

FIGURE 6.7
SCATTER PLOTS OF THE CHANGE IN PROVISIONS, THE CHANGE IN ACCOUNTS RECEIVABLE, AND THE CHANGE IN INVENTORY WITH THE REMAINING EXPLANATORY VARIABLES IN THE CASH FLOW FORECASTING MODEL

Notes. The figure shows scatter plots of the change in provisions, the change in accounts receivable, and the change in inventory with the remaining explanatory variables in the earnings-based cash flow forecasting model. Data source: Deutsche Bundesbank's USTAN database; own depiction.

2) *Statistical Analysis of Pairwise Correlation using (Pairwise) Correlation Coefficients*

Although a graphical analysis is useful to give a first indication of correlation, a statistical test is necessary to determine whether any detected correlation is spurious or not. For this purpose, I perform a parametric test using Pearson's product-moment correlation coefficient (denoted as ρ if referred to the population and denoted as *r* if

referred to the sample). Pearson's product-moment sample correlation coefficient is computed as[225]

$$r = \frac{Cov(X_1, X_2)}{s(X_1)s(X_2)}, \qquad [6.1]$$

with $-1 \leq r \leq 1$. $Cov(X_1, X_2)$ is the sample covariance between the explanatory variables X_1 and X_1 and $s(X_j)$ is the sample standard deviation of the respective explanatory variable.

a) Statistical Hypotheses

I formulate the (two-sided) null and alternative hypothesis about the population correlation coefficient, ρ, as follows:

- H_0: The population correlation coefficient of each pair of explanatory variables is *equal to zero* (i.e., there is no linear relation between the variables); and
- H_a: The population correlation coefficient of each pair of explanatory variables is *different from zero* (i.e., a linear relation between the variables exists).

More formally, these hypotheses can be stated as $H_0 : \rho_{x_1,x_2} = 0$ versus $H_0 : \rho_{x_1,x_2} \neq 0$.

b) Definition and Probability Distribution of the Test Statistic

To test the null hypothesis, I utilize the central limit theorem and make the assumption that the test statistic's probability distribution follows Student's t-distribution. This assumption allows conducting a t-test with a test statistic, *t*, defined as[226]

$$t_{(NT-2)} = \frac{r\sqrt{NT-2}}{1-r^2}, \qquad [6.2]$$

[225] Weiers (2011), p. 568; the formulation of the correlation coefficient is primarily based on the early work of K. PEARSON (Pearson (1913), pp. 22-33) and R. A. Fisher (Fisher (1915), pp. 507-521; Fisher (1921) pp. 3-32; and Fisher (1924)). See also Soper (1913), pp. 91-115; and Fisher (1950b), pp. 175-210.

[226] Olkin & Finn (1995), p. 155; Weiers (2011), p. 572.

where *NT* is the number of firm-year observations, *NT* – 2 is the number of degrees of freedom, and *r* is Pearson's product-moment sample correlation coefficient.

c) Significance Level, Sample Size, Degrees of Freedom, Critical Values, and Decision Rule

I specify a significance level, α, of 0.05. Using a sample of *NT* = 47,303 firm-year observations, the number of degrees of freedom, *df*, is *df* = *NT* – 2 = 47,301. The critical values at which I reject the null hypothesis are $t_{\alpha/2;NT-2} = t_{0.025;47301} = 1.960$ and $-t_{\alpha/2;NT-2} = -t_{0.025;47301} = -1.960$. Thus, I reject (do not reject) the null hypothesis if $t < -1.960$ or $t < -1.960$ $(-1.960 \leq t \leq 1.960)$.

d) Result

Table 6.10 reports Pearson's product-moment sample correlation coefficients computed for each pair of explanatory variables according to Equation [6.1]. The table shows that all correlation coefficients are low or moderate, thereby confirming the result of the graphical analysis that significant multicollinearity among explanatory variables is not a problem in the data. Furthermore, the table presents p-values resulting from the t-test. The p-values in the table indicate that correlation coefficients are statistically significant.

TABLE 6.10
CORRELATION MATRIX—PEARSON'S PRODUCT-MOMENT SAMPLE CORRELATION COEFFICIENTS FOR EACH PAIR OF THE CASH FLOW FORECASTING MODEL'S EXPLANATORY VARIABLES
(For all variables: $NT = 47{,}303$[a])

Variable[b]	*OCF* (1)	*DEPRAMORT* (2)	Δ*PROV* (3)	Δ*AR* (4)	Δ*INV* (5)	Δ*AP* (6)
OCF	1					
DEPRAMORT	0.3***	1				
	(0.000)					
Δ*PROV*	0.1***	0.1***	1			
	(0.000)	(0.000)				
Δ*AR*	-0.2***	0.1***	0.2***	1		
	(0.000)	(0.000)	(0.000)			
Δ*INV*	-0.3***	0.0***	0.2***	0.2***	1	
	(0.000)	(0.000)	(0.000)	(0.000)		
Δ*AP*	0.1***	0.1***	0.1***	0.5***	0.3***	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

Notes. The table reports Pearson's product-moment sample correlation coefficients for the earnings-based cash flow forecasting model's variables (see Equation [6.1]). P-values are shown in parentheses below the correlation coefficients. Data source: Deutsche Bundesbank's USTAN database.
[a] *NT* is the number of firm-year observations.
[b] *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; Δ*PROV* is the one-period change in provisions; Δ*AR* is the one-period change in accounts receivable; Δ*INV* is the one-period change in inventory; and Δ*AP* is the one-period change in accounts payable.
Asterisks *** indicate significance at the 0.01 level; two-tailed test.

3) *Statistical Analysis of Full (i.e., Non-Pairwise) Correlation using Variance Inflation Factors*

This analysis detects significant multicollinearity by computing the variance inflation factor (*VIF*) for each pair of explanatory variables. To compute a *VIF*, an explanatory variable is regressed against the remaining explanatory variables. Then, based on the resulting R-squared, R^2, the tolerance, *T*, is computed for the explanatory variable. *T* is defined as[227]

$$T_j = 1 - R_j^2, \qquad [6.3]$$

where $j = 1,2,\ldots,J$ denotes explanatory variables and R_j^2 is the R-squared of the *j*th regression. The reciprocal of *T* is the *VIF* for the respective pair of explanatory variables. Thus,

$$VIF_j = \frac{1}{T_j}. \qquad [6.4]$$

By construction, for any given pair of explanatory variables, the higher the relation between one explanatory variable and the remaining explanatory variables, the lower is *T*. Likewise, the lower *T*, the higher is the *VIF*. The *VIF* can be interpreted as the factor with which the variance of the coefficient estimates increases due to multicollinearity. I consider a value of 10 to be the threshold at which significant multicollinearity is present.[228] (A *VIF* of 10 corresponds to an R^2 of 90 percent.) That is, a value above this threshold suggests significant multicollinearity among the explanatory variables.

Table 6.11 presents *VIF*s resulting from regressions of explanatory variables on the group of the remaining explanatory variables (*VIF*s are computed according to Equation [6.4]). The table shows that none of the *VIFs* is at or above the threshold of 10. Thus, the table confirms the results of the graphical analysis and the statistical

[227] Backhaus, et al. (2010), p. 95; the method was first introduced in Belsley, Kuh, & Welsch (1980).
[228] Kennedy (2003), p. 213; O'Brien (2007), p. 674.

analysis using correlation coefficients—significant multicollinearity is not a problem in the data.

TABLE 6.11
VARIANCE INFLATION FACTORS FOR EACH OF THE CASH FLOW FORECASTING MODEL'S EXPLANATORY VARIABLES
(For all Regressions: *NT* = 39,291[a])

	Variable[b]					
	OCF	*DEPRA-MORT*	Δ*PROV*	Δ*AR*	Δ*INV*	Δ*AP*
	(1)	(2)	(3)	(4)	(5)	(6)
VIF[c]	1.4	1.2	1.1	1.5	1.3	1.5
Significant multi-collinearity?	No	No	No	No	No	No

Notes. The table reports variance inflation factors resulting from regressions of the earnings-based cash flow forecasting model's explanatory variables on the remaining explanatory variables (see Equation [6.4]). Variance inflation factors are rounded off to one decimal place. A value of 10 or higher (i.e., an R-squared value of 90 percent or higher) indicates significant multicollinearity. Data source: Deutsche Bundesbank's USTAN database.
[a] *NT* is the number of firm-year observations.
[b] *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; Δ*PROV* is the one-period change in provisions; Δ*AR* is the one-period change in accounts receivable; Δ*INV* is the one-period change in inventory; and Δ*AP* is the one-period change in accounts payable.
[c] *VIF* = variance inflation factor.

In summary, the three tests of the *no perfect collinearity* assumption have shown that there is no significant linear relation among the cash flow forecasting model's explanatory variables. As a result, the model is correctly specified and can be used in the empirical analysis concerning the IFRS introduction.

Zero Conditional Mean

The fourth assumption states: "The error *u* has an expected value of zero given any values of the independent variables."[229] This assumption implies that the error term is uncorrelated with the explanatory variables and that the explanatory variables are exogenous in explaining the dependent variable.[230]

[229] Wooldridge (2013), pp. 82.
[230] Wooldridge (2013), pp. 82-83.

As noted in Subsection 6.3.2.1, the cash flow forecasting model is dynamic; thus, the zero conditional mean assumption does not hold. To remedy the violation of the assumption, the GMM estimator is used.

Homoskedasticity

The fifth assumption states: "The error *u* has the same variance given any values of the explanatory variables."[231] If the assumption is violated, that is, if the error term is heteroskedastic, an estimator will not be a best linear unbiased estimator and statistical inferences using the F-test and t-test will not be valid.[232] This is because the standard errors of parameter estimates will be biased. (The parameter estimates themselves will not be affected.) An upward bias in the standard errors of parameter estimates leads to an increase in the probability of making a type II error, that is, of not rejecting the null hypothesis that the population parameter is significant when in fact it is not. To account for heteroskedasticity, the dissertation uses common procedures leading to heteroskedasticiy-robust standard errors of parameter estimates.[233] A specific test will not be conducted.

Normality

The assumption states: "The population error *u* is *independent* of the explanatory variables […] and is normally distributed […]."[234] The assumption ensures the validity of hypothesis tests such as the F- and t-test. If the normality assumption is violated, the estimation methods outlined-above may nevertheless be used as estimators of parameters are still *approximately* true given a sufficiently large sample.[235] The empirical analysis in the dissertation rests on a large sample. Thus, the second assumption is satisfied; a specific test will not be conducted.

---

[231] Wooldridge (2013), p. 89.
[232] Note that estimators are still consistent.
[233] The econometric literature provides several techniques to account for the potential problem of heteroskedasticity. For a detailed discussion of these procedures (applicable to OLS, GMM, or both) see, for example, Hayes & Cai (2007), pp. 709-722, MacKinnon & White (1985), pp. 305-325; White (1980), pp. 817-838; and Breusch & Pagan (1979). Procedures leading to robust standard errors are particularly important in the context of panel data. Here, it is not only required to derive heteroskedasticity-robust but also autocorrelation-robust standard errors (see Kiefer & Vogelsang (2005), pp. 1130-1164).
[234] Wooldridge (2013), p. 110.
[235] Wooldridge (2013), p. 110-113.

No Serial Correlation

The assumption states that, conditional on the level of the explanatory variables, the values of the error term are uncorrelated over time. A violation of this assumption results in biased estimators and likely in a general misspecification of the regression model. In the dissertation, serial correlation is likely to be only a minor problem due to the small number of years per firm. Moreover, I use serial correlation-robust standard errors in the regression analysis. As a consequence, I consider the assumption to be met.[236] Table 6.12 summarizes the discussion of the assumptions.

[236] Although I consider the assumption to be met I nevertheless conduct a statistical test, the Arellano-Bond test, to determine whether serial correlation is a problem in the error term. The test will be detailed below.

TABLE 6.12
SUMMARY OF ASSUMPTIONS UNDERLYING MULTIPLE LINEAR REGRESSION ANALYSIS

Assumption	Assumption a-priori satisfied?	Reasoning	Consequence of violation	Technique(s) used to correct for assumption violation
Linearity	Yes	Econometric models are based on cogent accounting theory	NA	NA
Random sampling	Yes	The sample used in the dissertation is representative of the universe of German firms	NA	NA
No perfect collinearity	Yes	Assumption likely to be satisfied as explanatory variables are defined by cogent accounting theory[a]	NA	NA
Zero conditional mean	No	Assumption not satisfied due to endogeneity	Standard errors of regression coefficients are biased and inconsistent	GMM estimation method (i.e., instrumental variables)
Homoskedasticity	No	Assumption likely not satisfied due to endogeneity	Standard errors of regression coefficients are biased and inconsistent	▪ GMM estimation method (i.e., instrumental variables) ▪ Heteroskedasticity-consistent (i.e., robust) standard errors

(CONTINUED)

Assumption	Assumption a-priori satisfied?	Reasoning	Consequence of violation	Technique(s) used to correct for assumption violation
Normality	Yes	Due to the large sample employed in the analysis it is reasonable to assume that the error term is approximately normally distributed	NA	NA
No serial correlation	No	Assumption likely not satisfied due to endogeneity; however, the problem is likely to be small due to the small number of years per firm in the sample	Standard errors of regression coefficients are biased and inconsistent; misspecification of regression model	▪ GMM estimation method (i.e., instrumental variables) ▪ Serial correlation-consistent (i.e., robust) standard errors ▪ Sargan test and Arellano-Bond test

Notes. The table summarizes the assumptions underlying multiple linear regression analysis.
[a] Nevertheless, several statistical tests are performed to confirm that significant multicollinearity is not present.

In summary, the discussion of the multiple linear regression assumptions shows that the estimates derived under the GMM and OLS method are unbiased and consistent and can be relied on when deriving inferences from the results of the regression analysis.

6.3.3 Step One—Estimation of the Cash Flow Forecasting Model

6.3.3.1 *General Issues*

The econometric specification of the cash flow forecasting model follows the model's economic specification outlined in Equation [5.1].[237] That is, the econometric specification uses one-year-ahead operating cash flow as the explained variable and several, hypothesis-specific accounting variables serving as explanatory variables. In addition, the econometric specification includes an idiosyncratic error term capturing all factors not included in the set of explanatory variables. Given the model specification so far, at this point the question arises as to whether the regression model should include fixed effects. This question is particularly important with regard to the use of firm fixed effects. As noted above, the dissertation takes firm-specific unobserved heterogeneity into account by scaling all accounting measures using total assets. It was further noted that, although this procedure accounts for firm-specific differences in general, it may not be sufficient to fully account for firm-specific unobserved heterogeneity as two distinct groups of firms, namely public and private firms, are under investigation. Putting it differently, although firm-specific unobserved heterogeneity within each group may be eliminated using the scaling procedure, heterogeneity across the two groups may still be present, rendering the use of firm fixed effects in the econometric model necessary. To determine whether firm fixed effects are useful in the regression model, an analysis of the difference in firm-size between public and private German firms will be performed.

[237] However, unlike in the economic model, the econometric models use a common measure for the variables depreciation expense and amortization expense. This is because separate measures are not available (see Subsection 6.2 for details.

6.3.3.2 *Statistical Analysis of the Difference in Firm-Size between Public and Private German Firms*

The dissertation operationalizes firm-size using *total assets* and conducts a statistical mean comparison test between public and private firms.[238] The test relies on the following assumptions: (1) the public firms' sample is independent of the private firms' sample;[239] (2) the populations from which the two subsamples are drawn are at least approximately normally distributed;[240] (3) the (unknown) variances of the two firm group populations are different from each other (i.e., are heterogeneous).[241] These assumptions lead to the application of the *mean-comparison unequal-variances t-test*.[242]

Statistical Hypotheses

Consistent with the belief that public and private German firms differ with regard to size, I formulate the (two-sided) null and alternative hypothesis, respectively, as follows:

- H_0: The difference in the population mean of total assets, *TA*, between public and private German firms is *equal to zero*; and
- H_a: The difference in the population mean of total assets, *TA*, between public and private German firms is *different from zero*.

More formally, these hypotheses can be stated as $H_0 : \mu_{TA\_public} - \mu_{TA\_private} = 0$ versus $H_0 : \mu_{TA\_public} - \mu_{TA\_private} \neq 0.$

[238] In the accounting literature, the operationalization of firm-size using total assets is a common practice (see, for example, Hoque & James (2000), p. 6).
[239] Samples are independent of each other if the process of selecting one sample is unrelated to the process of selecting the other (Weiers (2011), p. 365).
[240] Weiers (2011), p. 374.
[241] Weiers (2011), p. 375; the test of the difference between two population means when the population variances are unknown and assumed to be different from each other is based on the early work of F. E. SATTERTHWAITE and B. L. WELCH (see Satterthwaite (1946), pp. 110-114; Welch (1947), pp. 28-35).
[242] For a critique of this t-test, see Preece (1982), pp. 169-195.

Definition and Probability Distribution of the Test Statistic

To test the null hypothesis, I utilize the central limit theorem and make the assumption that the test statistic's probability distribution follows Student's t-distribution.[243] This assumption allows conducting a t-test with a test statistic, *t*, defined as[244]

$$t = \frac{(\overline{x}_{TA\_public} - \overline{x}_{TA\_private}) - (\mu_{TA\_public} - \mu_{TA\_private})_0}{\sqrt{\frac{s^2_{TA\_public}}{n_{public}} + \frac{s^2_{TA\_private}}{n_{private}}}}, \qquad [6.5]$$

where $(\overline{x}_{TA\_public} - \overline{x}_{TA\_private})$ is the difference in the sample mean of total assets between public and private German firms, $(\mu_{TA\_public} - \mu_{TA\_private})_0$ is the hypothesized difference in the population mean of total assets between public and private German firms under the null hypothesis, $s^2_{TA\_public}$ and $s^2_{TA\_private}$ is the sample variance of total assets in the public firms' sample and private firms' sample, respectively, and n_{public} and $n_{private}$ is the sample size of the public firms' sample and the private firms' sample, respectively.

Significance Level, Sample Size, Degrees of Freedom, Critical Values, and Decision Rule

I specify a significance level, α, of 0.05; the number of degrees of freedom, *df*, is computed as[245]

$$df = \frac{[(s^2_{TA\_public} / n_{public}) + (s^2_{TA\_private} / n_{private})]^2}{\frac{(s^2_{TA\_public} / n_{public})^2}{n_{public} - 1} + \frac{(s^2_{TA\_private} / n_{private})^2}{n_{private} - 1}}. \qquad [6.6]$$

Using a sample of $n_{public} = 6{,}123$ and $n_{private} = 41{,}180$ firm-year observations, respectively, the number of degrees of freedom according to Equation [6.6] is *df* = 6,137.7. (The number of observations in the combined sample is 47,303.) The

[243] The t-distribution was developed by Gosset [pseud.: Student] (1908), pp. 1-25.
[244] Weiers (2011), p. 375.
[245] Weiers (2011), p. 375; the number of degrees of freedom is computed using Satterthwaite's approximation.

critical values at which I reject the null hypothesis are $t_{\alpha/2;df} = t_{0.025;6,137.7} = 1.960$ and $-t_{\alpha/2;df} = -t_{0.025;6,137.7} = -1.960$. Thus, I reject (do not reject) the null hypothesis if $t < -1.960$ or $t > 1.960$ $(-1.960 \leq t \leq 1.960)$.

Result—Means, Standard Deviations, Difference in Means, and Test Statistic

Table 6.13 reports the result of the mean-comparison unequal-variances t-test based on German public and private firms' total assets.

TABLE 6.13
MEAN-COMPARISON UNEQUAL-VARIANCES T-TEST OF PUBLIC AND PRIVATE GERMAN FIRMS' TOTAL ASSETS
(Means and Standard Deviations in Millions of Euros)

	NT	*Mean*	*SD*
Sample	(1)	(2)	(3)
Private firms	41,180	322.8	1,360.2
Public firms	6,123	3,929.1	14,700.0
Combined	47,303	789.6	5,555.3
Difference in means		3,606.3**	
t-value		19.2	
Satterthwaite's df		6,137.7	

Notes. The table reports the result of the mean-comparison unequal-variances t-test of public and private German firms' total assets. Specifically, the table reports for each sample (combined sample, public firms' sample, and private firms' sample) the number of firm-year observations (*NT*), arithmetic mean (*Mean*), standard deviation (*SD*), the difference in the arithmetic mean of total assets between public and private German firms (*difference in means*) and the difference's t-value (see Equation [6.5]). Moreover, the table reports the number of degrees of freedom following Satterthwaite's approximation (Satterthwaite's df, see Equation [6.6]). Means and standard deviations are measured in millions of Euros. Prior to the mean-comparison unequal-variances t-test a variance-comparison test was performed. Untabulated results of the variance-comparison test show that the variances of the two samples are not equal; thus, it cannot be assumed that the two populations from which the samples are drawn have a common variance. As a result, a pooled variance estimator for the calculation of the standard error of the mean difference could not be used.
Asterisks ** indicate significance at the 0.05 level; two-tailed test.

The sample mean in total assets for public German firms, $\overline{x}_{TA\_public}$, is 3,929.1 million Euros; the sample mean in total assets for private German firms, $\overline{x}_{TA\_private}$, is 322.8 million Euros (combined sample: 789.6 million Euros). Thus, the difference in means in total assets between public and private German firms, $(\overline{x}_{TA\_public} - \overline{x}_{TA\_public})$, is 3,606.3 million Euros. The sample standard deviation in total assets for public German

firms, s_{TA_public}, is 14,700.0 million Euros; the sample standard deviation in total assets for private German firms, $s_{TA\_private}$, is 1,360.2 million Euros (combined sample: 5,555.3 million Euros). (As noted above, the number of observations in the public and private firms' sample is 6,123 and 41,180, respectively; the number of observations in the combined sample is 47,303.) Following Equation [6.5], the t-value is $t = 19.2$.

Statistical Decision and Economic Evaluation of Statistical Result

Given that the estimate of the test statistic is significantly *greater than* the upper critical value of 1.960 (i.e., $t > 1.960$), I *reject* the null hypothesis in favor of the alternative hypothesis stating that the public firms' population mean of total assets is different from the private firms' population mean of total assets. The statistical evidence suggests that public firms differ from private firms with regard to firm-size. As a consequence, the dissertation uses firm fixed effects in the econometric model to account for firm-specific unobserved heterogeneity.[246] In addition, the dissertation is also concerned with year-specific unobserved heterogeneity and accounts for it in the econometric model using year fixed effects, too.

In summary, the above-presented discussion has shown that the econometric specification of the cash flow forecasting model should not only consider hypothesis-specific explanatory accounting variables but also firm fixed effects and year fixed effects. The following outlines the model specification.

6.3.3.3 ***Hypothesis-Specific Model Specification***

The regression model under the *central hypothesis* (i.e., hypothesis one) has the following form:

$$\begin{aligned} OCF_{it+1} = {} & \beta_0 + \beta_1 OCF_{it} + \beta_2 DEPRAMORT_{it} + \beta_3 \Delta PROV_{it} + \beta_4 \Delta AR_{it} \\ & + \beta_5 \Delta INV_{it} + \beta_6 \Delta AP_{it} + firmFE + yearFE + \varepsilon_{it+1}, \end{aligned} \qquad [6.7]$$

[246] The use of firm fixed effects rests on the assumption that firm-specific unobserved heterogeneity is time-constant. In the empirical accounting literature, making this assumption is a common practice.

where subscript $i = 1,2,\ldots,N$ denotes firms; subscript $t = 1,2,\ldots,T$ denotes years; *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; $\Delta PROV$ is the one-period change in provisions; ΔAR is the one-period change in accounts receivable; ΔINV is the one-period change in inventory; ΔAP is the one-period change in accounts payable; ε is an idiosyncratic error term; and *firmFE* and *yearFE* are firm fixed effects and year fixed effects, respectively.

The regression model under hypothesis two has the following form (variable definitions as above):

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 \Delta PROV_{it} + firmFE + yearFE + \varepsilon_{it+1}. \quad [6.8]$$

The regression model under hypothesis three has the following form (variable definitions as above):

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 DEPRAMORT_{it} + \beta_3 \Delta AR_{it} + \beta_4 \Delta INV_{it} + firmFE + yearFE + \varepsilon_{it+1}. \quad [6.9]$$

The regression model under hypothesis four has the following form (variable definitions as above):

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 \Delta AP_{it} + firmFE + yearFE + \varepsilon_{it+1}. \quad [6.10]$$

As noted in Subsection 6.1, the dissertation analyzes the cash flow forecasting model's residuals using three distinct research designs: (1) the one-group pretest-posttest design; (2) the static-group posttest design; and (3) the DID design. Moreover, the dissertation uses two distinct analysis approaches: (1) the goodness-of-fit approach; and (2) the residual model approach. As further noted, the residual analysis under the first two pre-experimental designs is performed using the goodness-of-fit approach only; the residual analysis under the truly experimental DID design is performed using the residual model approach only. The following subsection discusses each of the three designs as well as each of the two analysis approaches in detail.

6.3.4 Step Two—Analysis of the Cash Flow Forecasting Model's Residuals

6.3.4.1 *Research Designs*

6.3.4.1.1 The Pre-Experimental One-Group Pretest-Posttest Design

Figure 6.8 illustrates the one-group pretest-posttest design. As the figure illustrates, the design focuses on the *treatment group* (i.e., on *public* German firms) only. Specifically, the design conducts a pretest and a posttest of the treatment group and compares the values of the outcome variable after the test. To implement the one-group pretest-posttest design, I form two distinct subsamples:

- subsample 1: *public* firms *before* the IFRS introduction (state 1 in the figure); and
- subsample 2: *public* firms *after* the IFRS introduction (state 2 in the figure).[247]

[247] Note that the term *pretest-posttest design* is used ambiguously in the literature. Some authors use the term when referring to a design that involves both a treatment group and a control group (e.g., Dimitrov & Rumrill (2003), p. 159), whereas others use the term when referring to a design exclusively involving the treatment group (e.g., Meyer (1995), p. 154; Mara et al. (2012), pp. 97-103). In the dissertation, the pretest-posttest design exclusively involves *public* German firms (i.e., the *treatment group*).

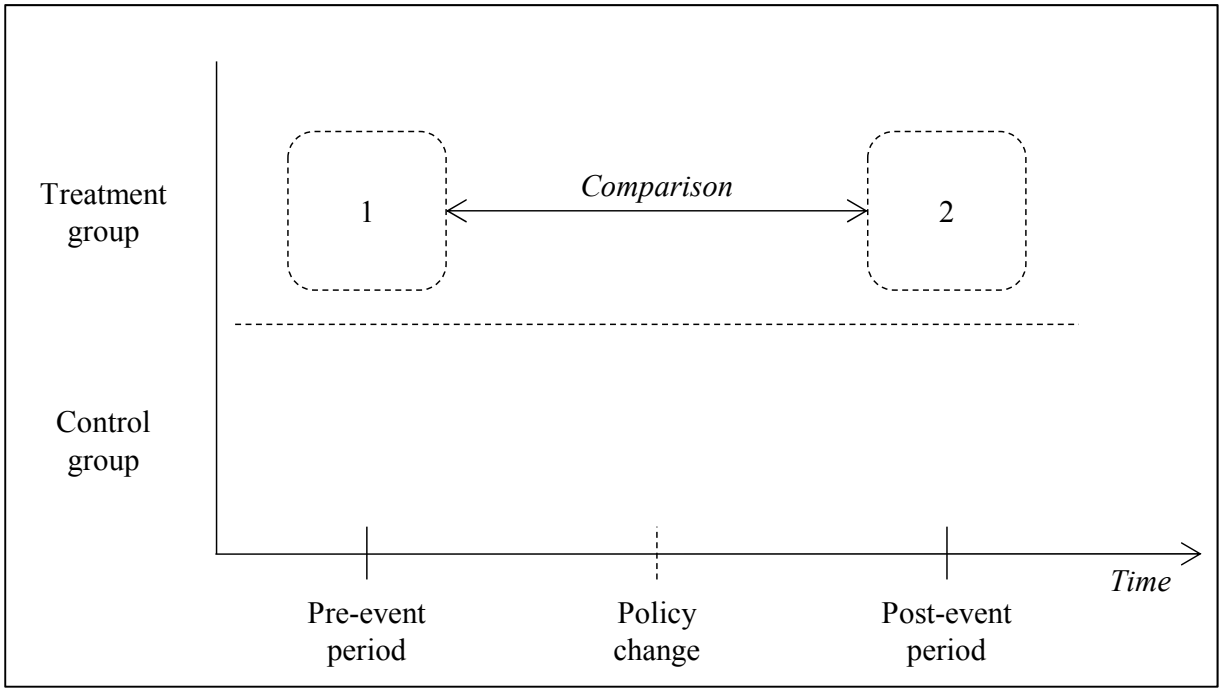

FIGURE 6.8
ILLUSTRATION OF THE ONE-GROUP PRETEST-POSTTEST DESIGN

Notes: The figure illustrates the one-group pretest-posttest design. Source: own depiction; reference is made to Shadish, et al. (2002), pp. 135-144.

The advantage of the design—relative to a situation in which one only analyzes the treatment group in the post-event period—is that it actually conducts a pretest, thereby allowing a comparison of two measured outcomes over time. The disadvantage of the design is that it does not involve a control group.

The design rests on the assumption that *only* the chosen explanatory variables affect the explained variable.[248] In the context of the dissertation, the design rests on the assumption that an observed difference in public German firms' earnings' predictive power between the pre-IFRS period and post-IFRS period only occurs due to changes in the cash flow forecasting model's explanatory variables and not due to changes in other factors. Figure 6.9 illustrates the assumption of the design.

[248] Babbie (2013), p. 279.

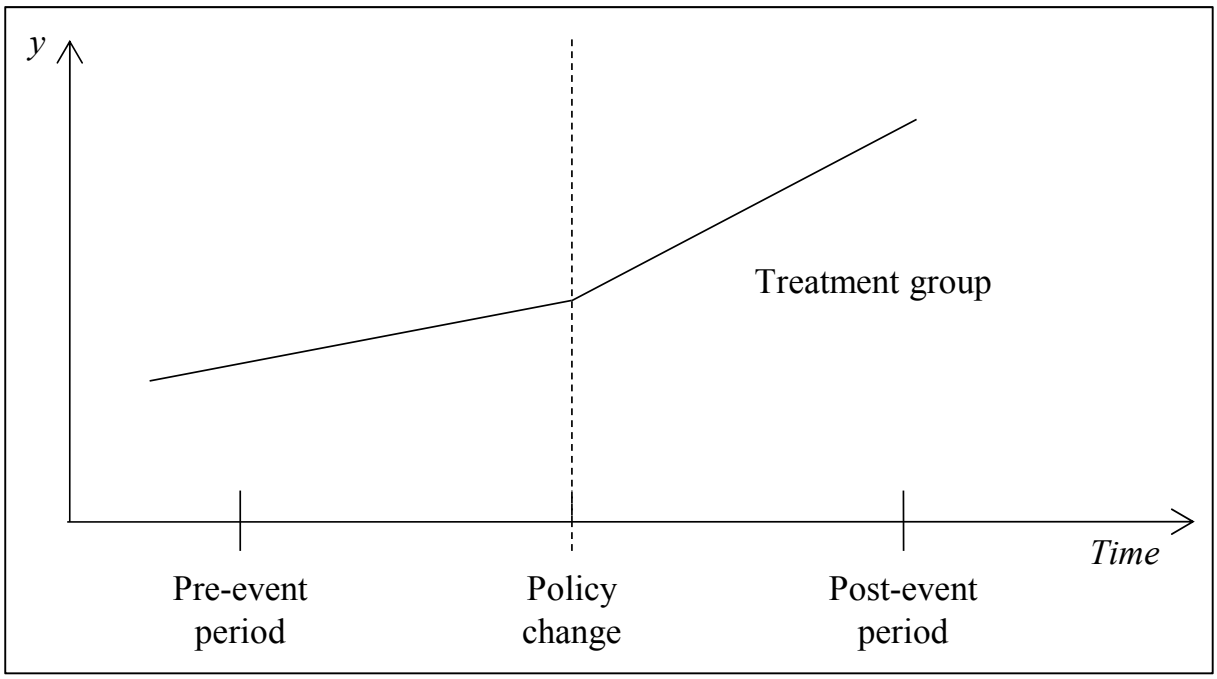

FIGURE 6.9
ILLUSTRATION OF THE ASSUMPTION UNDERLYING THE ONE-GROUP PRETEST-POSTTEST DESIGN

Notes: The figure illustrates the assumption underlying the one-group pretest-posttest design.
Source: own depiction.

The figure shows that the treatment group's trend in the explained variable changes when switching from the pre-event period to the post-event period. As no control group test is conducted and, thus, no trend for such a group is available, the treatment group's change of the trend in the explained variable is assumed to be solely caused by the treatment. This is a rather strong assumption. As a consequence, results derived under the one-group pretest-posttest design may only serve as a first indication as to whether the IFRS introduction has an effect on public German firms.

6.3.4.1.2 The Pre-Experimental Static-Group Posttest Design

Figure 6.10 illustrates the static-group posttest design. As the figure illustrates, the design involves both a treatment group *and* a control group (i.e., public German firms *and* private German firms). Specifically, the design conducts two posttests—one for each group—and compares the values of the explained variable after the test. However, unlike the one-group pretest-posttest design this design does not conduct a pretest. To implement the design, I form two distinct subsamples:

- subsample 1: *public* firms *after* the IFRS introduction (state 1 in the figure); and
- subsample 2: *private* firms *after* the IFRS introduction (state 2 in the figure).

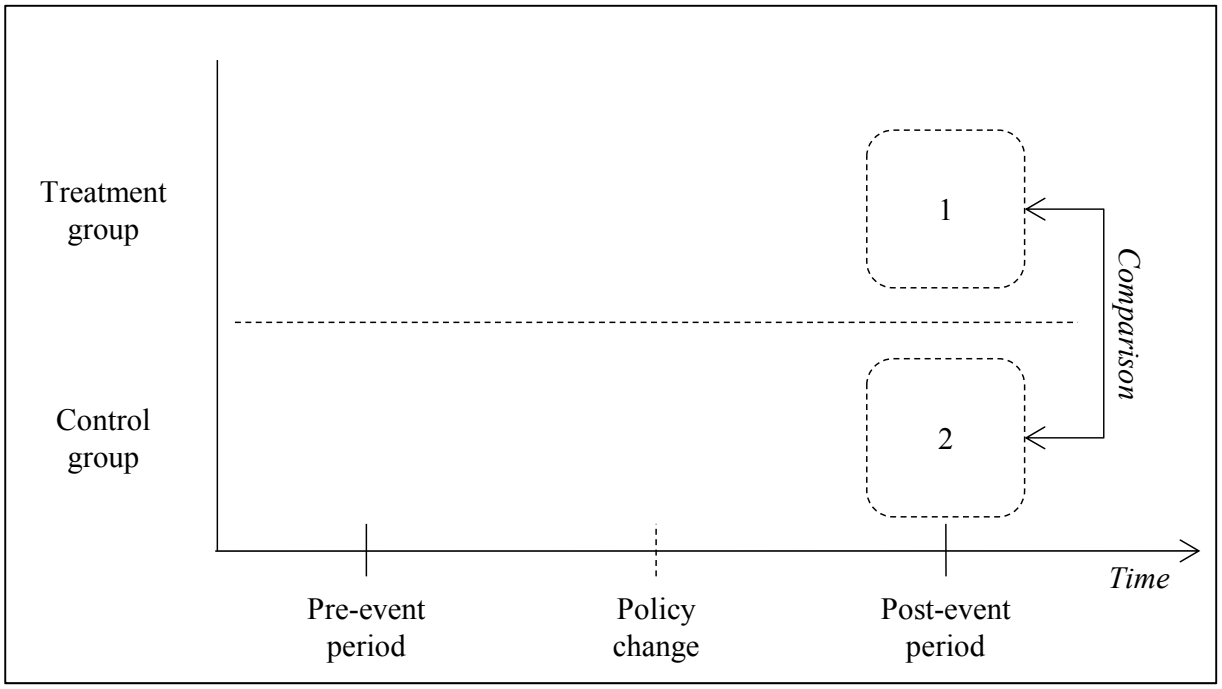

FIGURE 6.10
ILLUSTRATION OF THE STATIC-GROUP POSTTEST DESIGN

Notes: The figure illustrates the static-group posttest design. Source: own depiction; reference is made to Shadish, et al. (2002), pp. 135-144.

The advantage of the design is that it involves a control group, thereby allowing the comparison of measured outcomes across firms. The disadvantage of the design is that it does not conduct a pretest. Thus, a comparison of firm groups is only possible in the post-event period.

The design rests on the assumption that there are *no systematic differences* between the two groups of firms in the pre-event period with regard to characteristics affecting the explained variable; that is, an observed difference between the treatment group and control group in the post-event period is assumed to be the result of the treatment only.[249] In the context of the dissertation, the design assumes that an observed difference in earnings' predictive power between public and private German firms in

[249] Babbie (2013), p. 279.

the post-IFRS period only occurs due to the IFRS introduction and not due to changes in other factors. Figure 6.11 illustrates the assumption of the design.

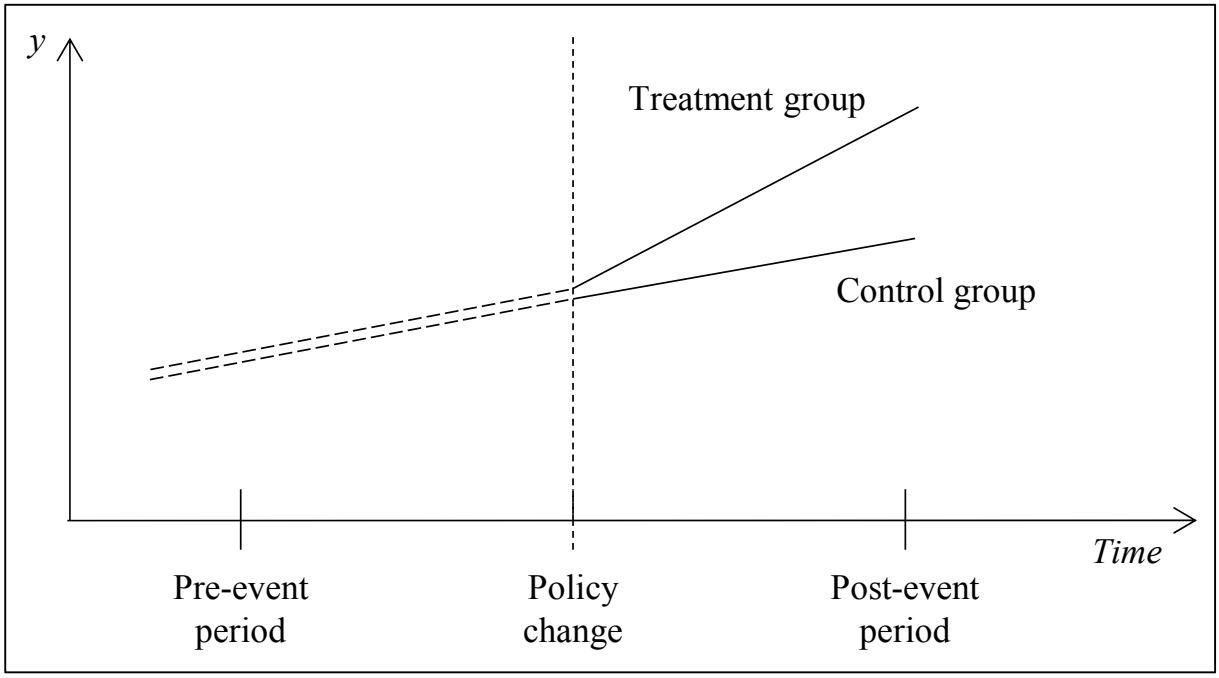

FIGURE 6.11
ILLUSTRATION OF THE ASSUMPTION UNDERLYING THE STATIC-GROUP POSTTEST DESIGN

Notes: The figure illustrates the assumption underlying the static-group posttest design. Source: own depiction.

The figure shows that the two (unobserved) trends in the explained variable are assumed to be coinciding in the pre-event period.[250] Thus, the observed difference in the explained variable's trend in the post-event period is assumed to be caused by the policy change only. This assumption is equally strong as the assumption underlying the one-group pretest-posttest design discussed above. As a consequence, results derived under the static-group posttest design may only serve as a first indication as to whether the IFRS introduction has an effect on public German firms.[251]

[250] To illustrate the design's assumption precisely, the two lines in the pre-event period should be drawn so that they exactly overlap. In the figure, however, the two dashed lines are drawn with a minimal distance between them to make the point that two distinct trends are involved—one for the treatment group and one for the control group.

[251] The reason why the assumption must be considered as strong lies in the fact that firms are not randomly assigned to each group (Babbie (2013), p. 279). Instead, firms have the characteristics *public* or *private* prior to the IFRS introduction.

6.3.4.1.3 The Experimental Difference-in-Differences Design

Combining the two previously discussed pre-experimental designs yields a truly experimental design—the DID design. The DID design allows causal inferences and is therefore the dissertation's central empirical design.[252] Figure 6.12 illustrates the DID design.

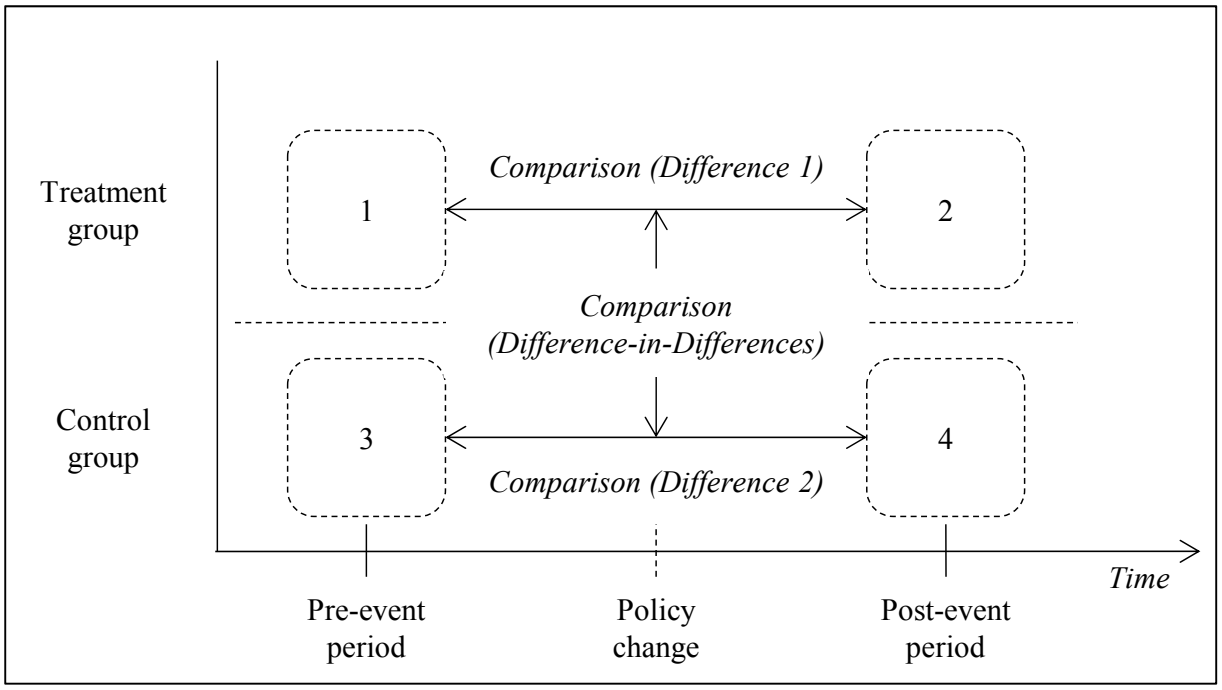

FIGURE 6.12
ILLUSTRATION OF THE DIFFERENCE-IN-DIFFERENCES DESIGN

Notes: The figure illustrates the difference-in-differences design. Source: own depiction; reference is made to Shadish, et al. (2002), pp. 135-144.

As the figure illustrates, the design involves both firm groups and both time periods. To implement the design, I form the following four distinct subsamples:

- subsample 1: *public* firms *before* the IFRS introduction (state 1 in the figure);
- subsample 2: *public* firms *after* the IFRS introduction (state 2 in the figure);
- subsample 3: *private* firms *before* the IFRS introduction (state 3 in the figure); and

[252] The DID design is widely used in empirical work as a means to develop causal relationships. For a general discussion see, for example, Morgan & Winship (2014); Legewie (2012), pp. 127-128; and Ployhart & Vandenberg (2010), pp. 127-128 and 135-136. For an application of the design in empirical work see, for example, Xie & Mo (2014), pp. 282-297; Chi, Lisic, Long, & Wang (2013), pp. 176-187; and Hong & Kacperczyk (2010), pp. 1683-1725.

- subsample 4: *private* firms *after* the IFRS introduction (state 4 in the figure).

The design may be explained using the following regression model:[253]

$$y_{it} = \beta_0 + \delta_0 POST_t + \beta_1 TREATMENT_i + \delta_1 POST_t * TREATMENT_i + controls_{it} + \varepsilon_{it} \quad [6.11]$$

where subscript $i = 1,2,\ldots,N$ denotes firms; subscript $t = 1,2,\ldots,T$ denotes years; *POST* is a dummy variable that equals one if representing observations prepared after the policy change and zero otherwise; *TREATMENT* is a dummy variable that equals one if representing observations from the treatment group and zero otherwise; *POST*TREATMENT* is an interaction term; and ε is an idiosyncratic error term. Figure 6.13 illustrates Equation [6.11].

[253] Adapted from Wooldridge (2013), p. 441; and Hong & Kacperczyk (2010), p. 1713.

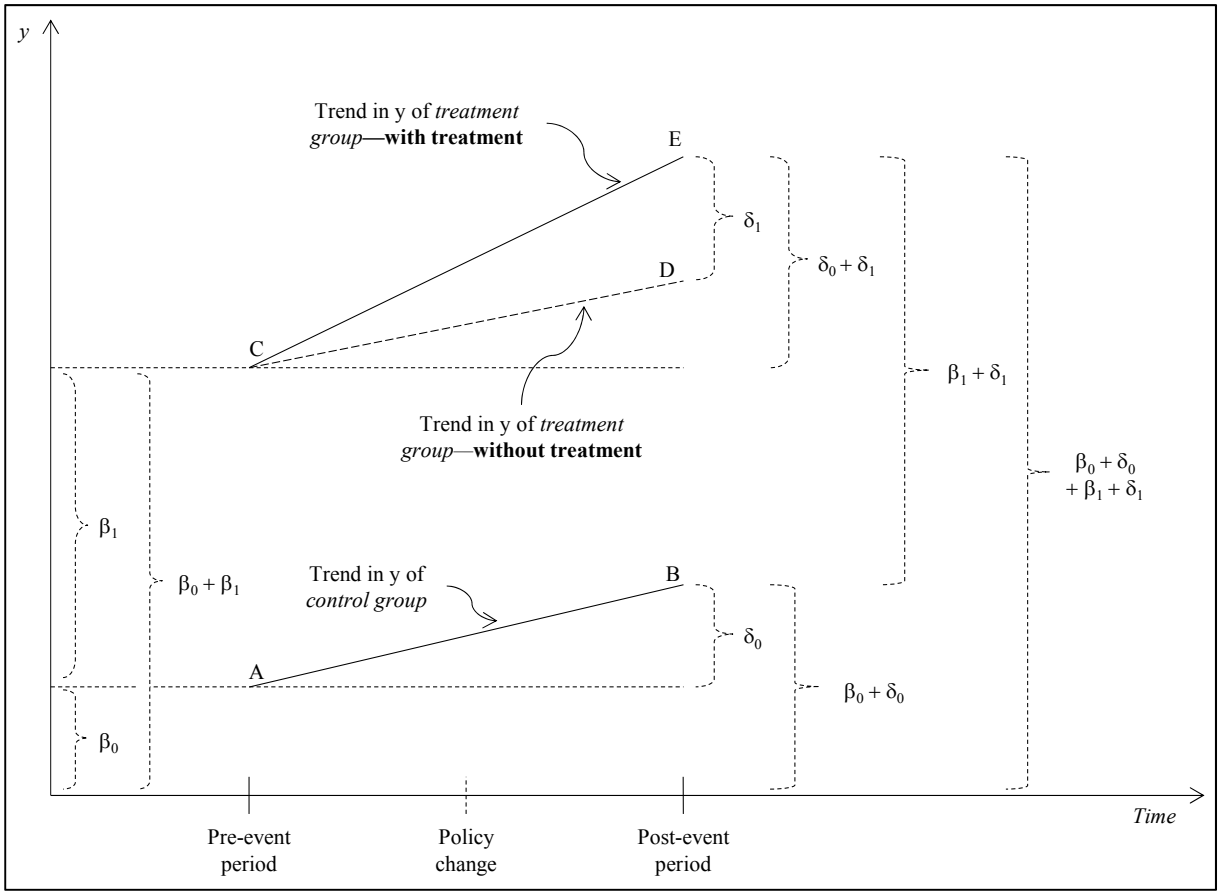

FIGURE 6.13
GRAPHICAL DEPICTION OF THE DIFFERENCE-IN-DIFFERENCES EQUATION

Notes. The figure illustrates Equation [6.11]. Source: own depiction; reference is made to Shadish, et al. (2002), pp. 135-144.

The DID design rests on two assumptions: (1) the *trend in the explained variable, y,* for the control group and the treatment group is *stable over time* (i.e., the lines $\overline{AB}$ and $\overline{CD}$ are parallel); (2) the policy change has *no effect* on the pre-event period.[254] In the context of the dissertation, these assumptions mean the following: (1) the trend in earnings' predictive power for public and private German firms is stable over time (i.e., any difference in earnings' predictive power between public and private German firms that existed prior to the IFRS introduction would have prevailed if no accounting policy change had occurred); (2) the IFRS introduction did not affect earnings' predictive power prior to 2005 (or any other date in which firms adopted the IFRS system). The assumptions of the DID design are much weaker than the assumptions made in the pre-experimental designs and thus allow the measurement of the IFRS

[254] Lechner (2011), p. 168.

treatment effect even if differences between public and private German firms exist—as long as these differences do not change over time.[255]

As the figure shows, the combination of time periods and firm groups leads to various states (denoted by upper-case letters in the figure) that are analyzable by the DID design. These states may be named as "pre-treatment non-treated" (point A), "post-treatment non-treated" (point B), "pre-treatment treated" (point C), and "post-treatment treated" (point E).[256] The critical point, however, is point D, which represents a state that would have occurred if the treatment group had not been subject to the policy change (i.e., point D represents the *post-treatment treated under no treatment*). The states lead to three distinct trends in the explained variable *y*: (1) a trend for the control group (line $\overline{AB}$); (2) a trend for the treatment group *under the treatment* (line $\overline{CE}$); and (3) an unobservable trend for the treatment group *under no treatment* (line $\overline{CD}$).[257]

The aim of the DID design is to estimate the (unobservable) point D and ultimately to compute the difference between this point and the state represented by point E (i.e., to compute the distance between the points D and E). This difference represents the effect of the treatment. LECHNER summarizes the aim of the DID design as follows:

> The idea of [the DID design] is that if the two treated and the two nontreated groups are subject to the same time trends, and if the treatment has had no effect in the pre-treatment period, then an estimate of the "effect" of the treatment in a period in which it is known to have none, can be used to remove the effect of confounding factors to which a comparison of post-treatment outcomes of treated and nontreated may be subject to. This is to say that we use the mean changes of the outcome variables for the nontreated over time and add them to the mean level of the outcome variable for the treated prior to treatment to obtain the mean outcome the treated would have experienced if they had not been subject to the treatment.[258]

---

[255] In the context of the dissertation, the DID design is particularly useful as the mean-comparison t-test has established that public and private firms differ with regard to firm-size (see Subsection 6.3).

[256] All quotations from Lechner (2011), p. 168.

[257] Line $\overline{CD}$ represents the counterfactual knowledge defined above. Note that the description of the DID design is at this point conceptual. The dissertation's empirical analysis is not primarily concerned with the level of (or change in) the cash flow forecasting model's explained variable, the one-year-ahead operating cash flow, but with the change in the model's overall *explanatory power*.

[258] Lechner (2011), p. 168.

Table 6.14 summarizes the states mentioned above and shows how the coefficients from Equation [6.11] relate to them.

TABLE 6.14
COEFFICIENTS FROM THE DIFFERENCE-IN-DIFFERENCES EQUATION AND RELATED STATES OF INTEREST

Panel A: combinations of time periods and firm types leading to states of interest [a]

	Pre-event period (1)	Post-event period (2)	"Post" minus "Pre" (3)
Control Group	β_0	$\beta_0 + \delta_0$	δ_0
Treatment Group	$\beta_0 + \beta_1$	$\beta_0 + \delta_0 + \beta_1 + \delta_1$	$\delta_0 + \delta_1$
"Treatment" minus "Control"	β_1	$\beta_1 + \delta_1$	$\boldsymbol{\delta_1}$

Panel B: description of states

Coefficient(s) (1)	State description (2)
β_0	Level of *y* for the control group in the pre-event period (A)
$\beta_0 + \beta_1$	Level of *y* for the treatment group in the pre-event period (C)
β_1	Difference in *y* between the control group and the treatment group in the pre-event period (C-A)
$\beta_0 + \delta_0$	Level of *y* for the control group in the post-event period (B)
$\beta_0 + \delta_0 + \beta_1 + \delta_1$	Level of *y* for the treatment group in the post-event period under the treatment, that is, if the treatment had actually occurred (E)
$\beta_1 + \delta_1$	Difference in *y* in the post-event period between the treatment group under the treatment, that is, if the treatment had actually occurred, and the control group (E-B)
δ_0	Difference in *y* for the control group between the post-event period and the pre-event period (B-A)
$\delta_0 + \delta_1$	Difference in *y* for the treatment group between the post-event period and the pre-event period under the treatment, that is, if the treatment had actually occurred (E-C)
$\boldsymbol{\delta_1}$	Difference in *y* in the post-event period between the treatment group under the treatment and the treatment group under no treatment, that is, the **difference-in-differences estimator** (E-D)

Notes. The table explains the DID design. Specifically, Panel A shows how the combination of time periods and firm types results in different states of interest, represented by coefficients from Equation [6.11]. Panel B further explains these coefficients.

[a] Panel A is reproduced from Wooldridge (2013), p. 441.

6.3.4.2 *Analysis Approaches*

6.3.4.2.1 The Goodness-of-Fit Approach

A model's goodness-of-fit measure is a regression statistic indicating to what extent the explanatory variables and the error term, respectively, explain the variation in the explained variable. The goodness-of-fit measure of interest in the dissertation is R-squared, which is "[…] the ratio of the explained variation compared to the total variation; thus, it is interpreted as the *fraction of the sample variation in y that is explained by x*."[259] In the context of the dissertation, R-squared indicates to what extent the variation in one-year-ahead operating cash flow is explained by components of current earnings and the residuals, respectively. (Residuals capture all other factors not accounted for in the chosen set of the cash flow forecasting model's explanatory variables.) A value of R-squared close to one (zero) indicates that a great portion of the variation in one-year-ahead operating cash flow is explained by components of current earnings (by the residuals). Putting it differently, a high (low) R-squared value means low (high) prediction error and thus high (low) explanatory power of the cash flow forecasting model.

Statistical Comparison of R-squared Measures Obtained under Different States of Interest

Analyzing the cash flow forecasting model's residuals under the two pre-experimental designs requires the comparison of R-squared measures across different states of interest. For example, when analyzing the cash flow forecasting model's residuals under the one-group pretest-posttest design, the R-squared measure resulting from the regression of *public* firms *before* the IFRS introduction needs to be compared to the R-squared measure resulting from the regression of *public* firms *after* the IFRS introduction.[260] Comparing R-squared measures requires two steps: (1) the

[259] Wooldridge (2013), p. 36; author's emphasis. Note that an R-squared measure derived from the GMM estimation method does not have the exact same properties as an R-squared measure derived from the OLS estimation method. For the purpose of the dissertation, however, they are considered to be comparable.

[260] Likewise, when analyzing the cash flow forecasting model's residuals under the static-group posttest design, the R-squared measure resulting from the regression of *public* firms *after* the IFRS introduction needs to be compared to the R-squared measure resulting from the regression of *private* firms *after* the IFRS introduction.

computation of the difference in the R-squared measures; and (2) a statistical test to determine whether the computed difference is statistically significant.

Consistent with the belief that the IFRS introduction deteriorates earnings' predictive power, I expect a decrease in the R-squared measure when switching from a state of interest reflecting the absence of IFRS to a state of interest reflecting the presence of IFRS. Specifically, I expect a decrease in R-squared when switching from the pre-event period to the post-event period in the one-group pretest-posttest design and when switching from private German firms to public German firms in the static-group posttest design. (In the statistical test, these expectations mean that I expect a statistically significant *negative* R-squared difference under each pre-experimental research design as the R-squared difference is computed by subtracting the non-IFRS affected R-squared measure from the IFRS-affected R-squared measure.) The following outlines the statistical test.

1) Statistical Hypotheses

Consistent with the belief that the IFRS introduction deteriorates earnings' predictive power, I formulate the (one-sided) null and alternative hypothesis about the population R-squared, ρ^2 respectively:[261]

a) One-Group Pretest-Posttest Design

- H_0: The difference in the population R-squared between *public* German firms in the *post*-IFRS period and *public* German firms in the *pre*-IFRS period is *positive or zero*.
- H_a: The difference in the population R-squared between *public* German firms in the *post*-IFRS period and *public* German firms in the *pre*-IFRS period is *negative*.

More formally, these hypotheses can be stated as $H_0 : \rho^2_{public\_post} - \rho^2_{public\_pre} \geq 0$ versus $H_0 : \rho^2_{public\_post} - \rho^2_{public\_pre} < 0$.

[261] The hypotheses are formulated for each of the two pre-experimental designs separately. The remaining description of the statistical test, however, is generic to facilitate the understanding of the test.

b) Static-Group Posttest Design

- H_0: The difference in the population R-squared between *public* German firms in the *post*-IFRS period and *private* German firms in the *post*-IFRS period is *positive or zero*.
- H_a: The difference in the population R-squared between *public* German firms in the *post*-IFRS period and *private* German firms in the *post*-IFRS period is *negative*.

More formally, these hypotheses can be stated as $H_0 : \rho^2_{public\_post} - \rho^2_{private\_post} \geq 0$ versus $H_0 : \rho^2_{public\_post} - \rho^2_{private\_post} < 0$.

2) Definition and Probability Distribution of the Test Statistic

To test the null hypothesis, I utilize the central limit theorem and make the assumption that the test statistic's probability distribution follows the standard normal distribution (i.e., the z-distribution). This assumption allows conducting a z-test with a test statistic, z, defined as[262]

$$z = \frac{R_I^2 - R_{II}^2}{\sqrt{\hat{\sigma}^2_{(R_I^2 - R_{II}^2)}}}, \qquad [6.12]$$

where R_I^1 and R_{II}^1 is the R-squared measure of the first and second subsample, respectively, and $\hat{\sigma}^2_{(R_I^2 - R_{II}^2)}$ is the estimated variance of the difference in the sample R-squared measures.[263] The population variance of the difference in R-squared measures, $\sigma^2_{(R_I^2 - R_{II}^2)}$, is defined as[264]

$$\sigma^2_{(R_I^2 - R_{II}^2)} = \frac{4}{n_I}\rho_I^2(1-\rho_I^2)^2 + \frac{4}{n_{II}}\rho_{II}^2(1-\rho_{II}^2)^2, \qquad [6.13]$$

[262] The definition of the z-statistic in the context of the comparison of R-squared measures follows Harris, et al. (1994), p. 198. The authors note that their approach is derived from Cramer (1987), pp. 253-266. The approach is also used in Ball, et al. (2000), pp. 16-17.

[263] Olkin & Finn (1995) note that this approach is only feasible if the sample R-squared measures are "obtained from large independent samples of n_1 and n_1 observations, respectively […]" (p. 161). Otherwise, the variance of each sample R-squared measure needs to be computed separately. Here, the stated condition is met.

[264] Olkin & Finn (1995), p. 162.

where n_I and n_{II} is the number of observations in the first and second subsample, respectively. By substituting sample values for the population R-squared in Equation [6.13] yields the sample variance of the difference in R-squared measures, $\hat{\sigma}^2_{(R_I^2-R_{II}^2)}$ defined as[265]

$$\hat{\sigma}^2_{(R_I^2-R_{II}^2)} = \frac{4}{n_I} R_I^2(1-R_I^2)^2 + \frac{4}{n_{II}} R_{II}^2(1-R_{II}^2)^2. \qquad [6.14]$$

3) Significance Level, Critical Value, and Decision Rule

I specify a significance level, α, of 0.05. The critical value at which I reject the null hypothesis is $-z_\alpha = -z_{0.05} = -1.645$. Thus, I reject (do not reject) the null hypothesis if $z < -1.645$ ($z \geq -1.645$).

6.3.4.2.2 The Residual Model Approach

The cash flow forecasting model's residual model is the regression of its squared residuals on a set of explanatory variables that may or may not be identical with the set of explanatory variables used in the cash flow forecasting model itself. The residual model has the following form:

$$\begin{aligned}\hat{\varepsilon}^2_{it} = {} & \alpha_0 + \delta_0 POST_t + \alpha_1 PUBLIC_i + \delta_1 IFRS_{it} + \alpha_2 OCF_{it} + \alpha_3 DEPRAMORT_{it} \\ & + \alpha_4 \Delta PROV_{it} + \alpha_5 \Delta AR_{it} + \alpha_6 \Delta INV_{it} + \alpha_7 \Delta AP_{it} + \alpha_8 \ln(TA_{it-1}) + \mu_{it},\end{aligned} \qquad [6.15]$$

where subscript i = 1,2,…,N denotes firms; subscript t = 1,2,…,T denotes years; $\hat{\varepsilon}^2$ is a residual vector generated through the estimation of the cash flow forecasting model; *POST* is a dummy variable that equals one if representing observations in the post-IFRS period and zero otherwise; *PUBLIC* is a dummy variable that equals one if representing observations of public German firms and zero otherwise; *IFRS* is the

[265] The formula of the variance is presented in Olkin & Finn (1995), p. 161, and is applicable to large samples and, relative to the sample size, a small amount of regressors. The authors note that their approach goes back to the early work of J. WISHART, T. KONDO, AND E. M. ELDERTON (see Wishart, Kondo, & Elderton (1931), pp. 353-376).

interaction term between *POST* and *PUBLIC* (i.e., $IFRS_{it} = POST_t * PUBLIC_i$); *TA* is total assets (a control variable); and μ is an idiosyncratic error term. The remaining variables are the accruals defined above. (Note that in the residual model, unlike in the cash flow forecasting model the accruals only serve as *control variables*; I am not interested in the specific sign or value of their coefficients.)

The residual model approach under the DID design is the *dissertation's central approach*; results obtained under the approach will be used to draw a final conclusion about the association of the IFRS introduction with changes in financial statement quality. (Given that the approach is central to the dissertation's empirical investigation, its results will be subject to various sensitivity analyses—Section 7.5 details what sensitivity analyses are performed.)

The approach measures the IFRS effect with the coefficient of the *IFRS* dummy variable—δ_1. Given the dissertation's view that the IFRS introduction deteriorates earnings' predictive power, I expect this coefficient to be positive. A *positive* coefficient value indicates that the IFRS introduction *increased* the cash flow forecasting model's variance and thus *deteriorated* its predictive power.

6.4 Summary

This section has outlined the research method employed to empirically examine the dissertation's research hypotheses stated in Subsection 5.2. Specifically, it was shown that the dissertation

- uses a large and unique data set from Deutsche Bundesbank's USTAN database representing public and private German firms;
- transforms the provided data using several procedures; and
- measures changes in earnings' predictive power using a two-step approach that includes: (1) the estimation of the cash flow forecasting model itself; and (2) the analysis of the cash flow forecasting model's residuals.

Moreover, it was shown that the second step of the measurement of changes in earnings' predictive power—the analysis of the cash flow forecasting model's

residuals—is performed under several research designs. Specifically, residuals are analyzed under

- two pre-experimental research designs (i.e., the one-group pretest-posttest design and the static-group posttest design); and
- the experimental DID design.

Unlike the two pre-experimental designs, which rely on strong assumptions, the DID design allows a causal interpretation of a measured change in earnings' predictive power as its underlying assumption is rather weak. (Unlike the two pre-experimental designs, the DID design allows for systematic differences between public and private German firms as long as these differences remain constant over time.)

Finally, it was shown that the second step of the measurement of changes in earnings' predictive power—the analysis of the cash flow forecasting model's residuals—is performed using several analysis approaches. Specifically, residuals are analyzed using

- the goodness-of-fit approach; and
- the residual model approach.

The first approach measures changes in earnings' predictive power by computing the difference in R-squared measures representing pre-IFRS and post-IFRS states of interest and by testing the computed difference statistically. The second approach measures changes in earnings' predictive power by estimating a residual model in which the cash flow forecasting model's squared residuals are regressed on two dummy variables which represent different states of interest—*POST* and *PUBLIC*—as well as on the interaction term of these two dummy variables—*IFRS*. (In addition, several control variables are included in the regression.) The residual model approach measures the IFRS effect with the coefficient of the *IFRS* dummy variable. Given the dissertation's view that the IFRS introduction deteriorates earnings' predictive power, I expect this coefficient to be positive. A *positive* coefficient value indicates that the IFRS introduction *increased* the cash flow forecasting model's variance and thus *decreased* its predictive power.

7 Empirical Results

7.1 Overview

As noted in the previous section, measuring changes in earnings' predictive power following the IFRS introduction requires both an estimation of the cash flow forecasting model itself and an analysis of the model's residuals. Interpreting estimation and residual analysis results, however, requires a deep understanding of the data used in the regression analysis. Thus, before reporting the dissertation's empirical results, a univariate analysis of the cash flow forecasting model's variables will be performed.

This section is organized as follows:

- Subsection 7.2 reports results of the *univariate analysis*—that is, summary and distributional statistics of the measures discussed in Subsection 6.2;
- Subsection 7.3 reports results of the *estimation of the cash flow forecasting model* under the central research hypothesis;
- Subsection 7.4 reports results of the *analysis of the cash flow forecasting model's residuals* under the remaining research hypotheses; and
- Subsection 7.5 reports results of *sensitivity analyses* under the central research hypothesis.

7.2 Univariate Analyses

To gain an understanding of key characteristics of the data used in the empirical analysis, summary and distributional statistics are computed for the measures defined in Subsection 6.2.3. Table 7.1 reports summary and distributional statistics for raw measures, scaled measures, and fully transformed (i.e., scaled and winsorized and thus final) measures.[266] Specifically, the table reports two measures of central tendency, namely the arithmetic mean and the median, one measure of dispersion, namely the standard deviation, and several measures of location, namely the minimum, the first quartile (i.e., the 25th percentile), the third quartile (i.e., the 75th percentile), and the

[266] Note that raw measures of balance sheet variables represent the variables' levels whereas scaled measures already represent the variables' one-period-change.

maximum. The table reports these statistics for the combined sample (Panels A, B, and C), the public firms' sample (Panels D, E, and F), and the private firms' sample (Panels G, H, and I), respectively.

TABLE 7.1
SUMMARY AND DISTRIBUTIONAL STATISTICS FOR THE SCALING VARIABLE TOTAL ASSETS AND THE CASH FLOW FORECASTING MODEL'S EXPLANATORY VARIABLES—COMBINED SAMPLE, PUBLIC FIRMS' SAMPLE, AND PRIVATE FIRMS' SAMPLE
(Raw Measures in Millions of Euros)

Variable	*NT* (1)	*Mean* (2)	*SD* (3)	*Min* (4)	*Q1* (5)	*Median* (6)	*Q3* (7)	*Max* (8)
Panel A: combined sample—raw measures								
TA	47,303	790	5,600	0	28.0	79.3	270.0	210,000
OCF	39,291	69	580	-32,000	0.9	5.5	22.5	24,000
DEPRAMORT	47,303	44	370	0	1.2	3.9	14.0	37,000
PROV	47,303	96	780	0	1.2	4.6	20.2	27,000
AR	47,303	97	710	0	4.0	12.0	41.1	51,000
INV	47,303	110	560	0	4.5	14.7	48.3	19,000
AP	47,303	68	430	0	2.2	6.5	22.3	16,000
Panel B: combined sample—scaled measures								
OCF	39,291	0.09	0.16	-9.40	0.03	0.09	0.15	14.25
DEPRAMORT	39,546	0.06	0.05	0.00	0.03	0.05	0.08	1.78
Δ*PROV*	39,546	0.01	0.04	-0.51	-0.01	0.00	0.01	1.46
Δ*AR*	39,546	0.01	0.07	-0.56	-0.01	0.00	0.03	3.88
Δ*INV*	39,546	0.02	0.09	-0.76	-0.01	0.00	0.03	8.08
Δ*AP*	39,546	0.01	0.06	-0.81	-0.01	0.00	0.02	2.90
Panel C: combined sample—scaled and winsorized (i.e., final) measures								
OCF	39,291	0.09	0.11	-0.42	0.03	0.09	0.15	0.53
DEPRAMORT	39,546	0.06	0.04	0.00	0.03	0.05	0.08	0.30
Δ*PROV*	39,546	0.00	0.03	-0.11	-0.01	0.00	0.01	0.17
Δ*AR*	39,546	0.01	0.06	-0.24	-0.01	0.00	0.03	0.44
Δ*INV*	39,546	0.01	0.07	-0.24	-0.01	0.00	0.03	0.49
Δ*AP*	39,546	0.01	0.04	-0.17	-0.01	0.00	0.02	0.31

(CONTINUED)

Variable	*NT* (1)	*Mean* (2)	*SD* (3)	*Min* (4)	*Q1* (5)	*Median* (6)	*Q3* (7)	*Max* (8)
Panel D: public firms' sample—raw measures								
TA	6,123	3,900	15,000	2	130.0	430.0	1,800.0	210,000
OCF	5,139	340	1,400	-28,000	5.8	31.8	150.0	24,000
DEPRAMORT	6,123	220	980	0	6.2	22.0	84.2	37,000
PROV	6,123	470	2,000	0	6.2	25.3	150.0	27,000
AR	6,123	460	1,900	0	18.3	68.1	260.0	51,000
INV	6,123	450	1,400	0	16.6	58.4	270.0	19,000
AP	6,123	330	1,100	0	9.1	35.8	160.0	16,000
Panel E: public firms' sample—scaled measures								
OCF	5,139	0.09	0.17	-6.41	0.04	0.09	0.14	3.09
DEPRAMORT	5,183	0.06	0.05	0.00	0.04	0.05	0.08	1.15
Δ*PROV*	5,183	0.01	0.04	-0.27	0.00	0.00	0.02	1.34
Δ*AR*	5,183	0.02	0.09	-0.53	-0.01	0.01	0.03	3.05
Δ*INV*	5,183	0.02	0.10	-0.54	-0.01	0.00	0.03	4.96
Δ*AP*	5,183	0.01	0.07	-0.43	-0.01	0.00	0.02	1.72
Panel F: public firms' sample—scaled and winsorized (i.e., final) measures								
OCF	5,139	0.09	0.10	-0.42	0.04	0.09	0.14	0.53
DEPRAMORT	5,183	0.06	0.04	0.00	0.04	0.05	0.08	0.30
Δ*PROV*	5,183	0.01	0.03	-0.10	0.00	0.00	0.02	0.17
Δ*AR*	5,183	0.01	0.06	-0.24	-0.01	0.01	0.03	0.44
Δ*INV*	5,183	0.01	0.06	-0.23	-0.01	0.00	0.03	0.49
Δ*AP*	5,183	0.01	0.04	-0.15	-0.01	0.00	0.02	0.31

(CONTINUED)

Variable	*NT* (1)	*Mean* (2)	*SD* (3)	*Min* (4)	*Q1* (5)	*Median* (6)	*Q3* (7)	*Max* (8)
Panel G: private firms' sample—raw measures								
TA	41,180	320	1,400	0	24.4	64.7	200.0	76,000
OCF	34,152	29	240	-32,000	0.8	4.5	16.7	5,100
DEPRAMORT	41,180	18	81	0	1.1	3.2	10.5	2,700
PROV	41,180	40	270	0	1.0	3.7	14.9	10,000
AR	41,180	43	160	0	3.4	10.0	30.3	6,400
INV	41,180	56	210	0	4.0	12.4	37.4	6,200
AP	41,180	29	150	0	1.9	5.4	16.4	7,600
Panel H: private firms' sample—scaled measures								
OCF	34,152	0.09	0.15	-9.40	0.03	0.09	0.15	14.25
DEPRAMORT	34,363	0.06	0.04	0.00	0.03	0.05	0.08	1.78
$\Delta PROV$	34,363	0.00	0.03	-0.51	-0.01	0.00	0.01	1.46
ΔAR	34,363	0.01	0.07	-0.56	-0.01	0.00	0.03	3.88
ΔINV	34,363	0.02	0.09	-0.76	-0.01	0.01	0.04	8.08
ΔAP	34,363	0.01	0.06	-0.81	-0.01	0.00	0.02	2.90
Panel I: private firms' sample—scaled and winsorized (i.e., final) measures								
OCF	34,152	0.09	0.11	-0.42	0.03	0.09	0.15	0.53
DEPRAMORT	34,363	0.06	0.04	0.00	0.03	0.05	0.08	0.30
$\Delta PROV$	34,363	0.00	0.03	-0.11	-0.01	0.00	0.01	0.17
ΔAR	34,363	0.01	0.06	-0.24	-0.01	0.00	0.03	0.44
ΔINV	34,363	0.02	0.07	-0.24	-0.01	0.01	0.04	0.49
ΔAP	34,363	0.01	0.04	-0.17	-0.01	0.00	0.02	0.31

(CONTINUED)

Notes. The table reports summary and distributional statistics for the earnings-based cash flow forecasting model's variables and the scaling variable total assets. *TA* is total assets; *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; *PROV* is provisions; *AR* is accounts receivable; *INV* is inventory; *AP* is accounts payable; Δ*PROV* is the one-period change in provisions; Δ*AR* is the one-period change in accounts receivable; Δ*INV* is the one-period change in inventory; and Δ*AP* is the one-period change in accounts payable. Statistics are reported for the variables' raw measures, scaled measures, and fully transformed (i.e., scaled and winsorized and thus final) measures (for a definition of measures, see Table A.1 in the appendix). Moreover, statistics are reported for the combined sample (panels A, B, and C), the public firms' sample (panels D, E, and F), and the private firms' sample (panels G, H, and I). Specifically, the table reports the number of firm-year observations (*NT*), the arithmetic mean (*Mean*), the standard deviation (*SD*), the minimum (*Min*), the first quartile (*Q1*), the median (*Median*), the third quartile (*Q3*), and the maximum (*Max*). Raw measures (except *NT*) are in millions of Euros and are rounded off to whole numbers. Transformed measures (except *NT*) are rounded off to two decimal places.

The table indicates that each sample contains outliers. This is particularly evident for the variable *operating cash flow*. However, the table also indicates that the method of winsorization effectively neutralizes outliers, thereby avoiding that outliers negatively affect regression results. For example, operating cash flow scaled by total assets in the combined sample (Panel B) amounts to -9.40; the winsorized value, however, amounts to only -0.42 (Panel C). Similar observations can be made for the public firms' sample and private firms' sample.

7.3 Test of the Central Research Hypothesis

7.3.1 Step One—Estimation of the Cash Flow Forecasting Model

Table 7.2 reports summary statistics from GMM regressions of the cash flow forecasting model specified in Equation [6.7]. The model is calibrated to the overall sample and the four subsamples representing the four states of interest. Specifically, the first, second, third, fourth, and fifth regression represent the overall sample, subsample one (public firms in the pre-event period), subsample two (public firms in the post-event period), subsample three (private firms in the pre-event period), and subsample four (private firms in the post-event period), respectively.

TABLE 7.2
TEST OF CENTRAL HYPOTHESIS—SUMMARY STATISTICS FROM DYNAMIC PANEL DATA GMM REGRESSIONS OF THE CASH FLOW FORECASTING MODEL CALIBRATED TO THE OVERALL SAMPLE AND EACH SUBSAMPLE

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 DEPRAMORT_{it} + \beta_3 \Delta PROV_{it} + \beta_4 \Delta AR_{it} + \beta_5 \Delta INV_{it} + \beta_6 \Delta AP_{it} + firmFE + yearFE + \varepsilon_{it+1}$$

Variable (predicted sign)[a]	Overall (1)	Public pre (2)	Public post (3)	Private pre (4)	Private post (5)
Intercept (?)	0.074***	0.076	0.083***	0.063***	0.078***
	(0.005)	(0.065)	(0.011)	(0.011)	(0.008)
OCF (+)	0.239***	0.299***	0.226***	0.234***	0.241***
	(0.018)	(0.093)	(0.063)	(0.025)	(0.027)
DEPRAMORT (-)	-0.413***	-0.437*	-0.314**	-0.441***	-0.380***
	(0.064)	(0.265)	(0.148)	(0.086)	(0.124)
Δ*PROV* (-)	-0.411***	-0.319**	-0.656***	-0.357***	-0.474***
	(0.042)	(0.146)	(0.127)	(0.059)	(0.063)
Δ*AR* (+)	0.596***	0.680***	0.472***	0.568***	0.635***
	(0.026)	(0.144)	(0.081)	(0.038)	(0.037)
Δ*INV* (+)	0.326***	0.327***	0.230***	0.315***	0.342***
	(0.023)	(0.078)	(0.083)	(0.031)	(0.032)
Δ*AP* (-)	-0.663***	-0.623***	-0.616***	-0.668***	-0.655***
	(0.028)	(0.113)	(0.139)	(0.041)	(0.039)
firmFE	Yes	Yes	Yes	Yes	Yes
yearFE	Yes	Yes	Yes	Yes	Yes
NT	31,207	1,967	2,063	15,482	11,695
N	5,751	225	607	3,101	3,143
Avg. # of obs. / *N*	5.4	8.7	3.4	5.0	3.7
# of IVs	32	28	20	29	24
R^2	0.351	0.309	0.487	0.357	0.430
Adj. R^2	0.348	0.218	0.472	0.351	0.426
Wald stat.	949.9	161.2	75.3	425.1	549.9
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AB stat. lag 1	-30.1	-7.2	-8.4	-21.8	-21.6
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AB stat. lag 2	-3.0	0.0	0.6	-2.0	-2.5
(p-value)	(0.003)	(0.999)	(0.557)	(0.049)	(0.012)
Sargan stat.	6.2	0.4	0.1	4.5	0.8
(p-value)	(0.013)	(0.539)	(0.820)	(0.034)	(0.364)

(CONTINUED)

Notes. The table reports summary statistics from dynamic panel data GMM regressions of the earnings-based cash flow forecasting model (Equation [6.7]) calibrated to different subsamples. (1) = overall sample; (2) = public firms in the pre-event period; (3) = public firms in the post-event period; (4) = private firms in the pre-event period; (5) = private firms in the post-event period. Specifically, the table reports coefficient estimates, the use of firm fixed effects (*firmFE*) and year fixed effects (*yearFE*), the number of firm-year observations (*NT*), the number of firms (*N*), the average number of observations per firm (Avg. # of obs. / *N*), the number of instrumental variables (# of IVs), the R-squared (R^2), the adjusted R-squared (Adj. R^2), the Wald chi-square test statistic (Wald stat.), the Arellano-Bond z-statistic for the first and second lag, respectively (AB stat. lag 1 and AB stat. lag 2, respectively), and the Sargan test statistic (Sargan stat.). Robust standard errors of coefficient estimates are presented in parentheses below the coefficient estimates; p-values for test statistics are presented in parentheses below the respective test statistic.

[a] *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; $\Delta PROV$ is the one-period change in provisions; ΔAR is the one-period change in accounts receivable; ΔINV is the one-period change in inventory; and ΔAP is the one-period change in accounts payable. Predicted signs as described in Table 5.1.

Asterisks *, **, and *** indicate significance at the 0.1, 0.05 and 0.01 level, respectively; two-tailed test.

The key findings in the table are the following:

- in all regressions, all accounting variables' coefficients are statistically significant, R-squared measures are reasonably high, and the Wald test statistic is significant; and
- in all regressions, all accounting variables' coefficients show the expected sign.

These key findings mean that the *chosen accounting variables explain one-year-ahead operating cash flow very well*. Further findings in the table are:

- in all regressions, the Arellano-Bond test statistic shows the desirable *significance* when testing whether the cash flow forecasting model's residuals follow an autoregressive process of the *first order*; and
- in regressions (2) and (3) (i.e., regressions related to public firms), the Arellano-Bond test statistic shows the desirable *insignificance* when testing whether the cash flow forecasting model's residuals follow an autoregressive process of the *second order*.

These findings mean that the cash flow forecasting model is correctly specified with regard to the endogenous explanatory variable current operating cash flow. Specifically, the fact that the Arellano-Bond test statistic is significant (insignificant)

with regard to the first lag (second lag) ensures that including only one lag of the explained variable in the set of explanatory variables is sufficient.[267] A final finding in the table is: in regressions (2), (3), and (5), the Sargan test statistic shows the desirable *insignificance* when testing overidentifying restrictions.[268] This finding means that the *instrumental variables* used in the dynamic panel data GMM regressions *are valid*.[269]

In summary, the results of Table 7.2 indicate that the cash flow forecasting model is useful in generating residuals necessary to test the IFRS effect. The following subsection reports the result of the analysis of the cash flow forecasting model's residuals.

7.3.2 Step Two—Analysis of the Cash Flow Forecasting Model's Residuals

7.3.2.1 *Test of Residuals Using Pre-Experimental Research Designs and the Goodness-of-Fit Approach*

Table 7.3 reports results of the analysis of the cash flow forecasting model's residuals under the two pre-experimental designs—the one-group pretest-posttest design and the static-group posttest design—using the goodness-of-fit approach. The goodness-of-fit approach analyzes the cash flow forecasting model's residuals by comparing R-squared measures with a statistical test.[270]

---

[267] Although some regressions show a significant Arellano-Bond test statistic even for the second lag I consider the model to be correctly specified. This is because significance for the second lag is likely to be without negative consequences given that both a large panel data set with many cross-sectional units and robust standard errors are used.

[268] The Sargan test is necessary as the number of instrumental variables outnumbers the number of endogenous explanatory variables.

[269] An *insignificant* Sargan test statistic means that the null hypothesis of the Sargan test (i.e., H_0: overidentifying restrictions are valid) cannot be rejected, rendering the chosen instrumental variables *valid*.

[270] For details regarding the statistical test, refer to Subsection 6.3 above.

TABLE 7.3
TEST OF CENTRAL HYPOTHESIS—COMPARISON OF SAMPLE R-SQUARED MEASURES RESULTING FROM DYNAMIC PANEL DATA GMM REGRESSIONS OF THE CASH FLOW FORECASTING MODEL UNDER THE PRE-EXPERIMENTAL DESIGNS

Panel A: one-group pretest-posttest design—public firms only[a]				
	Pre-event period (1)	Post-event period (2)	"Post" minus "Pre" (3)	Z-statistic[b] (4)
R^2	0.309	0.487	0.178	7.6***
SD	0.017	0.016	0.030	
NT	1,967	2,063		
Panel B: static-group posttest design—post-event period only[a]				
	Public firms (1)	Private firms (2)	"Public" minus "Private" (3)	Z-statistic[b] (4)
R^2	0.487	0.430	0.057	3.3***
SD	0.016	0.007	0.024	
NT	2,063	11,695		

Notes. The table reports results of the residual analysis under the two pre-experimental research designs. Residuals are obtained from GMM regressions of the earnings-based cash flow forecasting model calibrated to different subsamples (for details, see Table 7.2). Panel A reports results of the goodness-of-fit residual analysis under the one-group pretest-posttest design; the model is calibrated to the following subsamples: (1) public firms in the pre-event period and (2) public firms in the post-event period. Panel B reports results of the goodness-of-fit residual analysis under the static-group posttest design; the model is calibrated to the following subsamples: (1) public firms in the post-event period and (2) private firms in the post-event period. Specifically, for each subsample the table reports the R-squared, the R-squared's standard deviation (*SD*) (see Equation [6.14]), and the number of firm-year observations (*NT*). Moreover, the table shows the difference in the R-squared measures and the z-statistic from a statistical test of significance based on Equation [6.12].

[a] R-squared and *NT* values reproduced from Table 7.2.

b Z-statistics in the table show the exact values whereas differences and standard deviations of R-squared measures are rounded; thus, the ratio of R^2 and *SD* based on the values in the table slightly deviates from the shown z-statistics.

Asterisks *** indicate significance at 0.01 level; one-tailed test.

R-squared Measures, Standard Deviations, and Differences in R-squared Measures

Panel A of the table reports the result of the statistical R-squared comparison under the *one-group pretest-posttest design*. Under this design, the R-squared measure resulting from regression (2) in Table 7.2—*public* firms in the *pre*-event period—is compared to the R-squared measure resulting from regression (3) in Table 7.2—*public* firms in the *post*-event period. The panel shows the following:

- the difference in R-squared is 0.178;

- the estimated sample standard deviation of the R-squared measure for *public* firms in the *pre*-event period is 0.017;
- the estimated sample standard deviation of the R-squared measure for *public* firms in the *post*-event period is 0.016; and
- the estimated standard deviation of the difference in R-squared is 0.030.

Panel B of the table reports the result of the statistical R-squared comparison under the *static-group posttest design*. Under this design, the R-squared measure resulting from regression (3)—*public* firms in the *post*-event period—is compared to the R-squared measure resulting from regression (5)—*private* firms in the *post*-event period (regression numbers refer to Table 7.2 above). The panel shows the following:

- the difference in R-squared is 0.057;
- the estimated sample standard deviation of the R-squared measure for *public* firms in the *post*-event period is 0.016;
- the estimated sample standard deviation of the R-squared measure for *private* firms in the *post*-event period is 0.007; and
- the estimated standard deviation of the difference in R-squared is 0.024.

Test Statistics, Statistical Decision, and Economic Evaluation of Statistical Result

Panel A: The estimate of the z-statistic based on Equation [6.12] is $z = 7.6$ and thus greater than the critical value of $-z_{\alpha} = -z_{0.05} = -1.645$. Thus, I *fail to reject* the null hypothesis that the difference in the population R-squared measures between public firms in the post-event period and public firms in the pre-event period is greater than or equal to zero.

Panel B: The estimate of the z-statistic based on Equation [6.12] is $z = 3.3$ and thus greater than the critical value of $-z_{\alpha} = -z_{0.05} = -1.645$. Thus, I again *fail to reject* the null hypothesis that the difference in the population R-squared measures between public firms in the post-event period and private firms in the post-event period is greater than or equal to zero.

The results of the two R-squared comparisons under the two pre-experimental designs do not allow the conclusion that the IFRS introduction deteriorated public German firms' earnings' predictive power. However, as stressed in Subsection 6.3, the two pre-

experimental designs rely on strong assumptions and thus may only provide a *first indication* as to whether an IFRS effect is present. A reliable statement about the IFRS effect is only possible when analyzing the cash flow forecasting model's residuals under the *DID design*. The result of this design is presented in the following subsection.

7.3.2.2 *Main Empirical Finding of the Dissertation—Test of Residuals Using the Experimental DID Design and the Residual Model Approach*

Table 7.4 reports the *main finding of the dissertation's empirical analysis*—the regression result of the residual analysis under the DID design using the residual model approach. The table reports summary statistics from a pooled OLS regression of the cash flow forecasting model's squared residuals on DID design-specific dummy variables—*POST*, *PUBLIC*, and *IFRS*—and on accounting variables serving as controls. *POST* is a dummy variable that equals one if observations are from the period after the IFRS introduction and zero otherwise; *PUBLIC* is a dummy variable that equals one if observations are from public firms and zero otherwise; and *IFRS* is the interaction term of *POST* and *PUBLIC* and thus represents the IFRS effect.

The residuals under investigation are obtained by combining the four individual residual vectors resulting from the estimation of the cash flow forecasting model when calibrating the model to four subsamples: *public* firms *before* the IFRS introduction (regression (2) in Table 7.2); *public* firms *after* the IFRS introduction (regression (3) in Table 7.2); *private* firms *before* the IFRS introduction (regression (4) in Table 7.2); and *private* firms *after* the IFRS introduction (regression (5) in Table 7.2). The primary interest is in the coefficient of the *IFRS* dummy variable—δ_1.

TABLE 7.4
TEST OF CENTRAL HYPOTHESIS—SUMMARY STATISTICS FROM A POOLED OLS REGRESSION OF THE CASH FLOW FORECASTING MODEL'S SQUARED RESIDUALS

$$\hat{\varepsilon}_{it}^2 = \alpha_0 + \delta_0 POST_t + \alpha_1 PUBLIC_i + \delta_1 IFRS_{it} + \alpha_2 OCF_{it} + \alpha_3 DEPRAMORT_{it} + \alpha_4 \Delta PROV_{it} + \alpha_5 \Delta AR_{it} + \alpha_6 \Delta INV_{it} + \alpha_7 \Delta AP_{it} + \alpha_8 \ln(TA_{it-1}) + \mu_{it}$$

Variable (predicted sign)[a]	Coefficient (1)	Standard error (2)
Intercept	0.027***	0.001
POST	-0.003***	0.000
PUBLIC	-0.001	0.001
***IFRS* (+)**	**0.003*** **	**0.001**
OCF	0.014***	0.001
DEPRAMORT	0.025***	0.004
Δ*PROV*	0.010*	0.005
Δ*AR*	0.022***	0.003
Δ*INV*	0.021***	0.002
Δ*AP*	-0.012***	0.004
ln(*TA_lagged*)	-0.002***	0.000
firmFE	No	
yearFE	No	
NT	30,757	
R^2	0.032	
Adj. R^2	0.032	
F stat.	103.2	
(p-value)	(0.000)	

Notes. The table reports summary statistics from a pooled OLS regression of the earnings-based cash flow forecasting model's squared residuals (i.e., of the earnings-based cash flow forecasting model's *residual model*—Equation [6.15]). The residuals constituting the explained variable are obtained by combining the four individual residual vectors resulting from the estimation of the cash flow forecasting model calibrated to the subsample of public firms before the IFRS introduction, public firms after the IFRS introduction, private firms before the IFRS introduction, and private firms after the IFRS introduction (see Table 7.2).

Specifically, column (1) reports coefficient estimates, the use of firm fixed effects (*firmFE*) and year fixed effects (*yearFE*), the number of firm-year observations (*NT*), the R-squared (R^2), the adjusted R-squared (Adj. R^2), the F test statistic (F stat.) and the F test statistic's p-value. Column (2) reports robust standard errors of coefficient estimates.

[a] *POST* is a dummy variable that equals one if observations are from the period after the IFRS introduction and zero otherwise; *PUBLIC* is a dummy variable that equals one if observations are from public firms and zero otherwise; *IFRS* is the interaction term of *POST* and *PUBLIC* representing the IFRS effect; *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; Δ*PROV* is the one-period change in provisions; Δ*AR* is the one-period change in accounts receivable; Δ*INV* is the one-period change in inventory; Δ*AP* is the one-period change in accounts payable; and ln(*TA_lagged*) is the natural logarithm of lagged total assets. Predicted sign of the *IFRS* dummy variable results from the central hypothesis specified in Subsection 5.2.

Asterisks * and *** indicate significance at the 0.1 and 0.01 level, respectively; two-tailed test.

The main findings in the table are the following:

- the coefficient of the *IFRS* dummy variable is positive ($\delta_1 = 0.003$) and statistically significant at the 0.01 level;
- the F-test is significant (F stat. = 103.2; p-value = 0.000); the adjusted R-squared of the residual model, Adj. R^2, is 0.032; and
- coefficients of accounting-related control variables are significant.

The findings in Table 7.4 show that the coefficient of the *IFRS* dummy variable, δ_1, is positive and significant. This result indicates that the IFRS introduction has *increased* the cash flow forecasting model's prediction error.

7.4 Test of Remaining Research Hypotheses

7.4.1 Step One—Estimation of the Cash Flow Forecasting Model

Table 7.5 reports summary statistics from dynamic panel data GMM regressions of the cash flow forecasting model related to the second, third, and fourth hypothesis, respectively. These hypotheses differ from the central hypothesis (i.e., hypothesis one) with regard to the accruals used as explanatory variables. Specifically, hypothesis two uses the one-period-change in provisions; hypothesis three uses depreciation and amortization, the one-period-change in accounts receivable, and the one-period-change in inventory; and hypothesis four uses the one-period-change in accounts payable.

TABLE 7.5
TEST OF REMAINING HYPOTHESES—SUMMARY STATISTICS FROM DYNAMIC PANEL DATA GMM REGRESSIONS OF THE CASH FLOW FORECASTING MODEL CALIBRATED TO THE OVERALL SAMPLE

Hypothesis Two:

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 \Delta PROV_{it} + firmFE + yearFE + \varepsilon_{it+1}$$

Hypothesis Three:

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 DEPRAMORT_{it} + \beta_3 \Delta AR_{it} + \beta_4 \Delta INV_{it} + firmFE + yearFE + \varepsilon_{it+1}$$

Hypothesis Four:

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 \Delta AP_{it} + firmFE + yearFE + \varepsilon_{it+1}$$

Variable (predicted sign)[a]	H2 (1)	H3 (2)	H4 (3)
Intercept (?)	0.084***	0.091***	0.085***
	(0.005)	(0.006)	(0.005)
OCF (+)	-0.018	0.049***	-0.007
	(0.018)	(0.018)	(0.018)
DEPRAMORT (-)		-0.397***	
		(0.077)	
Δ*PROV* (-)	-0.100**		
	(0.042)		
Δ*AR* (+)		0.259***	
		(0.025)	
Δ*INV* (+)		0.128***	
		(0.018)	
Δ*AP* (-)			-0.211***
			(0.03)
firmFE	Yes	Yes	Yes
yearFE	Yes	Yes	Yes
NT	31,207	31,207	31,207
N	5,751	5,751	5,751
Avg. # of obs. / *N*	5.4	5.4	5.4
# of IVs	32	32	32
R^2	0.393	0.377	0.397
Adj. R^2	0.390	0.374	0.394
Wald stat.	149.5	308.3	200.3
(p-value)	(0.000)	(0.000)	(0.000)
AB stat. lag 1	-23.0	-24.8	-23.2
(p-value)	(0.000)	(0.000)	(0.000)
AB stat. lag 2	-3.4	-3.9	-3.4
(p-value)	(0.001)	(0.000)	(0.001)
Sargan stat.	1,969.6	1,259.2	1,799.1
(p-value)	(0.000)	(0.000)	(0.000)

(CONTINUED)

Notes. The table reports summary statistics from dynamic panel data GMM regressions of the earnings-based cash flow forecasting model under hypothesis two, three, and four, respectively, calibrated to the overall sample (Equations [6.8], [6.9], and [6.10]). H2 = research hypothesis two; H3 = research hypothesis three; H4 = research hypothesis four.
Specifically, the table reports coefficient estimates, the use of firm fixed effects (*firmFE*) and year fixed effects (*yearFE*), the number of firm-year observations (*NT*), the number of firms (*N*), the average number of observations per firm (Avg. # of obs. / *N*), the number of instrumental variables (# of IVs), the R-squared (R^2), the adjusted R-squared (Adj. R^2), the Wald chi-square test statistic (Wald stat.), the Arellano-Bond z-statistic for the first and second lag, respectively (AB stat. lag 1 and AB stat. lag 2, respectively), and the Sargan test statistic (Sargan stat.). Robust standard errors of coefficient estimates are presented in parentheses below the coefficient estimates; p-values for test statistics are presented in parentheses below the respective test statistic.
[a] *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; $\Delta PROV$ is the one-period change in provisions; ΔAR is the one-period change in accounts receivable; ΔINV is the one-period change in inventory; and ΔAP is the one-period change in accounts payable. Predicted signs as described in Table 5.1.
Asterisks ** and *** indicate significance at the 0.05 and 0.01 level, respectively; two-tailed test.

The table shows the following key results:

- in all regressions, *all accruals' coefficients are significant*, R-squared measures are reasonably high, and the Wald test statistic is significant—coefficients belonging to operating cash flow, however, are not always significant; and
- in all regressions, *all accruals' coefficients show the expected sign*.

The key results indicate that the chosen accounting variables explain one-year-ahead operating cash flow *to a large extent*. Further findings obtained from the table are:

- in all regressions, the Arellano-Bond test statistic is significant when testing whether the cash flow forecasting model's residuals follow an autoregressive process of the first order; however:
- the test statistic is also significant when testing whether the cash flow forecasting model's residuals follow an autoregressive process of the second order.

These findings mean that it may be advisable to include a second lag of the explained variable into the model when testing the remaining hypotheses. A final result in the table is: in all regressions, the Sargan test statistics are significant. This result indicates that the chosen instrumental variables may not be fully valid.

The results of the estimation of the cash flow forecasting model under each of the remaining research hypotheses indicate that the cash flow forecasting model's

explanatory variables still explain one-year-ahead operating cash flow but to a lesser extent than the explanatory variables under the central hypothesis. As a result, the cash flow forecasting model under each of the remaining hypotheses is still suitable to generate residuals, but caution is required when drawing inferences from the residual analysis.

7.4.2 Step Two—Analysis of the Cash Flow Forecasting Model's Residuals

For the remaining research hypotheses, the cash flow forecasting model's residuals are only analyzed using the DID design and the residual model approach; that is, the pre-experimental designs and the goodness-of-fit approach are not used here. Table 7.6 reports summary statistics from a pooled OLS regression of the cash flow forecasting model's residuals. The table shows the following:

- the coefficients of the dummy variable *IFRS* are *positive* (H2: $\delta_1^{H2} = 0.004$; H3: $\delta_1^{H3} = 0.004$; and H4: $\delta_1^{H4} = 0.003$) and statistically significant at the 0.01 level;
- coefficients of accounting-related control variables are significant; and
- the F-tests are significant (F stat. for H2, H3, and H4 is 154.0, 173.7, and 149.6, respectively; p-value for all = 0.000)—the adjusted R-squared measures, however, are relatively low (Adj. R^2 for H2, H3, and H4 is 0.029, 0.043, and 0.028, respectively).

TABLE 7.6
TEST OF REMAINING HYPOTHESES—SUMMARY STATISTICS FROM A POOLED OLS REGRESSION OF THE CASH FLOW FORECASTING MODEL'S SQUARED RESIDUALS

Hypothesis Two:

$$\hat{\varepsilon}_{it}^2 = \alpha_0 + \delta_0 POST_t + \alpha_1 PUBLIC_i + \delta_1 IFRS_{it} + \alpha_2 OCF_{it} + \alpha_3 \Delta PROV_{it} + \alpha_4 \ln(TA_{it-1}) + \mu_{it}$$

Hypothesis Three:

$$\hat{\varepsilon}_{it}^2 = \alpha_0 + \delta_0 POST_t + \alpha_1 PUBLIC_i + \delta_1 IFRS_{it} + \alpha_2 OCF_{it} + \alpha_3 DEPRAMORT_{it} + \alpha_4 \Delta AR_{it} + \alpha_5 \Delta INV_{it} + \alpha_6 \ln(TA_{it-1}) + \mu_{it}$$

Hypothesis Four:

$$\hat{\varepsilon}_{it}^2 = \alpha_0 + \delta_0 POST_t + \alpha_1 PUBLIC_i + \delta_1 IFRS_{it} + \alpha_2 OCF_{it} + \alpha_3 \Delta AP_{it} + \alpha_4 \ln(TA_{it-1}) + \mu_{it}$$

Variable (predicted sign)[a]	H2 (1)	H3 (2)	H4 (3)
Intercept	0.032***	0.028***	0.031***
	(0.001)	(0.001)	(0.001)
POST	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)
PUBLIC	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
***IFRS* (+)**	**0.004*** **	**0.004*** **	**0.003*** **
	(0.001)	(0.001)	(0.001)
OCF	0.014***	0.017***	0.015***
	(0.001)	(0.001)	(0.001)
DEPRAMORT		0.045***	
		(0.004)	
$\Delta PROV$	0.024***		
	(0.005)		
ΔAR		0.025***	
		(0.003)	
ΔINV		0.019***	
		(0.002)	
ΔAP			0.009***
			(0.003)
ln(*TA_lagged*)	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)
firmFE	Yes	Yes	Yes
yearFE	Yes	Yes	Yes
NT	30,757	30,757	30,757
R^2	0.029	0.043	0.028
Adj. R^2	0.029	0.043	0.028
F stat.	154.0	173.7	149.6
(p-value)	(0.000)	(0.000)	(0.000)

(CONTINUED)

Notes. The table reports summary statistics from pooled OLS regressions of the earnings-based cash flow forecasting model's squared residuals (i.e., of the earnings-based cash flow forecasting model's *residual model*) under hypothesis two, three, and four, respectively. H2 = research hypothesis two; H3 = research hypothesis three; H4 = research hypothesis four.
Specifically, the table reports coefficient estimates, the use of firm fixed effects (*firmFE*) and year fixed effects (*yearFE*), the number of firm-year observations (*NT*), the R-squared (R^2), the adjusted R-squared (Adj. R^2), the F test statistic (F stat.) and the F test statistic's p-value. Robust standard errors of coefficient estimates are presented in parentheses below the coefficient estimates.
[a] *POST* is a dummy variable that equals one if observations are from the period after the IFRS introduction and zero otherwise; *PUBLIC* is a dummy variable that equals one if observations are from public firms and zero otherwise; *IFRS* is the interaction term of *POST* and *PUBLIC* representing the IFRS effect; *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; $\Delta PROV$ is the one-period change in provisions; ΔAR is the one-period change in accounts receivable; ΔINV is the one-period change in inventory; ΔAP is the one-period change in accounts payable; and ln(*TA_lagged*) is the natural logarithm of lagged total assets. Predicted sign of the *IFRS* dummy variable results from the central hypothesis specified in Subsection 5.2.
Asterisks *** indicate significance at the 0.01 level; two-tailed test.

7.5 Sensitivity Analyses

7.5.1 Overview

The result of the test of the central research hypothesis and, thus, the dissertation's main empirical finding presented in Table 7.4 is that the coefficient of the *IFRS* dummy variable, δ_1, is positive and significant, indicating that the IFRS introduction increased the cash flow forecasting model's prediction error. This result will be subjected to several sensitivity analyses. The dissertation performs sensitivity analyses with regard to (1) the estimation of the cash flow forecasting model; and (2) the analysis of the cash flow forecasting model's residuals.[271]

[271] Note that all sensitivity analyses are related to the central hypothesis only.

7.5.2 Step One—Estimation of the Cash Flow Forecasting Model

The regression results of Table 7.2 are obtained using the GMM estimation method which is implemented using Stata's "xtabond2" command with a particular set of specifications.[272] Table 7.7 details how the command is specified.

TABLE 7.7
ILLUSTRATION OF THE "XTABOND2" COMMAND SPECIFICATION

Issue	Specification chosen in command	Syntax in Stata
Use of estimator	Two-step estimator[a]	twostep
Type of standard errors with regard to heteroskedasticity and autocorrelation	Robust standard errors	robust
Number of lags of instrumental variables	One lag for transformed equation; one lag for levels equation	laglimits (1 1)
Limitation or no limitation of instrumental variables creation	Limitation	collapse
Equation using instrumental variables	Only the first-difference equation	equation (diff)
Form of the estimate of the covariance matrix of the idiosyncratic error term	Non-simple form	h(2)

Notes. The table illustrates the specification of the *xtabond2* command used to derive dynamic panel data GMM regression results in Table 7.2.
[a] For a discussion of the two-step estimator, see, for example, Windmeijer (2005), pp. 25-51.

To verify the results from Table 7.2, the estimation approach for the cash flow forecasting model is changed. Specifically:

- the cash flow forecasting model is estimated using the GMM estimation method but Stata's "xtdpdsys" command instead of the "xtabond2" command;
- the cash flow forecasting model is estimated using the GMM estimation method and Stata's "xtabond2" command—as in the main analysis—but with a *different set of specifications*; and
- the cash flow forecasting model is estimated using the OLS estimation method.

[272] The command uses a GMM estimator developed by Blundell & Bond (1998), pp. 115-143; Arellano & Bover (1995), pp. 29-51; Arellano & Bond (1991), pp. 277-297; and Holtz-Eakin, Newey, & Rosen (1988), pp. 1371-1395. (For a discussion of the command, see also Roodman (2009a), pp. 86-136.)

Results—GMM Estimation with the "xtdpdsys" command; GMM Estimation with a Different Set of Specifications

Untabulated results of GMM regressions using Stata's "xtdpdsys" command reveal that neither the magnitude nor the sign of the coefficients of the cash flow forecasting model's explanatory variables change significantly. The same insight is obtained when using the "xtabond2" command—that is, the command used in the main analysis—but a set of command specifications that differs from the one outlined in Table 7.7 (e.g., by using the one-step estimator instead of the two-step estimator, by using a different number of laglimits, or by using a different form of the estimate of the covariance matrix of the idiosyncratic error term). Thus, when estimating the cash flow forecasting model using a specification of the GMM estimation method that differs from the specification in the main analysis, the model's predictive power is not compromised. The finding gives additional comfort that the cash flow forecasting model is robust; its residuals can be used with confidence to measure changes in earnings' predictive power following the IFRS introduction.

Results—OLS Estimation

Table 7.8 reports summary statistics from OLS regressions of the cash flow forecasting model under the central hypothesis. As in the GMM case, the model is calibrated to the overall sample and the four subsamples representing the four states of interest. Specifically, the first, second, third, fourth, and fifth regression represents the overall sample, subsample one (*public* firms in the *pre*-event period), subsample two (*public* firms in the *post*-event period), subsample three (*private* firms in the *pre*-event period), and subsample four (*private* firms in the *post*-event period), respectively. The table shows the following:

- similar to the case of GMM estimation, most but not all of the explanatory variables' coefficients are statistically significant—R-squared measures, however, are low even though F test statistics, when available, are significant; and
- unlike in the case of GMM estimation, most of the explanatory variables' coefficients do not show the expected sign.

TABLE 7.8
SENSITIVITY TEST OF CENTRAL HYPOTHESIS—SUMMARY STATISTICS FROM FIXED-EFFECTS (WITHIN) OLS REGRESSIONS OF THE CASH FLOW FORECASTING MODEL CALIBRATED TO THE OVERALL SAMPLE AND EACH SUBSAMPLE

$$OCF_{it+1} = \beta_0 + \beta_1 OCF_{it} + \beta_2 DEPRAMORT_{it} + \beta_3 \Delta PROV_{it} + \beta_4 \Delta AR_{it} + \beta_5 \Delta INV_{it} + \beta_6 \Delta AP_{it} + firmFE + yearFE + \varepsilon_{it+1}$$

Variable (predicted sign)a	Overall (1)	Public pre (2)	Public post (3)	Private pre (4)	Private post (5)
Intercept (?)	0.076***	0.053	0.114***	0.074***	0.102***
	(0.004)	(0.048)	(0.009)	(0.007)	(0.006)
OCF (+)	-0.082***	-0.093**	-0.093**	-0.104***	-0.180***
	(0.011)	(0.042)	(0.042)	(0.015)	(0.016)
DEPRAMORT (-)	0.271***	0.370***	-0.284**	0.204***	0.072
	(0.045)	(0.098)	(0.132)	(0.067)	(0.093)
Δ*PROV* (-)	0.085***	0.142	-0.110	0.155***	0.070
	(0.03)	(0.112)	(0.109)	(0.044)	(0.05)
Δ*AR* (+)	0.163***	0.099	0.225***	0.127***	0.185***
	(0.018)	(0.107)	(0.061)	(0.027)	(0.028)
Δ*INV* (+)	-0.016	-0.104*	-0.055	-0.068***	0.030*
	(0.013)	(0.059)	(0.07)	(0.019)	(0.018)
Δ*AP* (-)	-0.270***	-0.153*	-0.308***	-0.237***	-0.254***
	(0.022)	(0.093)	(0.102)	(0.032)	(0.032)
firmFE	Yes	Yes	Yes	Yes	Yes
yearFE	Yes	Yes	Yes	Yes	Yes
NT	30,757	1,944	1,906	15,275	11,632
N	5,707	224	588	3,071	3,135
Avg. # of obs. / *N*	5.4	8.7	3.2	5.0	3.7
R^2	0.041	0.037	0.064	0.038	0.086
Adj. R^2	0.040	0.024	0.055	0.036	0.085
Ov. R^2	0.000	0.000	0.000	0.000	0.000
F stat.	24.4	NA	3.1	12.7	NA
(p-value)	0.000	NA	0.000	0.000	NA

Notes. The table reports summary statistics from fixed-effects (within) OLS regressions of the earnings-based cash flow forecasting model (Equation [6.7]) calibrated to different subsamples. (1) = overall sample; (2) = public firms in the pre-event period; (3) = public firms in the post-event period; (4) = private firms in the pre-event period; (5) = private firms in the post-event period. Specifically, the table reports coefficient estimates, the use of firm fixed effects (*firmFE*) and year fixed effects (*yearFE*), the number of firm-year observations (*NT*), the number of firms (*N*), the average number of observations per firm (Avg. # of obs. / *N*), the R-squared (R^2), the adjusted R-squared (Adj. R^2), the overall R-squared (Ov. R^2), and the F test statistic (F stat.). Robust standard errors of coefficient estimates are presented in parentheses below the coefficient estimates; p-values for test statistics are presented below the respective test statistic.

[a] *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; Δ*PROV* is the one-period change in provisions; Δ*AR* is the one-period change in accounts receivable; Δ*INV* is the one-period change in inventory; and Δ*AP* is the one-period change in accounts payable. Predicted signs as described in Table 5.1.

Asterisks *, **, and *** indicate significance at the 0.1, 0.05 and 0.01 level, resp.; two-tailed test.

The results indicate that the chosen accounting variables explain the one-year-ahead operating cash flow, but to a lesser extent than in the GMM estimation case. The fact that the results of the OLS estimation are less substantial than the results of the GMM estimation does not come as a surprise; due to endogeneity, OLS estimation is only of limited use in the dissertation. Nevertheless, the sensitivity analysis related to the cash flow forecasting model using OLS estimation gives comfort that the cash flow forecasting model is correctly specified.

7.5.3 Step Two—Analysis of the Cash Flow Forecasting Model's Residuals

The dissertation's main result—reported in Table 7.4—is that the *IFRS* dummy variable's coefficient, δ_1, is positive and significant, indicating that the IFRS introduction increased the cash flow forecasting model's prediction error. The regression results of Table 7.4 are obtained using a *pooled OLS regression* of squared residuals on DID design-specific dummy variables—*POST*, *PUBLIC*, and *IFRS*—as well as on the cash flow forecasting model's accounting variables. To verify the results, the following sensitivity analyses are undertaken:

- (1) the residual model is estimated using a *random-effects GLS regression*;
- (2) the residual model is estimated using a *fixed-effects (within) OLS regression*; and
- (3) other sensitivity analyses are performed. These include:
    a. the estimation of the residual model using a pooled OLS regression but *no control variables*; and
    b. the estimation of the residual model using a pooled OLS regression (and control variables) but a *different residual vector*.[273]

Results—Random Effects GLS Regression and Fixed-Effects (within) OLS Regression

Table 7.9 reports the results of the sensitivity analyses.

[273] Recall that the residual vector in the residual model of Table 7.4 encompasses the four individual residual vectors from the calibration of the cash flow forecasting model to the four individual subsamples. Here, a residual vector is used that results from the calibration of the cash flow forecasting model to the *overall sample* only.

TABLE 7.9
SENSITIVITY TEST OF CENTRAL HYPOTHESIS—SUMMARY STATISTICS FROM A RANDOM-EFFECTS GLS REGRESSION AND A FIXED-EFFECTS (WITHIN) OLS REGRESSION OF THE CASH FLOW FORECASTING MODEL'S SQUARED RESIDUALS

$$\hat{\varepsilon}_{it}^2 = \alpha_0 + \delta_0 POST_t + \alpha_1 PUBLIC_i + \delta_1 IFRS_{it} + \alpha_2 OCF_{it} + \alpha_3 DEPRAMORT_{it} + \alpha_4 \Delta PROV_{it} + \alpha_5 \Delta AR_{it} + \alpha_6 \Delta INV_{it} + \alpha_7 \Delta AP_{it} + \alpha_8 \ln(TA_{it-1}) + \mu_{it},$$

Variable (predicted sign)[a]	Random effects (1)	Fixed effects (2)
Intercept	0.034***	0.093***
	(0.002)	(0.005)
POST	-0.002***	0.000
	(0.000)	(0.000)
PUBLIC	0.001	0.000
	(0.001)	NA
***IFRS* (+)**	**0.002****	**0.002**
	(0.001)	(0.001)
OCF	0.011***	0.007***
	(0.001)	(0.002)
DEPRAMORT	0.018***	-0.002
	(0.005)	(0.007)
Δ*PROV*	0.007	0.006
	(0.005)	(0.005)
Δ*AR*	0.015***	0.006**
	(0.003)	(0.003)
Δ*INV*	0.013***	0.006***
	(0.002)	(0.002)
Δ*AP*	-0.013***	-0.016***
	(0.003)	(0.004)
ln(*TA_lagged*)	-0.002***	-0.007***
	(0.000)	(0.000)
firmFE	Yes	Yes
yearFE	Yes	Yes
NT	30,757	30,757
N	5,707	5,707
Avg. # of obs. / *N*	5.4	5.4
Wald stat.	522.0	NA
(p-value)	(0.000)	(0.000)
F stat.	NA	46.0
(p-value)	(0.000)	(0.000)
Ov. R^2	0.029	0.016

(CONTINUED)

Notes. The table reports summary statistics from a random-effects GLS regression (regression (1)) and a fixed-effects (within) OLS regression (regression (2)) of the earnings-based cash flow forecasting model's squared residuals (i.e., of the earnings-based cash flow forecasting model's *residual model*—Equation [6.15]). The regression uses the residuals of the cash flow forecasting model calibrated to the overall sample.
Specifically, the table reports coefficient estimates, the use of firm fixed effects (*firmFE*) and year fixed effects (*yearFE*), the number of firm-year observations (*NT*), the number of firms (*N*), the average number of observations per firm (Avg. # of obs. / *N*), the Wald chi-square test statistic (Wald stat.), the Wald test statistic's p-value, the F test statistic (F stat.), the F test statistic's p-value, and the overall R-squared (Ov. R^2). Robust standard errors are presented in parentheses below the coefficient estimates.
[a] *POST* is a dummy variable that equals one if observations are from the period after the IFRS introduction and zero otherwise; *PUBLIC* is a dummy variable that equals one if observations are from public firms and zero otherwise; *IFRS* is the interaction term of *POST* and *PUBLIC* representing the IFRS effect; *OCF* is operating cash flow; *DEPRAMORT* is depreciation and amortization expense; $\Delta PROV$ is the one-period change in provisions; ΔAR is the one-period change in accounts receivable; ΔINV is the one-period change in inventory; ΔAP is the one-period change in accounts payable; and ln(*TA_lagged*) is the natural logarithm of lagged total assets. Predicted sign of the *IFRS* dummy variable results from the central hypothesis specified in Subsection 5.2.
Asterisks ** and *** indicate significance at the 0.05 and 0.01 level, respectively; two-tailed test.

The table shows that the coefficient of the dummy variable *IFRS* remains positive and significant when estimating the residual model using *random effects* ($\delta_1 = 0.002^{**}$), but becomes positive and *insignificant* when estimating the residual model using *fixed effects* ($\delta_1 = 0.002$).

Results—No Control Variables; Different Residual Vector

Untabulated results of the estimation of the residual model using a pooled OLS regression but *no control variables* and the estimation of the residual model using a pooled OLS regression (and control variables) but a *different residual vector* also *confirm* the result in the main analysis.

7.6 Summary and Interim Conclusions

Test of the Central Research Hypothesis

The central hypothesis was tested by (1) estimating the cash flow forecasting model (calibrated to different samples); and (2) by analyzing the cash flow forecasting model's residuals using two pre-experimental research designs as well as the experimental DID design.

1) *Estimation of the Cash Flow Forecasting Model*

The result of the cash flow forecasting model's GMM estimation shows that the chosen explanatory variables (current *operating cash flow* and various current *accruals*) very well explain *one-year-ahead operating cash flow* (Table 7.2). This result indicates that the cash flow forecasting model's residuals are suitable for an analysis of the IFRS effect. The result of the cash flow forecasting model's OLS estimation (sensitivity analyses, Table 7.8) confirms the result of Table 7.2 to a large extent.

2) *Analysis of the Cash Flow Forecasting Model's Residuals—Pre-Experimental Designs*

The result of the analysis of the cash flow forecasting model's residuals under the two *pre-experimental research designs* and the *goodness-of-fit approach* does not support the notion that the IFRS introduction increased the cash flow forecasting model's prediction error and thus deteriorated earnings' predictive power. However, as these designs rely on strong assumptions the results only provide a *first indication* of the presence (or absence) and direction of the IFRS effect.

3) *Analysis of the Cash Flow Forecasting Model's Residuals—DID Design*

The dissertation's main finding—the result of the analysis of the cash flow forecasting model's residuals under the DID research design and the residual model approach using a pooled OLS regression—shows that the coefficient of the *IFRS* dummy variable, δ_1, is positive and significant ($\delta_1 = 0.003$; significant at the 0.01 level of significance—Table 7.4). A sensitivity analysis using a random-effects GLS regression confirms this result ($\delta_1 = 0.002$; significant at the 0.05 level of significance—regression (1) in Table 7.9). The two results indicate that the IFRS introduction has *increased* the cash flow forecasting model's prediction error and thus *deteriorated* earnings' predictive power.

Despite the fact that the results of the residual analysis point at a clear deterioration of earnings' predictive power following the IFRS introduction, the empirical results nevertheless have some minor caveats. Specifically, the following two limitations apply:

- (1) the R-squared measures of both the pooled OLS regression and the fixed-effects (within) OLS regression are rather small (Table 7.4: R-squared = 0.032; Adj. R-squared = 0.032; Table 7.9, regression (1): overall R-squared = 0.029); and
- (2) a sensitivity test of the residual model using a fixed-effects (within) OLS regression renders the coefficient of the *IFRS* dummy variable insignificant (δ_1 = 0.002; overall R-squared = 0.016—regression (2) in Table 7.9).

Test of the Remaining Research Hypotheses

The remaining hypotheses were tested by (1) estimating the cash flow forecasting model (calibrated to different samples); and (2) by analyzing the cash flow forecasting model's residuals using the DID design only.

1) *Estimation of the Cash Flow Forecasting Model*

The result of the cash flow forecasting model's GMM estimation shows that the chosen explanatory variables—except current operating cash flow in the case of H2 and H4—explain one-year-ahead operating cash flow (Table 7.5). This result indicates that the cash flow forecasting model's residuals are suitable for an analysis of the IFRS effect under each of the remaining hypotheses, even though to a lesser extent than in the case of the central hypothesis.

2) *Analysis of the Cash Flow Forecasting Model's Residuals—DID Design only*

The result of the analysis of the cash flow forecasting model's residuals under the *DID design* and the *residual model approach* using a pooled OLS regression shows that the coefficient of the *IFRS* dummy variable, δ_1, is positive and significant for each of the remaining hypotheses ($\delta_1^{H2} = 0.004$; $\delta_1^{H3} = 0.004$; and $\delta_1^{H4} = 0.003$; significance at the 0.01 level of significance for all hypotheses—Table 7.6). (The remaining hypotheses express the expectation that different accruals react differently to the IFRS introduction.) The results indicate that the IFRS introduction has *increased* the cash flow forecasting model's prediction error and thus *deteriorated* earnings' predictive power. Specifically:

- Under hypothesis *two* it was hypothesized that earnings' predictive power exhibits a *relatively smaller decline*, compared to the expected decline under the central

hypothesis, when using accrual subset *one* (i.e., provisions only).[274] This hypothesis is *not supported* as the decline was more severe than under the central hypothesis ($\delta_1^{H2} = 0.004 > \delta_1 = 0.003$).

- Under hypothesis *three* it was hypothesized that earnings' predictive power exhibits a *relatively larger decline*, compared to the expected decline under the central hypothesis, when using accrual subset *two* (i.e., depreciation and amortization expense, accounts receivable, and inventory).[275] This hypothesis is *supported* as the decline was indeed more severe than under the central hypothesis ($\delta_1^{H3} = 0.004 > \delta_1 = 0.003$).
- Under hypothesis *four* it was hypothesized that earnings' predictive power *does not change* when using accrual subset *three* (i.e., accounts payable only).[276] This hypothesis is *not supported* as there was a decline in earnings' predictive power ($\delta_1^{H4} = 0.003 \neq 0$).

Overall Summary of Empirical Results and Interim Conclusion

In summary, considering the result of the residual analysis under the central hypothesis (Table 7.4), the result of the residual analysis under the remaining hypotheses (Table 7.6), and the result of the sensitivity analyses (Table 7.9) it can be concluded that the cash flow forecasting model's prediction error has increased, thereby deteriorating earnings' predictive power of public German firms. This result also holds for the remaining hypotheses where, in some cases, only a moderate decline or no change of earnings' predictive power was expected. The following statement summarizes the dissertation's overall result:

[274] The relatively smaller decline was hypothesized as the analysis of differences between the HGB and IFRS system with regard to management discretion (Subsection 5.1.1) had revealed that differences are only moderate for provisions.

[275] The relatively larger decline was hypothesized as the analysis in Subsection 5.1.1 had revealed that differences between the HGB and IFRS system are significant with regard to these accruals (especially with regard to *amortization expense* and *accounts receivable*).

[276] The null effect was hypothesized as no differences between the HGB and IFRS were found with regard to *accounts payable*.

OVERALL RESULT OF THE DISSERTATION'S EMPIRICAL ANALYSIS

The analysis of the earnings-based cash flow forecasting model's residuals under different research hypotheses has shown that the coefficient of the *IFRS* dummy variable in the residual model is *positive and significant*, thereby indicating that the cash flow forecasting model's prediction error *has increased*; sensitivity analyses confirm the result to a large extent.

The dissertation's research question was: Does earnings' predictive power *change* following the IFRS introduction for public German firms when measuring earnings' predictive power using a disaggregated, earnings-based cash flow forecasting model? The results of the empirical analysis lead to a *positive answer* for this question.

The dissertation's central research hypothesis was: Earnings' predictive power *decreases* following the IFRS introduction for public German firms when measuring earnings' predictive power using a disaggregated, earnings-based cash flow forecasting model and the *full* set of accruals (i.e., depreciation expense, amortization expense, provisions, accounts receivable, inventory, and accounts payable). In light of all evidence, the results indicate that public German firms' earnings' predictive power has *deteriorated* following the IFRS introduction. Thus, the dissertation's central research hypothesis is *supported*.

8 Discussion

This section provides a detailed discussion of the results obtained in the empirical analysis. The discussion follows the aims established in Subsection 2.2.2.

Aim One

The dissertation's primary aim was to empirically examine the association between the IFRS introduction and financial statement quality of public German firms. This aim was achieved by operationalizing the broad concept of *financial statement quality* using *earnings quality* and ultimately the specific concept of *earnings' predictive power* with regard to forecasting operating cash flow. The use of this specific concept constitutes a considerable contribution to the empirical financial accounting literature as only a very limited number of studies investigate the IFRS effect this way.[277] The dissertation's main empirical result was derived using a disaggregated earnings-based cash flow forecasting model under an experimental difference-in-differences design which takes a control group of private firms explicitly into account; changes in the model's prediction error were not only derived by using a simple analysis of R-squared measures but by using a *residual model*. The use of a difference-in-differences design as well as the use of a residual model constitutes another considerable contribution to the empirical financial accounting literature.[278]

The dissertation's main empirical result was that earnings' predictive power with regard to forecasting operating cash flow has deteriorated following the IFRS introduction. This finding means that the switch from the HGB system—a system limiting discretionary accrual choices—to the IFRS system—a system providing extensive discretionary accrual choices—has deteriorated accrual quality. As accruals

[277] See the literature review in Subsection 4.2.

[278] For example, Atwood, et al. (2011), one of the few studies directly comparable to the dissertation, use earnings' predictive power as a proxy for financial statement quality but do not use a difference-in-differences design and thus private firms in the analysis. Further, the study does not use a residual model when determining changes in the cash flow forecasting model's prediction error.

are the main component of earnings[279], the finding also means that earnings quality and, ultimately, financial statement quality has deteriorated.

The dissertation's main empirical result contrasts studies in the IFRS-related accounting literature that find an improvement in financial statement quality following the IFRS introduction (e.g., Daske, et al. (2013); Horton, et al. (2013); Barth, et al. (2012); Armstrong, et al. (2010); and Barth, et al. (2008)) and supports studies that find a deterioration in financial statement quality following the IFRS introduction (e.g., Ahmed, et al. (2013); Capkun, et al. (2013); Chen, et al. (2010); Christensen, et al. (2008); and van Tendeloo & Vanstraelen (2005)). Given that there is considerable uncertainty among accounting practitioners and academics as to whether the IFRS introduction has improved the quality of public German firms' financial statements relative to the quality level that existed under the HGB system, the dissertation's main empirical result contributes to the IFRS debate and reduces that uncertainty by providing a further piece of evidence on the IFRS effect.

Aim Two and Aim Three

The dissertation's second aim is to explain why there is or is not an association between the IFRS introduction and financial statement quality of public German firms and, if an association is observed, to explain its direction; the dissertation's third aim is to predict what would happen if the IFRS mandate were extended to firms currently not required to apply the IFRS system. Achieving these two aims requires positive accounting theory.[280]

In accounting, two positive theories dominate: the contracting view (also denoted as the theory of the firm) and the theory of regulation.[281] The *contracting* view is primarily concerned with corporations and related agency problems. The theory of

---

[279] Recall that the dissertation assumes the other component of earnings—cash flow—to be constant as management does not have any significant discretion with regard to this variable.

[280] As WATTS and ZIMMERMAN put it: "The objective of [positive] accounting theory is to explain and predict accounting practice. […] Explanation means providing reasons for observed practice. […] Prediction of accounting practice means that the theory predicts unobserved accounting phenomena." (Watts & Zimmerman (1986), p. 2; emphases removed). Positive accounting theory was primarily developed by the authors (see Watts & Zimmerman (1978), pp. 112-134; Watts & Zimmerman (1979), pp. 273-305; Watts & Zimmerman (1986); and Watts & Zimmerman (1990), pp. 131-156; see also Kinney Jr (1986), p. 339).

[281] Watts & Zimmerman (1986), pp. 353-354; the authors' note that theories in accounting gradually evolved from economic theory.

regulation is primarily concerned with the political process and wealth transfers.[282] The dissertation addresses the stated research problem primarily from the perspective of fundamental investors of public German firms—firms facing agency problems due to their corporate organizational form. Fundamental investors of public firms perform their own valuation and demand a reliable anchor for their cash flow forecasts—a goal only achieved if the stewardship role in accounting is emphasized and management does not make opportunistic discretionary accrual choices. Given this perspective, the dissertation confines its attention to the contracting view in accounting to explain its empirical results and to predict outcomes if the IFRS mandate were extended.

The contracting view in accounting is concerned with the impact of agency problems on the principals' willingness to enter contractual relationships with agents. (In the presence of agency problems, principals are reluctant to enter contracts with agents.) The contracting view holds that agency problems and ultimately information asymmetry can be mitigated by means of preparing and publicly disseminating high-quality financial statements. Thus, high-quality financial statements provide incentives for principals to enter contracts and fulfill a contracting role.[283] Examples of contracts for which financial statement information plays a key role are employment contracts between shareholders and top-level managers and lending agreements between debtholders and management.

In essence, the contracting view is another form of the principal-agent theory. As noted in Subsection 2.1, investors (i.e., principals) of public firms have less information than managers (i.e., agents) and, thus, face the risk that agents will not act in their best interest. In the context of the IFRS introduction, this risk means that managers may use the larger amount of accrual choices granted by the IFRS system to make assumption and estimates in an opportunistic way instead of using their increased margin of discretion to better inform investors about the economic transactions that occurred during the fiscal year. Given the dissertation's empirical result that financial statement quality of public German firms has deteriorated, the contracting view in accounting provides a convincing explanation for the observed phenomenon.

[282] Watts & Zimmerman (1986), p. 354.
[283] Watts & Zimmerman (1986), pp. 196-199.

Under the contracting view in accounting, the dissertation's main empirical result (that the IFRS introduction has reduced financial statement quality) suggests that information asymmetry between public German firms' investors and managers has widened due to opportunistic management behavior when determining accruals. Thus, the dissertation arrives at the overall conclusion that the IFRS introduction has not resulted in benefits for investors and other contractually related parties of German firms. This result has several implications in areas where financial statements are used as the basis for the formulation of contracts. For example:

- assessing the performance of top-level managers and determining suitable executive compensation has become more costly for principals[284];
- determining breaches of accounting-based debt covenants in lending agreements has become more difficult for debtholders[285];
- determining the suitable amount of dividend payments has become more difficult for investors[286]; and
- performing financial statement analyses has become more difficult for financial analysts.[287]

Consequently, with regard to a possible extension of the IFRS mandate to firms that are currently not subject to it[288], the dissertation arrives at the conclusion that such an extension would further widen information asymmetry between principals and agents in Germany.

Aim Four

The dissertation's fourth aim is to make policy recommendations that help standard-setting bodies (e.g., the IASB or the German legislator) develop optimal accounting principles and rules that can ultimately be used to prescribe how accounting practitioners should form their accounting. Establishing such an aim relies on the

[284] Brüggemann, et al. (2013), pp. 23-24; see also Ozkan, Singer, & You (2012), pp. 1077-1107 for an empirical analysis of the IFRS introduction's effect on executive compensation.
[285] Brüggemann, et al. (2013), pp. 24-25.
[286] Recall from Subsection 2.1 that investors use *consolidated* net income as a basis to form expectations about dividend payments that are made out of the parent company's *stand-alone* financial statements; if consolidated net income becomes less informative, forming these expectations will be more difficult.
[287] Küting, et al. (2013), p. 284.
[288] For example, public firms preparing unconsolidated financial statements, private firms, and public firms that are not currently subject to the IFRS system due to a listing in a foreign country such as the U.S.; see Subsection 2.2.2 for details.

assumption that the observed deterioration in financial statement quality is mainly attributable to a deterioration in GAAP quality (i.e., to the fact that the IFRS system is generally of lower quality than the HGB system). Putting it differently, establishing such an aim relies on the assumption that factors that may affect financial statement quality, other than GAAP quality, have remained constant. These factors may generally be divided into two distinct categories: institutional factors and management-related factors. Key *institutional factors* are:[289]

- the quality of the GAAP enforcement system (e.g., the quality of GAAP enforcement by government authorities and stock exchanges);
- the sophistication of capital markets (i.e., the presence or absence of active and well-developed capital markets); and
- the quality of auditors (i.e., the level of auditor scrutiny).

Key *management-related factors* are:[290]

- management's willingness to represent business transactions opportunistically;
- management's willingness to arrange business transactions opportunistically[291]; and
- management's willingness to engage in illegal, fraudulent behavior (e.g., to illegally manipulate source documents arising from business transactions).

The dissertation makes the assumption that a detected change in financial statement quality following the IFRS introduction is primarily driven by a change in GAAP quality and not by a change in the other factors.[292] Under this assumption, the finding that financial statement quality has deteriorated following the IFRS introduction can

[289] It is not intended to provide a complete list of possible institutional factors. The institutional factors considered here are commonly mentioned in the accounting literature (for a general discussion, see Penman (2013), pp. 593-594; Burgstahler, et al. (2006), pp. 983-1016; and Ball, et al. (2000), pp. 1-51). For specifics on enforcement, see, Christensen, Hail, & Leuz (2013a), pp. 1-52; Christensen, Hail, & Leuz (2013b), pp. 147-177; Ernstberger, Stich, & Vogler (2012), pp. 217-251; Hitz, Ernstberger, & Stich (2012), pp. 253-281; and Holthausen (2009), pp. 447-458.

[290] Penman (2013), pp. 593-594.

[291] Management may arrange business transactions in a way that their representation in financial statements appears more favorable than they actually are; Schildbach, Stobbe, & Brösel (2013) use the term *Urbildspielraum* when referring to this phenomenon (p. 35).

[292] At first sight, the assumption that only GAAP quality has changed during the sample period from 1987 through 2013 may seem strong. However, it should be noted that the dissertation uses a highly sophisticated research design—the difference-in-differences design—which only requires that factors influencing firms' financial statement quality affect public and private German firms *equally*. This property of the research design attenuates the assumption considerably.

directly be attributed to the lower quality level of the IFRS system relative to the HGB system.

Achieving the dissertation's fourth aim requires a normative (or prescriptive) accounting framework. The purpose of such a framework is to prescribe how legislators and private standard-setting bodies should design accounting principles and rules. As WATTS and ZIMMERMAN note:

> […] the objective of [normative] theory appears to be the production of prescriptions for government accounting policy (i.e., for accounting standards and regulation of disclosure).[293]

In the methodological accounting literature, the question as to whether academic research can contribute to standard-setting issues has been widely discussed. One view holds that academic research is irrelevant to standard setting bodies as the development of accounting principles and rules—which constitute a public good—requires a decision as to what societal party should benefit from a particular standard to the detriment of other societal parties (i.e., as to what social preferences should be emphasized over others); the view holds that science cannot contribute to the specification of social preferences.[294] Proponents of another view—while agreeing that science cannot contribute to the specification of social preferences—hold that science may nevertheless contribute to standard-setting issues by providing insights as to how standards should be developed and to verify whether their standards have resulted in the desired outcome. As BARTH puts it:

> […] research can provide insights into standard setting issues by operationalizing the criteria the standard setters establish for deciding among alternatives when developing standards, such as relevance and reliability.[295]

Similarly, TROMBETTA, WAGENHOFER, and WYSOCKI:

> […] academic research is a valuable resource that can help standard setters

[293] Watts & Zimmerman (1986), p. 338.
[294] Barth (2006), pp. 77-78; based on Gonedes & Dopuch (1974), pp. 48-129.
[295] Barth (2006), p. 72; similarly: Trombetta, Wagenhofer, & Wysocki (2012), p. 128; and Fülbier, Hitz, & Sellhorn (2009), p. 458.

understand the possible effects of accounting standards.[296]

The dissertation takes the view that empirical financial accounting research can inform standard setters and thus provides policy recommendations to standard-setting bodies based on the obtained empirical results.

The dissertation's normative accounting framework is based on the view that accounting principles and rules should lead to accounting amounts that truly reflect underlying economic transactions. This view implies that accounting amounts should be prepared under the stewardship role of accounting and a particular focus on reliability. Given the empirical results of the dissertation which suggest that the IFRS introduction has deteriorated financial statement quality, and further given that the IASB's accounting principles and rules emphasize the valuation role of accounting and the related relevance principle over the stewardship role of accounting and reliability, the dissertation derives the recommendation to further revise the IASB's existing conceptual framework and accounting standards in a way that stewardship and reliability will receive more emphasis. Achieving such a revision mainly implies restricting the use of fair value accounting to situations in which fair values can be derived using Level 1 inputs.

Limitations and Suggestions for Future Research

Several limitations may impede the interpretation of the dissertation's empirical results. First, the dissertation makes the assumption that factors related to financial statement quality other than GAAP quality (e.g., legal enforcement or auditor quality) have remained unchanged. If these other factors changed considerably, inferring from the detected deterioration of financial statement quality to a lower quality level of the IFRS system may be challenging. However, as noted above, the use of the difference-in-differences design attenuates the assumption considerably as it allows a change in these other factors as long as they affect public and private firms *simultaneously and with the same magnitude* (recall from Subsection 6.3.4.1.3 that the difference-in-

[296] Trombetta, et al. (2012), p. 143; proponents of the second view acknowledge, however, that academic research cannot make recommendations with regard to specific standards. Rather, research aids in identifying issues, helping standard setters structure their thinking about a particular issue, and providing research evidence that informs the debate about an issue." (Barth (2006), p. 84).

differences design allows differences between the treatment and control group as long as these differences are *constant*). Further, the dissertation uses a one-country design, thereby mitigating the influence of these other factors even more. Second, the dissertation exclusively focuses on only one dimension of financial statement quality—transparency (i.e., the ability of accounting amounts to serve as a reliable anchor for fundamental investors when forecasting operating cash flow). Another dimension of financial statement quality is comparability. If these two dimensions are not independent of each other, interpreting the empirical results from the perspective of cash flow forecasting alone may be challenging. Third, the dissertation focuses on the IAS Regulation and thus on EU-endorsed IFRS only. Given that the IFRS have been introduced in many countries around the world and that other countries have made changes to the IFRS so that the EU-endorsed IFRS differ from non-EU-endorsed IFRS, an analysis in a non-EU setting may yield different results. Finally, the dissertation uses both public and private German firms. While the explicit use of private firms constitutes a significant contribution to the accounting literature, the use of this type of firms also introduces the risk of having two groups of firms in the sample that differ from each other in a fundamental way. However, as discussed in Section 6, the use of firm fixed effects and the use of normalized variables (variables divided by lagged total assets) mitigates these differences. Also, very small private firms were excluded from the sample.

From these limitations, the dissertation makes the following suggestions for future research. First, one may conduct the empirical analysis in a non-EU setting to examine the association between non-EU versions of the IFRS system and financial statement quality. Second, one may exclude more private firms from the sample to further narrow the gap in firm size between public and private firms.

Has the IFRS introduction been a success? One may argue that the use of a single set of accounting standards in more than 100 countries around the world has led to enhanced comparability of financial statements and, thus, to more integrated capital markets. While this argument may be true—mandating the application of common accounting rules enhances financial statement comparability almost by definition—

enhanced comparability alone does not make this significant accounting regime change economically justifiable. Given the significant increase in accounting costs for firms that had to switch from local accounting rules to IFRS—especially in countries having local rules that are fundamentally different from the IFRS rules such as Germany—the IFRS introduction is only economically justifiable if IFRS financial statements have also become more *transparent.* Transparency, however, has not improved.

9 Executive Summary

1. The dissertation addresses the problem of uncertainty as to whether the IFRS introduction has improved the quality of public German firms' financial statements relative to the quality level that existed under the HGB system. The research problem is important as accounting practitioners and academics have contentiously been debating the success of the IFRS introduction. The debate centers around the question of whether the extensive use of the fair value measurement concept is feasible or not. Relative to the HGB system, the IFRS system allows the extensive use of fair values—in particular fair values derived using data inputs that exclusively rely on management assumptions and estimates (i.e., Level 3 inputs); IFRS critics, therefore, hypothesize that the accounting regime change will result in a deterioration of public German firms' financial statement quality. The dissertation follows the IFRS critics' argument and formulates its hypotheses accordingly.

2. The dissertation is primarily focused on fundamental investors (i.e., on shareholders and debtholders demanding financial statements as an anchor to forecast operating cash flow in the context of valuation); nevertheless, the dissertation's audience also comprises other contractually-related parties of public German firms (e.g., employees, suppliers, and customers of long-lived products) and even non-contractually related parties of public German firms (e.g., standard-setting bodies, audit firms, financial analysts, rating agencies, and academics).

3. The dissertation establishes four aims: (1) to empirically examine the association between the IFRS introduction and financial statement quality of public German firms; (2) to explain why there is or is not an association between the IFRS introduction and financial statement quality of public German firms and, if an association is observed, to explain its direction; (3) to predict what would happen if the IFRS mandate were extended to firms currently not required to apply the IFRS system; and (4) to make policy recommendations that help standard-setting bodies (e.g., the IASB or the German legislator) develop optimal accounting

principles and rules that can ultimately be used to prescribe how accounting practitioners should form their accounting.

4. Following the insight that the accrual basis of accounting is superior to the cash basis of accounting in the context of valuation, that is, following the insight that current earnings are superior to current operating cash flow in anchoring cash flow forecasts, the dissertation operationalizes the broad concept of financial statement quality with earnings quality. As a consequence, the dissertation utilizes an earnings-based (as opposed to a cash-based) cash flow forecasting model when measuring the impact of the IFRS introduction on financial statement quality. An earnings-based cash flow forecasting model explains the dependent variable, one-year-ahead operating cash flow, with current earnings.

5. Earnings-based cash flow forecasting models may be used in the aggregated or disaggregated form. The dissertation provides a discussion of the relative usefulness of aggregation and disaggregation and arrives at the result that disaggregated current earnings yield higher predictive power than aggregated current earnings when forecasting operating cash flow. Using this insight, the dissertation employs a disaggregated (as opposed to an aggregated) earnings-based cash flow forecasting model when measuring the impact of the IFRS introduction on financial statement quality. Such a disaggregated earnings-based cash flow forecasting model explains the dependent variable—one-year-ahead operating cash flow—with components of current earnings—current operating cash flow and current accruals—and also decomposes the accrual component of earnings into various individual accrual items.

6. Having established the usefulness of a disaggregated earnings-based cash flow forecasting model, the dissertation formulates the following research question: Does earnings' predictive power with regard to forecasting operating cash flow change following the IFRS introduction for public German firms when measuring earnings' predictive power using a disaggregated earnings-based cash flow forecasting model?

7. The dissertation provides a literature review featuring key studies investigating the impact of the IFRS introduction on financial statement quality. The literature review reveals that IFRS-related studies use a wide range of proxies to operationalize financial statement quality but generally fail to use earnings' predictive power with regard to forecasting operating cash flow and a disaggregated earnings-based cash flow forecasting model. Thus, the dissertation's main contribution is to close this gap in the literature by using earnings' predictive power as a proxy for financial statement quality and by using a disaggregated earnings-based cash flow forecasting model as a measurement tool. Other contributions are: (1) the use of a difference-in-differences design; (2) the use of a residual model when measuring changes in the model's prediction error; (3) the use of a statistical test to determine whether differences between R-squared measures from regressions on different subsamples are significant; (4) the use of a high-quality and rarely used IFRS-specific database (i.e., Deutsche Bundesbank's USTAN data base); (5) the focus on a country in which differences between local accounting rules and IFRS are significant (i.e., Germany); (6) the inclusion of both voluntary *and* mandatory adopters; (7) the interpretation of empirical results in an agency-theoretic setting; and (8) the derivation of policy recommendations from the empirical results.

8. Measuring a change in earnings' predictive power following the IFRS introduction requires the identification of specific accrual components that serve as explanatory variables in the disaggregated earnings-based cash flow forecasting model. Given that the dissertation aims at empirically examining the effect of the IFRS introduction on financial statement quality relative to the quality level that existed under the HGB system, accruals are suitable when representing accounting issues that reflect differences between the HGB and IFRS system. Differences between the two accounting systems are significant with regard to business combinations (reflected in the accrual amortization expense) and revenue recognition (reflected in the accrual accounts receivable). Moderate differences exist with regard to provisioning (reflected in the accrual provisions), revaluation of property, plant, and equipment (reflected in the accrual depreciation expense), and inventory valuation (reflected in the accrual

inventory). No notable differences are present with regard to the treatment of accounts payable; however, the accrual is nevertheless included into the model as the three working capital accruals accounts receivable, inventory, and accounts payable as a group explain—following insights from previous research—the model's dependent variable, future operating cash flow, collectively. Thus, the disaggregated earnings-based cash flow forecasting model contains the following explanatory variables: (1) current operating cash flow; (2) current depreciation expense; (3) current amortization expense; (4) current provisions; (5) current accounts receivable; (6) current inventory; (7) and current accounts payable.

9. Given the specific form of the disaggregated earnings-based cash flow forecasting model, several hypotheses are formulated. The dissertation's central hypothesis relates to the full set of accruals outlined above and states: Earnings' predictive power with regard to forecasting operating cash flow *decreases* following the IFRS introduction for public German firms when measuring earnings' predictive power using a disaggregated cash flow forecasting model and the full set of accruals (i.e., depreciation expense, amortization expense, provisions, accounts receivable, inventory, and accounts payable). Sub-hypotheses relate to different sets of accruals.

10. The IFRS introduction in Germany constitutes a natural experiment as it divides the universe of German firms into a treatment group—public German firms that are subject to the policy change—and a control group—private German firms that are not subject to the policy change. Thus, the following four distinct states of interest arise: (1) public firms before the IFRS introduction; (2) public firms after the IFRS introduction; (3) private firms before the IFRS introduction; and (4) private firms after the IFRS introduction. The dissertation uses this natural experiment and employs a difference-in-differences design which takes these states of interest into account and thus allows drawing causal inferences about the IFRS introduction's impact on financial statement quality.

11. The dissertation uses panel data provided by Deutsche Bundesbank's USTAN database. The database, which was established for the purpose of facilitating

IFRS-related research, provides high-quality accounting data for the entire universe of public and private German firms. The database has only become available for the wider research community recently and has therefore not widely been used in empirical financial accounting research. As noted above, using this database constitutes a contribution to the empirical IFRS-related accounting literature.

12. To measure the change in earnings' predictive power following the IFRS introduction, the dissertation employs a two-step approach: (1) estimation of the disaggregated earnings-based cash flow forecasting model; and (2) analysis of the model's residuals.

    a. Step one—estimation of the cash flow forecasting model. Given the dynamic formulation of the model (the model is dynamic as it contains a lag of the explained variable, namely current cash flow, in the set of explanatory variables), the estimation uses the GMM estimator. Also, to ensure correct specification, the model is calibrated to the overall sample as well as to four subsamples that represent the above-mentioned states of interest. The estimation of the model generates residuals that are then analyzed under step two.

    b. Step two—analysis of the cash flow forecasting model's residuals. The dissertation analyzes the model's residuals using three distinct research designs: (1) the one-group pretest-posttest design; (2) the static-group posttest design; and (3) the difference-in-differences design. Of these three designs, only the difference-in-differences design is truly experimental as it covers all of the above-mentioned states of interest at the same time. The other two designs are limited to a subset of these states of interest and are, therefore, denoted as pre-experimental. Given that the difference-in-differences design represents the experimental method and thus allows drawing causal inferences about the IFRS effect, the dissertation is primarily concerned with this design—the two pre-

experimental designs only serve the purpose of providing a *first indication* as to whether an IFRS effect is present or not.

13. The dissertation's main finding is that the disaggregated earnings-based cash flow forecasting model's prediction error has increased, thereby leading to a positive answer for the research question and supporting the central research hypothesis that the IFRS introduction reduces earnings' predictive power with regard to forecasting operating cash flow. The result means that earnings quality and ultimately financial statement quality has deteriorated for public German firms. In a broader sense, the result means that information asymmetry between fundamental investors and managers of public German firms has widened.

References

Adler, H., Düring, W., & Schmaltz, K. (1987). Vorbemerkung zu §§ 290 - 315 HGB. In K. H. Forster, R. Goerdeler, J. Lanfermann, H. P. Müller, W. Müller, G. Siepe, K. Stolberg & S. Weirich (Eds.), *Rechnungslegung und Prüfung der Unternehmen - Kommentar zum HGB, AktG, GmbHG, PublG nach den Vorschriften des Bilanzrichtlinien-Gesetzes* (Vol. 5th). Stuttgart: C.E. Poeschel Verlag.

Aharony, J., Barniv, R., & Falk, H. (2010). The Impact of Mandatory IFRS Adoption on Equity Valuation of Accounting Numbers for Security Investors in the EU. *European Accounting Review, 19*(3), 535-578.

Ahmed, A. S., Neel, M., & Wang, D. (2013). Does Mandatory Adoption of IFRS Improve Accounting Quality? Preliminary Evidence. *Contemporary Accounting Research, 30*(4), 1344-1372. doi: 10.1111/j.1911-3846.2012.01193.x

Al-Attar, A., & Hussain, S. (2004). Corporate Data and Future Cash Flows. *Journal of Business Finance & Accounting, 31*(7-8), 861-903. doi: 10.1111/j.0306-686X.2004.00560.x

Ali, A. (1994). The Incremental Information Content of Earnings, Working Capital from Operations, and Cash Flows. *Journal of Accounting Research, 32*(1), 61-74. doi: 10.2307/2491387

Amiram, D. (2012). Financial Information Globalization and Foreign Investment Decisions. *Journal of International Accounting Research, 11*(2), 57-81.

Angrist, J. D., & Pischke, J.-S. (2009). *Mostly harmless econometrics : an empiricist's companion*. Princeton (USA): Princeton University Press.

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies, 58*(2), 277-297. doi: 10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics, 68*(1), 29-51.

Argento, D. (2008). Kees Camfferman & Stephen A. Zeff, Financial reporting and global capital markets. A history of the International Accounting Standards Committee, 1973-2000 - Oxford University Press, Oxford, 2007. *Journal of Management & Governance*, 1-6. doi: 10.1007/s10997-008-9042-0

Armstrong, C. S., Barth, M. E., Jagolinzer, A. D., & Riedl, E. J. (2010). Market Reaction to the Adoption of IFRS in Europe. *The Accounting Review, 85*(1), 31-61.

Arrow, K. J. (1985). The Economics of Agency. In J. W. Pratt & R. J. Zeckhauser (Eds.), *Principals and Agents: The Structure of Business*. Cambridge, MA (USA): Harvard Business School Press.

Ashbaugh, H., & Pincus, M. (2001). Domestic Accounting Standards, International Accounting Standards, and the Predictability of Earnings. *Journal of Accounting Research, 39*(3), 417-434. doi: 10.2307/2672967

Atwood, T. J., Drake, M. S., Myers, J. N., & Myers, L. A. (2011). Do earnings reported under IFRS tell us more about future earnings and cash flows? *Journal of Accounting and Public Policy, 30*(2), 103-121. doi: http://dx.doi.org/10.1016/j.jaccpubpol.2010.10.001

Babbie, E. (2013). *The Practice of Social Research* (13th international ed.). Wadsworth (USA): Cengage Learning.

Backhaus, K., Erichson, B., Plinke, W., & Weiber, R. (2010). *Multivariate Analysemethoden - Eine anwendungsorientierte Einführung* (13th ed.). Heidelberg: Springer.

Badertscher, B. A., Collins, D. W., & Lys, T. Z. (2012). Discretionary accounting choices and the predictive ability of accruals with respect to future cash flows. *Journal of Accounting and Economics, 53*(1–2), 330-352.

Bae, K.-H., Tan, H., & Welker, M. (2008). International GAAP Differences: The Impact on Foreign Analysts. *Accounting Review, 83*(3), 593-628.

Ball, R. (2006). International Financial Reporting Standards (IFRS): pros and cons for investors. *Accounting and Business Research, 36*(Supplement), 5-27. doi: 10.1080/00014788.2006.9730040

Ball, R., & Brown, P. (1968). An Empirical Evaluation of Accounting Income Numbers. *Journal of Accounting Research, 6*(2), 159-178.

Ball, R., & Brown, P. R. (2014). Ball and Brown (1968): A Retrospective. *Accounting Review, 89*(1), 1-26.

Ball, R., Kothari, S. P., & Robin, A. (2000). The effect of international institutional factors on properties of accounting earnings. *Journal of Accounting and Economics, 29*(1), 1-51.

Ballwieser, W., Küting, K., & Schildbach, T. (2004). Fair value - erstrebenswerter Wertansatz im Rahmen einer Reform der handelsrechtlichen Rechnungslegung? *Betriebswirtschaftliche Forschung und Praxis (BFuP), 56*(6), 529-549.

Baltagi, B. H. (2013). *Econometric Analysis of Panel Data* (5th ed.). Chichester (UK): Wiley.

Baltagi, B. H. (2014) Panel Data Econometrics. *Critical Concepts in Economics*. London (UK): Routledge.

Barth, Beaver, W. H., Hand, J. R. M., & Landsman, W. R. (1999). Accruals, cash flows, and equity values. *Review of Accounting Studies, 4*(3-4), 205-229.

Barth, & Hutton, A. (2004). Analyst Earnings Forecast Revisions and the Pricing of Accruals. *Review of Accounting Studies, 9*(1), 59-96.

Barth, M., Cram, D. P., & Nelson, K. K. (2001). Accruals and the prediction of future cash flows. *The Accounting Review, 76*(1), 27-58.

Barth, M. E. (2006). Research, Standard Setting, and Global Financial Reporting. *Foundations and Trends in Accounting, 1*(2), 71-165.

Barth, M. E., Landsman, W. R., Lang, M., & Williams, C. (2012). Are IFRS-based and US GAAP-based accounting amounts comparable? *Journal of Accounting and Economics, 54*(1), 68-93.

Barth, M. E., Landsman, W. R., & Lang, M. H. (2008). International Accounting Standards and Accounting Quality. *Journal of Accounting Research, 46*(3), 467-498. doi: 10.1111/j.1475-679X.2008.00287.x

Baum, C. F., Schaffer, M. E., & Stillman, S. (2003). Instrumental variables and GMM: Estimation and testing. *Stata Journal, 3*(1), 1-31.

Beaver, W. H. (1968). The Information Content of Annual Earnings Announcements. *Journal of Accounting Research, 6*(3), 67-92.

Beaver, W. H., & Dukes, R. E. (1972). Interperiod Tax Allocation, Earnings Expectations, and the Behavior of Security Prices. *The Accounting Review, 47*(2), 320-332. doi: 10.2307/244755

Belsley, D., Kuh, E., & Welsch, R. (1980). *Regression Diagnostics*. New York City (USA): Wiley.

Beneish, M. D., Miller, B. P., & Yohn, T. L. (2015). Macroeconomic evidence on the impact of mandatory IFRS adoption on equity and debt markets. *Journal of Accounting and Public Policy, 34*(1), 1-27. doi: http://dx.doi.org/10.1016/j.jaccpubpol.2014.10.002

Berle, A. A., & Means, G. C. (1939). *The Modern Corporation and Private Property*. New York City (USA): The Macmillan Company.

Berndt, T. (2005). *Wahrheits- und Fairnesskonzeptionen in der Rechnungslegung*. Stuttgart: Schäffer-Poeschel.

Biddle, G. C., & Hilary, G. (2006). Accounting Quality and Firm-Level Capital Investment. *The Accounting Review, 81*(5), 963-982. doi: 10.2307/4093094

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115-143.

Bond, S. (2002). *Dynamic panel data models: A guide to micro data methods and practice*. Working Paper CWP09/02, Cemmap, Institute for Fiscal Studies. Available at http://cemmap.ifs.org.uk/wps/cwp0209.pdf.

Bowen, R. M., Burgstahler, D., & Daley, L. A. (1986). Evidence on the Relationships between Earnings and Various Measures of Cash Flow. *The Accounting Review, 61*(4), 713-725. doi: 10.2307/247365

Bowen, R. M., Burgstahler, D., & Daley, L. A. (1987). The Incremental Information Content of Accrual versus Cash Flows. *The Accounting Review, 62*(4), 723-747. doi: 10.2307/247781

Breusch, T. S., & Pagan, A. R. (1979). A Simple Test for Heteroscedasticity and Random Coefficient Variation. *Econometrica, 47*(5), 1287-1294. doi: 10.2307/1911963

Brochet, F., Jagolinzer, A. D., & Riedl, E. J. (2013). Mandatory IFRS Adoption and Financial Statement Comparability. *Contemporary Accounting Research, 30*(4), 1373-1400.

Brown, Goetzmann, W. N., & Ross, S. A. (1995). Survival. *The Journal of Finance, 50*(3), 853-873. doi: 10.2307/2329290

Brown, P. (2011). International Financial Reporting Standards: what are the benefits? *Accounting and Business Research, 41*(3), 269-285. doi: 10.1080/00014788.2011.569054

Brüggemann, U., Daske, H., Homburg, C., & Pope, P. F. (2012). How do Individual Investors React to Global IFRS Adoption? *AAA 2010 Financial Accounting and Reporting Section (FARS) Paper. Available at SSRN: http://ssrn.com/abstract=1458944 or http://dx.doi.org/10.2139/ssrn.1458944*

Brüggemann, U., Hitz, J.-M., & Sellhorn, T. (2013). Intended and Unintended Consequences of Mandatory IFRS Adoption: A Review of Extant Evidence and Suggestions for Future Research. *European Accounting Review, 22*(1), 1-37.

Burgstahler, D. C., Hail, L., & Leuz, C. (2006). The Importance of Reporting Incentives: Earnings Management in European Private and Public Firms. *The Accounting Review, 81*(5), 983-1016.

Byard, D., Li, Y., & Yu, Y. (2011). The Effect of Mandatory IFRS Adoption on Financial Analysts' Information Environment. *Journal of Accounting Research, 49*(1), 69-96. doi: 10.2307/20869863

Callao, S., & Jarne, J. I. (2010). Have IFRS Affected Earnings Management in the European Union? *Accounting in Europe, 7*(2), 159-189. doi: 10.1080/17449480.2010.511896

Camfferman, K., & Zeff, S. A. (2007). *Financial Reporting and Global Capital Markets : A History of the International Accounting Standards Committee, 1973-2000*. Oxford (UK): Oxford University Press.

Capkun, V., Collins, D. W., & Jeanjean, T. (2013). The Effect of IAS/IFRS Adoption on Earnings Management (Smoothing): A Closer Look at Competing Explanations. *Available at SSRN: http://ssrn.com/abstract=1850228 or http://dx.doi.org/10.2139/ssrn.1850228*

Chen, C., Young, D., & Zhuang, Z. (2013). Externalities of Mandatory IFRS Adoption: Evidence from Cross-Border Spillover Effects of Financial Information on Investment Efficiency. *The Accounting Review, 88*(3), 881-914.

Chen, H., Tang, Q., Jiang, Y., & Lin, Z. (2010). The Role of International Financial Reporting Standards in Accounting Quality: Evidence from the European Union. *Journal of International Financial Management & Accounting, 21*(3), 220-278. doi: 10.1111/j.1467-646X.2010.01041.x

Cheng, C. S. A., Liu, C.-S., & Schaefer, T. F. (1996). Earnings Permanence and the Incremental Information Content of Cash Flows from Operations. *Journal of Accounting Research, 34*(1), 173-181. doi: 10.2307/2491338

Chi, W., Lisic, L. L., Long, X., & Wang, K. (2013). Do regulations limiting management influence over auditors improve audit quality? Evidence from China. *Journal of Accounting and Public Policy, 32*(2), 176-187. doi: http://dx.doi.org/10.1016/j.jaccpubpol.2013.02.001

Chia, Y. K., & Czernkowski, R. (1997). The association of aggregate and disaggregated earnings with annual stock returns. *Accounting & Finance, 37*(1), 111-128.

Christensen, Lee, E., & Walker, M. (2007). Cross-sectional variation in the economic consequences of international accounting harmonization: The case of mandatory IFRS adoption in the UK. *The International Journal of Accounting, 42*(4), 341-379.

Christensen, H. B., Frimor, H., & Şabac, F. (2013). The Stewardship Role of Analyst Forecasts, and Discretionary Versus Non-discretionary Accruals. *European Accounting Review, 22*(2), 257-296. doi: 10.1080/09638180.2012.686590

Christensen, H. B., Hail, L., & Leuz, C. (2013a). Capital-Market Effects of Securities Regulation: Prior Conditions, Implementation, and Enforcement. *Chicago Booth Research Paper No. 12-04. Available at SSRN: http://ssrn.com/abstract=1745105 or http://dx.doi.org/10.2139/ssrn.1745105*

Christensen, H. B., Hail, L., & Leuz, C. (2013b). Mandatory IFRS reporting and changes in enforcement. *Journal of Accounting and Economics, 56*(Supplement), 147-177.

Christensen, H. B., Lee, E., & Walker, M. (2008). Incentives or Standards: What Determines Accounting Quality Changes Around IFRS Adoption? *AAA 2008 Financial Accounting and Reporting Section (FARS) Paper. Available at SSRN: http://ssrn.com/abstract=1013054 or http://dx.doi.org/10.2139/ssrn.1013054*.

Claussen, C. P., & Scherrer, G. (2011). *Kölner Kommentar zum Rechnungslegungsrecht §§ 238 - 342e*. Köln: Carl Heymanns Verlag

Coase, R. H. (1937). The Nature of the Firm. *Economica, 4*(16), 386-405. doi: 10.1111/j.1468-0335.1937.tb00002.x

Cook, T. D., & Campbell, D. T. (1979). *Quasi-Experimentation - Design & Analysis Issues for Field Settings*. Chicago (USA): Rand McNally.

Cramer, J. S. (1987). Mean and variance of R2 in small and moderate samples. *Journal of Econometrics, 35*(2–3), 253-266. doi: http://dx.doi.org/10.1016/0304-4076(87)90027-3

Cuijpers, R., & Buijink, W. (2005). Voluntary Adoption of Non-Local GAAP in the European Union: A Study of Determinants and Consequences. *European Accounting Review, 14*(3), 487-524.

Damodaran, A. (2012). *Investment Valuation - Tools and Techniques for Determining the Value of Any Asset* (3rd ed.). Hoboken (USA): Wiley.

Daske, H. (2006). Economic Benefits of Adopting IFRS or US-GAAP – Have the Expected Cost of Equity Capital Really Decreased? *Journal of Business Finance & Accounting, 33*(3/4), 329-373.

Daske, H., Hail, L., Leuz, C., & Verdi, R. (2008). Mandatory IFRS Reporting around the World: Early Evidence on the Economic Consequences. *Journal of Accounting Research, 46*(5), 1085-1142.

Daske, H., Hail, L., Leuz, C., & Verdi, R. (2013). Adopting a Label: Heterogeneity in the Economic Consequences Around IAS/IFRS Adoptions. *Journal of Accounting Research, 51*(3), 495-547. doi: 10.1111/1475-679x.12005

Davidson, R., & MacKinnon, J. G. (2004). *Econometric Theory and Methods*. New York City (USA): Oxford University Press.

DeAngelo, L. E. (1986). Accounting Numbers as Market Valuation Substitutes: A Study of Management Buyouts of Public Stockholders. *The Accounting Review, 61*(3), 400-420. doi: 10.2307/247149

DeAngelo, L. E. (1988). Managerial competition, information costs, and corporate governance: The use of accounting performance measures in proxy contests. *Journal of Accounting and Economics, 10*(1), 3-36.

Dechow, P. M. (1994). Accounting earnings and cash flows as measures of firm performance: The role of accounting accruals. *Journal of Accounting and Economics, 18*(1), 3-42.

Dechow, P. M., & Dichev, I. D. (2002). The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors. *The Accounting Review, 77*(Supplement: Quality of Earnings Conference), 35-59. doi: 10.2307/3203324

Dechow, P. M., Kothari, S. P., & Watts, R. (1998). The relation between earnings and cash flows. *Journal of Accounting and Economics, 25*(2), 133-168.

Dechow, P. M., & Schrand, C. (2004). *Earnings quality*. Charlottesville (USA): Research Foundation of CFA Institute.

Dechow, P. M., & Sloan, R. G. (1991). Executive incentives and the horizon problem: An empirical investigation. *Journal of Accounting and Economics, 14*(1), 51-89. doi: http://dx.doi.org/10.1016/0167-7187(91)90058-S

Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1995). Detecting Earnings Management. *The Accounting Review, 70*(2), 193-225. doi: 10.2307/248303

DeFond, Hu, X., Hung, M., & Li, S. (2011). The impact of mandatory IFRS adoption on foreign mutual fund ownership: The role of comparability. *Journal of Accounting and Economics, 51*(3), 240-258.

Deutsche Bundesbank. (2014). *Bilanzübersicht*. Internal Work Procedure. Deutsche Bundesbank. Frankfurt/Main.

Dimitrov, D. M., & Rumrill, J. P. D. (2003). Pretest-posttest designs and measurement of change. *Work, 20*(2), 159.

Dimson, E., Marsh, P. R., & Staunton, M. (2002). *Triumph of the Optimists: 101 Years of Global Investment Returns*. Princeton (USA): Princeton University Press.

Dixon, W. J. (1960). Simplified Estimation from Censored Normal Samples. *The Annals of Mathematical Statistics, 31*(2), 385-391. doi: 10.2307/2237953

Ernst & Young LLP. (2015). *International GAAP 2015 - Generally Accepted Accounting Practice under International Financial Reporting Standards* (Vol. 1). West Sussex (UK): Wiley.

Ernstberger, J., Stich, M., & Vogler, O. (2012). Economic Consequences of Accounting Enforcement Reforms: The Case of Germany. *European Accounting Review, 21*(2), 217-251. doi: 10.1080/09638180.2011.628096

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance, 25*(2), 383-417.

Fama, E. F. (1991). Efficient Capital Markets: II. *Journal of Finance, 46*(5), 1575-1617.

Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *Journal of Finance, 47*(2), 427-465.

Finger, C. A. (1994). The Ability of Earnings to Predict Future Earnings and Cash Flow. *Journal of Accounting Research, 32*(2), 210-223. doi: 10.2307/2491282

Fisher, I. (1896). What is Capital? *The Economic Journal, 6*(24), 509-534. doi: 10.2307/2957184

Fisher, R. A. (1915). Frequency Distribution of the Values of the Correlation Coefficient in Samples from an Indefinitely Large Population. *Biometrika, 10*(4), 507-521. doi: 10.2307/2331838

Fisher, R. A. (1921). On the "Probable Error" of a Coefficient of Correlation deduced from a Small Sample. *Metron, 1*(4), 3-32.

Fisher, R. A. (1924). The Distribution of the Partial Correlation Coefficient. *Metron, 3*(3-4), 329-332.

Fisher, R. A. (1950a). *The Design of Experiments* (6th ed.). Edinburgh (UK): Tweeddale Court.

Fisher, R. A. (1950b). *Statistical Methods for Research Workers* (11th ed.). Edinburgh (UK): Tweeddale Court.

Florou, A., & Kosi, U. (2013). Does Mandatory IFRS Adoption Facilitate Debt Financing? *INTACCT Working Paper No. MRTN-CT-2006-035850 INTACCT. Available at SSRN: http://ssrn.com/abstract=1508324 or http://dx.doi.org/10.2139/ssrn.1508324*

Flower, J. (2004). *European Financial Reporting Adapting to a Changing World*. Hampshire (USA): Palgrave MacMillan.

Förschle, G., & Deubert, M. (2012). Beck'scher Bilanzkommentar - Handelsbilanz, Steuerbilanz. In H. Ellrott, B. Grottel, S. Schmidt, G. Förschle, M. Kozikowski & N. Winkeljohann (Eds.), *Beck'scher Bilanz-Kommentar*. München: C. H. Beck.

Francis, J., Olsson, P., LaFond, R., & Schipper, K. (2005). The market pricing of accruals quality. *Journal of Accounting and Economics, 39*(2), 295-327. doi: 10.1016/j.jacceco.2004.06.003

Francis, J., & Schipper, K. (1999). Have Financial Statements Lost Their Relevance? *Journal of Accounting Research, 37*(2), 319-352. doi: 10.2307/2491412

Frankel, R., & Li, X. (2004). Characteristics of a firm's information environment and the information asymmetry between insiders and outsiders. *Journal of Accounting and Economics, 37*(2), 229-259. doi: http://dx.doi.org/10.1016/j.jacceco.2003.09.004

Frost, C. A. (1994). Discussion of The Effects of Accounting Diversity: Evidence from the European Union. *Journal of Accounting Research, 32*(3), 169-175.

Fülbier, R. U., Hitz, J.-M., & Sellhorn, T. (2009). Relevance of Academic Research and Researchers' Role in the IASB's Financial Reporting Standard Setting. *Abacus, 45*(4), 455-492.

Fung, W., & Hsieh, D. A. (2004). Extracting Portable Alphas from Equity Long/Short Hedge Funds. *Journal of Investment Management, 2*(4), 57-75.

García Lara, J. M., García Osma, B., & Belén Gill de Albornoz, N. (2006). Effects of database choice on international accounting research. *Abacus, 42*(3/4), 426-454.

Garrod, N., & Hadi, M. (1998). Investor Response to Cash Flow Information. *Journal of Business Finance & Accounting, 25*(5/6), 613-630.

Gassen, J. (2008). Are Stewardship and Valuation Usefulness Compatible or Alternative Objectives of Financial Accounting? *Available at SSRN: http://ssrn.com/abstract=1095215 or http://dx.doi.org/10.2139/ssrn.1095215*

Glaum, M., Baetge, J., Grothe, A., & Oberdörster, T. (2013). Introduction of International Accounting Standards, Disclosure Quality and Accuracy of Analysts' Earnings Forecasts. *European Accounting Review, 22*(1), 79-116.

Gombola, M. J., & Ketz, J. E. (1983). A Note on Cash Flow and Classification Patterns of Financial Ratios. *The Accounting Review, 58*(1), 105-114. doi: 10.2307/246645

Gonedes, N. J., & Dopuch, N. (1974). Capital Market Equilibrium, Information Production, and Selecting Accounting Techniques: Theoretical Framework and Review of Empirical Work. *Journal of Accounting Research, 12*(3), 48-129.

Gosset [pseud.: Student], W. S. (1908). The Probable Error of a Mean. *Biometrika, 6*(1), 1-25. doi: 10.2307/2331554

Graham, B. (1949). *The Intelligent Investor*. New York City (USA): Harper & Brothers.

Graham, B., & Dodd, D. L. (1934). *Security Analysis*. New York City (USA): McGraw-Hill.

Greenberg, R. R., Johnson, G. L., & Ramesh, K. (1986). Earnings versus Cash Flow as a Predictor of Future Cash Flow Measures. *Journal of Accounting, Auditing & Finance, 1*(4), 266-277.

Greene, W. H. (2012). *Econometric Analysis* (7th, International ed.). Upper Saddle River (USA): Prentice-Hall.

Hansen, L. P. (1982). Large Sample Properties of Generalized Method of Moments Estimators. *Econometrica, 50*(4), 1029-1054. doi: 10.2307/1912775

Hansen, L. P., & Singleton, K. J. (1982). Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models. *Econometrica, 50*(5), 1269-1286. doi: 10.2307/1911873

Harris, T. S., Lang, M., & Mőller, H. P. (1994). The Value Relevance of German Accounting Measures: An Empirical Analysis. *Journal of Accounting Research, 32*(2), 187-209. doi: 10.2307/2491281

Hayes, A., & Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior Research Methods, 39*(4), 709-722. doi: 10.3758/bf03192961

Hayn, S., & Waldersee, G. G. (2014). *IFRS und HGB im Vergleich: synoptische Darstellung für den Einzel- und Konzernabschluss*. Stuttgart: Schäffer-Poeschel.

Healy, P. M. (1985). The effect of bonus schemes on accounting decisions. *Journal of Accounting and Economics, 7*(1–3), 85-107. doi: http://dx.doi.org/10.1016/0165-4101(85)90029-1

Healy, P. M., & Wahlen, J. M. (1999). A Review of the Earnings Management Literature and Its Implications for Standard Setting. *Accounting Horizons, 13*(4), 365-383.

Hitz, J.-M., Ernstberger, J., & Stich, M. (2012). Enforcement of Accounting Standards in Europe: Capital-Market-Based Evidence for the Two-Tier Mechanism in Germany. *European Accounting Review, 21*(2), 253-281.

Hodgson, A., & Stevenson-Clarke, P. (2000). Earnings, cashflows and returns: Functional relations and the impact of firm size. *Accounting & Finance, 40*(1), 51-73.

Holthausen, R. W. (2009). Accounting Standards, Financial Reporting Outcomes, and Enforcement. *Journal of Accounting Research, 47*(2), 447-458.

Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating Vector Autoregressions with Panel Data. *Econometrica, 56*(6), 1371-1395. doi: 10.2307/1913103

Homburg, C., & Wrede, N. (2007). Persistente Bestimmungsgrößen des künftigen operativen Cash Flows. *Zeitschrift für Betriebswirtschaft, 77*(9), 875-910. doi: 10.1007/s11573-007-0289-8

Hong, H., & Kacperczyk, M. (2010). Competition and Bias. *Quarterly Journal of Economics, 125*(4), 1683-1725.

Hoque, Z., & James, W. (2000). Linking Balanced Scorecard Measures to Size and Market Factors: Impact on Organizational Performance. *Journal of Management Accounting Research, 12*(1), 1-17.

Horngren, C. T., Sundem, G. L., Elliott, J. A., & Philbrick, D. R. (2014). *Introduction to Financial Accounting* (11th global ed.). Essex (UK): Pearson.

Horton, J., & Serafeim, G. (2010). Market reaction to and valuation of IFRS reconciliation adjustments: First evidence from the UK. *Review of Accounting Studies, 15*(4), 725-751. doi: 10.1007/s11142-009-9108-5

Horton, J., Serafeim, G., & Serafeim, I. (2013). Does Mandatory IFRS Adoption Improve the Information Environment? *Contemporary Accounting Research, 30*(1), 388-423. doi: 10.1111/j.1911-3846.2012.01159.x

Hsiao, C. (2005). Why Panel Data? *Singapore Economic Review, 50*(2), 143-154.

Hsiao, C. (2014) Analysis of Panel Data. In D. W. K. Andrews & J. C. Ely (Series Ed.), *Econometric Society Monographs: Vol. 54* (3rd ed.). New York City (USA): Cambridge University Press.

Hung, M., & Subramanyam, K. R. (2007). Financial statement effects of adopting international accounting standards: The case of Germany. *Review of Accounting Studies, 12*(4), 623-657. doi: 10.1007/s11142-007-9049-9

ICAEW Financial Reporting Faculty. (2014). *The Effects of Mandatory IFRS Adoption in the EU: A Review of Empirical Research*. Information for Better Markets. London, UK.

Institut der Wirtschaftsprüfer (IDW). (2009). *IDW Standard: Principles for the Performance of Business Valuations (IDW S 1) in the version of 2008*. Düsseldorf: IDW-Verlag.

Jarva, H., & Lantto, A.-M. (2012). Information Content of IFRS versus Domestic Accounting Standards: Evidence from Finland. *Liiketaloudellinen Aikakauskirja*(2), 141-177.

Jeanjean, T., & Stolowy, H. (2008). Do accounting standards matter? An exploratory analysis of earnings management before and after IFRS adoption. *Journal of Accounting and Public Policy, 27*(6), 480-494. doi: http://dx.doi.org/10.1016/j.jaccpubpol.2008.09.008

Jensen, M. C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *The American Economic Review, 76*(2), 323-329. doi: 10.2307/1818789

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305-360. doi: http://dx.doi.org/10.1016/0304-405X(76)90026-X

Jones, J. J. (1991). Earnings Management During Import Relief Investigations. *Journal of Accounting Research, 29*(2), 193-228. doi: 10.2307/2491047

Joos, P., & Lang, M. (1994). The Effects of Accounting Diversity: Evidence from the European Union. *Journal of Accounting Research, 32*(3), 141-168.

Jorion, P., & Goetzmann, W. N. (1999). Global Stock Markets in the Twentieth Century. *Journal of Finance, 54*(3), 953-980.

Kennedy, P. (2003). *A Guide to Econometrics*. Cambridge (USA): MIT Press.

Kiefer, N. M., & Vogelsang, T. J. (2005). A New Asymptotic Theory for Heteroskedasticity-Autocorrelation Robust Tests. *Econometric Theory, 21*(6), 1130-1164. doi: 10.2307/3533462

Kim, J.-b., Shi, H., & Zhou, J. (2014). International Financial Reporting Standards, institutional infrastructures, and implied cost of equity capital around the world. *Review of Quantitative Finance and Accounting, 42*(3), 469-507. doi: http://dx.doi.org/10.1007/s11156-013-0350-3

Kim, J.-b., Tsui, J. S., & Yi, C. H. (2011). The voluntary adoption of International Financial Reporting Standards and loan contracting around the world. *Review of Accounting Studies, 16*(4), 779-811. doi: http://dx.doi.org/10.1007/s11142-011-9148-5

Kim, M., & Kross, W. (2005). The Ability of Earnings to Predict Future Operating Cash Flows Has Been Increasing-Not Decreasing. *Journal of Accounting Research, 43*(5), 753-780. doi: 10.2307/3542456

Kinney Jr, W. R. (1986). Empirical Accounting Research Design for Ph.D. Students. *Accounting Review, 61*(2), 338-350.

Kothari, S. P., Shanken, J., & Sloan, R. G. (1995). Another Look at the Cross-section of Expected Stock Returns. *Journal of Finance, 50*(1), 185-224.

Kühnberger, M. (2014). Fair Value Accounting, Bilanzpolitik und die Qualität von IFRS-Abschlüssen. Ein Überblick über ausgewählte Aspekte der Fair Value-Bewertung. *zfbf Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung, 66*(5-6), 428-450. doi: https://www.wiso-net.de:443/document/ZFBF__091412003

Küting, K., Pfitzer, N., & Weber, C.-P. (2013). *IFRS oder HGB? Systemvergleich und Beurteilung* (2nd ed.). Stuttgart: Schäffer-Poeschel.

La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (1999). Corporate Ownership around the World. *The Journal of Finance, 54*(2), 471-517. doi: 10.2307/2697717

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and Finance. *Journal of Political Economy, 106*(6), 1113-1155. doi: 10.1086/250042

Landsman, W. R., Maydew, E. L., & Thornock, J. R. (2012). The information content of annual earnings announcements and mandatory adoption of IFRS. *Journal of Accounting and Economics, 53*(1–2), 34-54.

Lechner, M. (2011). The Estimation of Causal Effects by Difference-in-Difference Methods. *Foundations and Trends® in Econometrics, 4*(3), 165-224. doi: 10.1561/0800000014

Legewie, J. (2012). Die Schätzung von kausalen Effekten: Überlegungen zu Methoden der Kausalanalyse anhand von Kontexteffekten in der Schule. *Kölner Zeitschrift für Soziologie und Sozialpsychologie, 64*(1), 123-153.

Leuz, C., Nanda, D., & Wysocki, P. D. (2003). Earnings management and investor protection: An international comparison. *Journal of Financial Economics, 69*(3), 505-527. doi: 10.1016/s0304-405x(03)00121-1

Leuz, C., & Verrecchia, R. E. (2000). The Economic Consequences of Increased Disclosure. *Journal of Accounting Research, 38*(3), 91-124.

Lev, B. (1989). On the Usefulness of Earnings and Earnings Research: Lessons and Directions from Two Decades of Empirical Research. *Journal of Accounting Research, 27*(3), 153-192.

Lev, B., Li, S., & Sougiannis, T. (2010). The usefulness of accounting estimates for predicting cash flows and earnings. *Review of Accounting Studies, 15*(4), 779-807. doi: http://dx.doi.org/10.1007/s11142-009-9107-6

Lev, B., & Zarowin, P. (1999). The Boundaries of Financial Reporting and How to Extend Them. *Journal of Accounting Research, 37*(2), 353-385. doi: 10.2307/2491413

Li, & Sougiannis, T. (2014). *Mandatory IFRS adoption and the usefulness of accounting information in predicting future earnings and cash flows*. Paper presented at the American Accounting Association Annual Meeting, Atlanta (USA).

Li, S. (2010). Does Mandatory Adoption of International Financial Reporting Standards in the European Union Reduce the Cost of Equity Capital? *The Accounting Review, 85*(2), 607-636. doi: 10.2307/20744143

Lüdenbach, N., Hoffmann, W.-D., & Freiberg, J. (2014). *IFRS Kommentar* (12th ed.). Freiburg/München: Haufe.

MacKinnon, J. G., & White, H. (1985). Some Heteroskedasticity-Consistent Covariance Matrix Estimators with Improved Finite Sample Properties. *Journal of Econometrics, 29*(3), 305-325.

Mara, C. A., Cribbie, R. A., Flora, D. B., LaBrish, C., Mills, L., & Fiksenbaum, L. (2012). An improved model for evaluating change in randomized pretest, posttest, follow-up designs. *Methodology: European Journal of Research Methods for the Behavioral and Social Sciences, 8*(3), 97-103.

Mard, M. J., Hitchner, J. R., & Hyden, S. D. (2011). *Valuation for Financial Reporting* (3rd ed.). Hoboken (USA): Wiley.

Mátyás, L., & Sevestre, P. (Eds.). (2008). *The Econometrics of Panel Data - Fundamentals and Recent Developments in Theory and Practice* (3rd ed.). Berlin: Springer.

McNichols, M. F. (2000). Research design issues in earnings management studies. *Journal of Accounting and Public Policy, 19*(4-5), 313-345.

McNichols, M. F. (2002). The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors: Discussion. *The Accounting Review, 77*(Supplement: Quality of Earnings Conference), 61-69. doi: 10.2307/3203325

McNichols, M. F., & Wilson, G. P. (1988). Evidence of Earnings Management from the Provision for Bad Debts. *Journal of Accounting Research, 26*(3), 1-31. doi: 10.2307/2491176

Melcher, W., David, K., & Skowronek, T. (2013). *Rückstellungen in der Praxis - Anwendungsfälle nach HGB und IFRS*. Weinheim: Wiley.

Meyer, B. D. (1995). Natural and Quasi-Experiments in Economics. *Journal of Business & Economic Statistics, 13*(2), 151-161. doi: 10.2307/1392369

Miller, M., H. , & Modigliani, F. (1966). Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57. *The American Economic Review, 56*(3), 333-391. doi: 10.2307/1823774

Morgan, S. L., & Winship, C. (2014). *Counterfactuals and Causal Inference: Methods and Principles for Social Research (Analytical Methods for Social Research)* (2nd ed.). Cambridge (USA): Cambridge University Press.

Moxter, A. (1984). *Bilanzlehre - Band I: Einführung in die Bilanztheorie* (3rd ed.). Wiesbaden: Gabler.

Moxter, A. (1986). *Bilanzlehre - Band II: Einführung in das neue Bilanzrecht* (3rd ed.). Wiesbaden: Gabler.

Moxter, A. (1995). Zum Verhältnis von handelsrechtliehen Grundsätzen ordnungsmäßiger Bilanzierung und True-and-fair-view-Gebot bei Kapitalgesellschaften. In G. Förschle, K. Kaiser & A. Moxter (Eds.), *Rechenschaftslegung im Wandel - Festschrift für Wolfgang Dieter Budde*. München: C.H. Beck.

Nerlove, M. (2002). *Essays in panel data econometrics*. New York City (USA): Cambridge University Press.

Nissim, D., & Penman, S. (2008). *Principles for the Application of Fair Value Accounting*. New York City (USA): CEASA - Center for Excellence in Accounting and Security Analysis.

Nobes, C. W. (2005). Rules-Based Standards and the Lack of Principles in Accounting. *Accounting Horizons, 19*(1), 25-34.

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality and Quantity, 41*(5), 673-690. doi: 10.1007/s11135-006-9018-6

Olkin, I., & Finn, J. D. (1995). Correlations redux. *Psychological Bulletin, 118*(1), 155-164.

Ozkan, N., Singer, Z. V. I., & You, H. (2012). Mandatory IFRS Adoption and the Contractual Usefulness of Accounting Information in Executive Compensation. *Journal of Accounting Research, 50*(4), 1077-1107.

Paananen, M., & Lin, H. (2009). The Development of Accounting Quality of IAS and IFRS over Time: The Case of Germany. *Journal of International Accounting Research, 8*(1), 31-55.

Patell, J. M. (1989). Discussion of On the Usefulness of Earnings and Earnings Research: Lessons and Directions from Two Decades of Empirical Research. *Journal of Accounting Research, 27*(Supplement), 193-201.

Pearson, K. (1913). On the Probable Error of a Coefficient of Correlation as Found from a Fourfold Table. *Biometrika, 9*(1/2), 22-33. doi: 10.2307/2331798

Pearson, K. (1936). Method of Moments and Method of Maximum Likelihood. *Biometrika, 28*(1/2), 34-59. doi: 10.2307/2334123

Pellens, B., Fülbier, R. U., Gassen, J., & Sellhorn, T. (2014). *Internationale Rechnungslegung - IFRS 1 bis 13, IAS 1 bis 41, IFRIC-Interpretationen, Standardentwürfe* (9th ed.). Stuttgart: Schäffer-Poeschel.

Penman, S. H. (2009). Accounting for intangible assets: There is also an income statement. *Abacus, 45*(3), 358-371. doi: 10.1111/j.1467-6281.2009.00293.x

Penman, S. H. (2011). *Accounting for Value*. New York City (USA): Columbia University Press.

Penman, S. H. (2013). *Financial Statement Analysis and Security Valuation* (5th ed.). New York City (USA): McGraw-Hill.

Ployhart, R. E., & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. *Journal of Management, 36*(1), 94-120. doi: 10.1177/0149206309352110

Pope, P. F., & McLeay, S. J. (2011). The European IFRS experiment: objectives, research challenges and some early evidence. *Accounting and Business Research, 41*(3), 233-266. doi: 10.1080/00014788.2011.575002

Pratt, J. W., & Zeckhauser, R. J. (1985). Principals and Agents: An Overview. In J. W. Pratt & R. J. Zeckhauser (Eds.), *Principals and Agents: The Structure of Business*. Cambridge (USA): Harvard Business School Press.

Pratt, J. W., Zeckhauser, R. J., & Arrow, K. J. (1985). *Principals and Agents: The Structure of Business*. Cambridge (USA): Harvard Business School Press.

Preece, D. A. (1982). t Is for Trouble (and Textbooks): A Critique of Some Examples of the Paired-Samples t-Test. *Journal of the Royal Statistical Society. Series D (The Statistician), 31*(2), 169-195. doi: 10.2307/2987888

PricewaterhouseCoopers LLP. (2015). IFRS Ready. Retrieved March 15, 2015, from http://www.pwc.com/us/en/faculty-resource/ifrs-ready.jhtml

Riahi-Belkaoui, A. (2005). *Accounting Theory* (5th ed.). London (UK): Thomson.

Ronen, J., & Yaari, V. (2008) Earnings Management : Emerging Insights in Theory, Practice, and Research. *Springer Series in Accounting Scholarship*. New York City (USA): Springer.

Roodman, D. (2009a). How to do xtabond2: An introduction to difference and system GMM in Stata. *Stata Journal, 9*(1), 86-136.

Roodman, D. (2009b). Practitioners' corner: A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics, 71*(1), 135-158. doi: 10.1111/j.1468-0084.2008.00542.x

Ross, S. A. (1973). The Economic Theory of Agency: The Principal's Problem. *American Economic Review, 63*(2), 134-139.

Ruhnke, K., & Simons, D. (2012). *Rechnungslegung nach IFRS und HGB : Lehrbuch zur Theorie und Praxis der Unternehmenspublizität mit Beispielen und Übungen* (3rd ed.). Stuttgart: Schäffer-Poeschel.

Ryan, S. G., & Zarowin, P. A. (2003). Why Has the Contemporaneous Linear Returns-Earnings Relation Declined? *The Accounting Review, 78*(2), 523-553. doi: 10.2307/3203264

Sackley, W. H. (2002). The Economic Consequences of Increased Disclosure. *CFA Digest, 32*(1), 3-4. doi: 10.2469/dig.v32.n1.1001

Sargan, J. D. (1958). The Estimation of Economic Relationships using Instrumental Variables. *Econometrica, 26*(3), 393-415. doi: 10.2307/1907619

Satterthwaite, F. E. (1946). An Approximate Distribution of Estimates of Variance Components. *Biometrics Bulletin, 2*(6), 110-114. doi: 10.2307/3002019

Schildbach, T. (2009). Fair value-Statik und Information des Kapitalmarktes. *Betriebswirtschaftliche Forschung und Praxis (BFuP), 61*(6), 581-598.

Schildbach, T. (2012). Fair value accounting und Information des Markts. *zfbf Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung, 64*(5), 522-535. doi: https://www.wiso-net.de:443/document/ZFBF__081215005

Schildbach, T., Stobbe, T., & Brösel, G. (2013). *Der handelsrechtliche Jahresabschluss* (10 th ed.). Sternenfels: Verlag Wissenschaft & Praxis.

Schipper, K. (2003). Principles-Based Accounting Standards. *Accounting Horizons, 17*(1), 61-72.

Schipper, K., & Vincent, L. (2003). Earnings Quality. *Accounting Horizons, 17*(Supplement), 97-110.

Schleicher, T., Tahoun, A., & Walker, M. (2010). IFRS adoption in Europe and investment-cash flow sensitivity: Outsider versus insider economies. *International Journal of Accounting, 45*(2), 143-168.

Schmalenbach, E. (1919). Grundlagen dynamischer Bilanzlehre. *ZfhF - Zeitschrift für handelswissenschaftliche Forschung, 13*, 1-50.

Schmalenbach, E. (1962). *Dynamische Bilanz* (13th ed.). Köln and Opladen: Westdeutscher Verlag.

Schmidt, A. (2012). Die Kaufpreisallokation im handelsrechtlichen Konzernabschluss. In J. Baetge & H.-J. Kirsch (Eds.), *Schriften zum Revisionswesen*. Düsseldorf: IDW Verlag.

Schmidt, R. H. (1982). Rechnungslegung als Informationsfunktion auf nahezu effizienten Kapitalmärkten. *zfbf Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung, 34*, 728-748.

Schmitting, W., & Wöhrmann, A. (2013). Konsequenzen der Datenbankwahl für die empirische Forschung mit Archivdaten. *ZfbF, 65*, 553-587.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. Boston (USA): Houghton Mifflin.

Shumway, T., & Warther, V. A. (1999). The Delisting Bias in CRSP's Nasdaq Data and Its Implications for the Size Effect. *The Journal of Finance, 54*(6), 2361-2379. doi: 10.2307/797998

Simon, H. V. (1910). *Die Bilanzen der Aktiengesellschaften und der Kommanditgesellschaften auf Aktien* (4th ed.). Berlin: Guttentag.

Sloan, R. G. (1996). Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review, 71*(3), 289-289.

Soderstrom, N. S., & Sun, K. J. (2007). IFRS Adoption and Accounting Quality: A Review. *European Accounting Review, 16*(4), 675-702. doi: 10.1080/09638180701706732

Soper, H. E. (1913). On the Probable Error of the Correlation Coefficient to a Second Approximation. *Biometrika, 9*(1/2), 91-115. doi: 10.2307/2331802

Stolowy, H., & Breton, G. (2004). Accounts Manipulation: A Literature Review and Proposed Conceptual Framework. *Review of Accounting and Finance, 3*(1), 5-66.

Tan, H., Wang, S., & Welker, M. (2011). Analyst Following and Forecast Accuracy After Mandated IFRS Adoptions. *Journal of Accounting Research, 49*(5), 1307-1357. doi: 10.2307/41328960

Tarca, A. (2012). The case for global accounting standards: arguments and evidence *appendix to Report to the Trustees of the IFRS Foundation: IFRS Foundation Staff Analysis of the SEC Final Staff Report – Work Plan for the Consideration of Incorporating IFRS into the Financial Reporting System for US Issuers*. London, UK: IFRS Foundation.

Thode, S. F., Drtina, R. E., & Largay Iii, J. A. (1986). Operating Cash Flows: A Growing Need for Separate Reporting. *Journal of Accounting, Auditing & Finance, 1*(1), 46-61.

Trombetta, M., Wagenhofer, A., & Wysocki, P. (2012). The Usefulness of Academic Research in Understanding the Effects of Accounting Standards. *Accounting in Europe, 9*(2), 127-146. doi: 10.1080/17449480.2012.720871

Tukey, J. W. (1962). The Future of Data Analysis. *The Annals of Mathematical Statistics, 33*(1), 1-67. doi: 10.2307/2237638

van Tendeloo, B., & Vanstraelen, A. (2005). Earnings management under German GAAP versus IFRS. *European Accounting Review, 14*(1), 155-180. doi: 10.1080/0963818042000338988

Watts, R. L., & Zimmerman, J. L. (1978). Towards a Positive Theory of the Determination of Accounting Standards. *The Accounting Review, 53*(1), 112-134. doi: 10.2307/245729

Watts, R. L., & Zimmerman, J. L. (1979). The Demand for and Supply of Accounting Theories: The Market for Excuses. *The Accounting Review, 54*(2), 273-305. doi: 10.2307/245516

Watts, R. L., & Zimmerman, J. L. (1986). *Positive accounting theory*. Englewood Cliffs (USA): Prentice-Hall.

Watts, R. L., & Zimmerman, J. L. (1990). Positive Accounting Theory: A Ten Year Perspective. *The Accounting Review, 65*(1), 131-156. doi: 10.2307/247880

Weiers, R. M. (2011). *Introductory Business Statistics* (7th international ed.). Boston (USA): South-Western Cengage Learning.

Welch, B. L. (1947). The Generalization of `Student's' Problem when Several Different Population Variances are Involved. *Biometrika, 34*(1/2), 28-35. doi: 10.2307/2332510

White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica, 48*(4), 817-838. doi: 10.2307/1912934

Wilson, G. P. (1986). The Relative Information Content of Accruals and Cash Flows: Combined Evidence at the Earnings Announcement and Annual Report Release Date. *Journal of Accounting Research, 24*(Supplement), 165-200. doi: 10.2307/2490736

Wilson, G. P. (1987). The Incremental Information Content of the Accrual and Funds Components of Earnings After Controlling for Earnings. *Accounting Review, 62*(2), 293.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics, 126*(1), 25-51. doi: 10.1016/j.jeconom.2004.02.005

Winker, P. (2010). *Empirische Wirtschaftsforschung und Ökonometrie* (3rd ed.). Heidelberg: Springer.

Wishart, J., Kondo, T., & Elderton, E. M. (1931). The Mean and Second Moment Coefficient of the Multiple Correlation Coefficient, in Samples from a Normal Population. *Biometrika, 22*(3/4), 353-376. doi: 10.2307/2332101

Wooldridge, J. M. (2013). *Introductory Econometrics: A Modern Approach* (5th international ed.). Cincinnati (USA): South-Western.

Wrede, N. (2009). *Erklärungsgrößen künftiger operativer Cash Flows*. Köln: Gabler.

Xie, S., & Mo, T. (2014). Index Futures Trading and Stock Market Volatility in China: A Difference-in-Difference Approach. *Journal of Futures Markets, 34*(3), 282-297. doi: 10.1002/fut.21650

Yip, R. W. Y., & Young, D. (2012). Does mandatory IFRS adoption improve information comparability? *Accounting Review, 87*(5), 1767-1789. doi: 10.2308/accr-50192

Zeff, S. A. (2012). The Evolution of the IASC into the IASB, and the Challenges it Faces. *Accounting Review, 87*(3), 807-837.

Zeff, S. A. (2013). The objectives of financial reporting: a historical survey and analysis. *Accounting and Business Research, 43*(4), 262-327. doi: 10.1080/00014788.2013.782237

Zwirner, C. (Ed.). (2013). *BilMoG & MicroBilG - §§ 238-342e HGB mit Änderungen von EGHGB, EStG, PublG, AktG, EGAktG, GmbHG, EGGmbHG, GenG, SEAG, SCEAG, WPO, AO, URV, JVkostO, KHBV, RechVersV, PBV. HGB-Synopse altes/neues Recht.* (5th ed.). München: C. H. Beck.

Appendices

A.1—Measures

TABLE A.1
ACCOUNTING VARIABLES OF THE CASH FLOW FORECASTING MODEL, ASSOCIATED DEUTSCHE BUNDESBANK RAW MEASURES, AND TRANSFORMATION PROCEDURES

	Deutsche Bundesbank raw measure				Transformation	
Accounting variable	Provided by USTAN?[a]	Acronym	Description	Official name (German)	One-period change?	Scaling?
Total assets	Yes	ap088	Total assets	Bilanzsumme	No	NA
Operating cash flow	No[b]	various	NA	NA	No	Yes
Depreciation and amortization expense	Yes[c]	▪ ap156	▪ Depreciation of property, plant and equipment, long-term intangible assets and start-up expenses	▪ Abschreibungen auf Sachanlagen, immaterielle Vermögensgegenstände des Anlagevermögens und Ingangsetzungsaufwendungen	No	Yes
Provisions	Yes	▪ ap108 ▪ ap126	▪ Short-term provisions ▪ Long-term provisions	▪ Sonstige kurzfristige Rückstellungen ▪ Sonstige langfristige Rückstellungen	Yes	Yes

(CONTINUED)

Accounting variable	Deutsche Bundesbank raw measure: Provided by USTAN?[a]	Acronym	Description	Official name (German)	Transformation: One-period change?	Scaling?
Accounts receivable	Yes	▪ ap049	▪ Accounts receivable	▪ Forderungen aus Lieferungen und Leistungen	Yes	Yes
		▪ ap207	▪ Accounts receivable from subsidiaries	▪ Von Pos. 051, 052 und 053 auf Lieferungen und Leistungen ent-fallende Beträge		
Inventory	Yes	▪ ap059	▪ Inventory	▪ Vorräte	Yes	Yes
Accounts payable	Yes	▪ ap098	▪ Accounts payable (long-term)	▪ Verbindlichkeiten aus Lieferungen und Leistungen	Yes	Yes
		▪ ap114	▪ Accounts payable (short-term)	▪ Verbindlichkeiten aus Lieferungen und Leistungen		

Notes. The table illustrates how accounting variables from the earnings-based cash flow forecasting model are operationalized using Deutsche Bundesbank measures (raw measures) and how these measures, in turn, are transformed to arrive at final measures which are usable in the dissertation's empirical analysis.
[a] USTAN = Deutsche Bundesbank database.
[b] The USTAN database does not provide a raw measure representing the accounting variable *operating cash flow*. Thus, the variable is calculated based on various other raw measures.
[c] The USTAN database does not provide separate raw measures for the accounting variables *depreciation expense* and *amortization expense*. Thus, a combined measure is used.

A.2—Stata Commands and Stata Output of Selected Statistical Tests and Regressions

A.2.1—Mean-Comparison Unequal-Variances T-Test

```
. sdtest ta, by(public)

Variance ratio test
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	41180	322824.4	6702.707	1360171	309687	335961.9
1	6123	3929079	187249.9	1.47e+07	3562003	4296155
combined	47303	789625.6	25542.67	5555341	739561.6	839689.6

```
    ratio = sd(0) / sd(1)                                     f =   0.0086
Ho: ratio = 1                         degrees of freedom = 41179, 6122

    Ha: ratio < 1               Ha: ratio != 1                 Ha: ratio > 1
 Pr(F < f) = 0.0000         2*Pr(F < f) = 0.0000          Pr(F > f) = 1.0000


. ttest ta, by(public) level(95) unequal

Two-sample t test with unequal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	41180	322824.4	6702.707	1360171	309687	335961.9
1	6123	3929079	187249.9	1.47e+07	3562003	4296155
combined	47303	789625.6	25542.67	5555341	739561.6	839689.6
diff		-3606254	187369.8		-3973565	-3238944

```
    diff = mean(0) - mean(1)                                  t = -19.2467
Ho: diff = 0                     Satterthwaite's degrees of freedom =   6137.7

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

A.2.2—Pearson's T-Test

```
. pwcorr ocf depramort dprov dar dinv dap
```

	ocf	depram~t	dprov	dar	dinv	dap
ocf	1.0000					
depramort	0.3320	1.0000				
dprov	0.1329	0.0946	1.0000			
dar	-0.2052	0.0942	0.2456	1.0000		
dinv	-0.2553	0.0315	0.1719	0.2437	1.0000	
dap	0.0683	0.0785	0.1487	0.4608	0.3379	1.0000

```
. pwcorr ocf depramort dprov dar dinv dap, sig star(0.01)
```

	ocf	depram~t	dprov	dar	dinv	dap
ocf	1.0000					
depramort	0.3320*	1.0000				
	0.0000					
dprov	0.1329*	0.0946*	1.0000			
	0.0000	0.0000				
dar	-0.2052*	0.0942*	0.2456*	1.0000		
	0.0000	0.0000	0.0000			
dinv	-0.2553*	0.0315*	0.1719*	0.2437*	1.0000	
	0.0000	0.0000	0.0000	0.0000		
dap	0.0683*	0.0785*	0.1487*	0.4608*	0.3379*	1.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	

A.2.3—Variance Inflation Factors

```
. quietly reg ocf depramort dprov dar dinv dap

. scalar vif_ocf = 1/(1-e(r2))

. display e(N)
39291

. display vif_ocf
1.4337089

.
. quietly reg depramort ocf dprov dar dinv dap

. scalar vif_depramort = 1/(1-e(r2))

. display e(N)
39291

. display vif_depramort
1.1747275

.
. quietly reg dprov ocf depramort dar dinv dap

. scalar vif_dprov = 1/(1-e(r2))

. display e(N)
39291

. display vif_dprov
1.1395474

.
. quietly reg dar ocf depramort dprov dinv dap

. scalar vif_dar = 1/(1-e(r2))

. display e(N)
39291

. display vif_dar
1.4956142

.
. quietly reg dinv ocf depramort dprov dar dap

. scalar vif_dinv = 1/(1-e(r2))

. display e(N)
39291

. display vif_dinv
1.2925333

.
. quietly reg dap ocf depramort dprov dar dinv

. scalar vif_dap = 1/(1-e(r2))

. display e(N)
39291

. display vif_dap
1.4706787
```

A.2.4—Hypothesis One: Estimation of the Cash Flow Forecasting Model

Overall sample

```
. xi: xtabond2 aheadocf ocf $accruals ///
>                 i.year        , ///
>               twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>               ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: firmid                          Number of obs      =     31207
Time variable : year                            Number of groups   =      5751
Number of instruments = 32                      Obs per group: min =         1
Wald chi2(30) =    949.94                                      avg =      5.43
Prob > chi2   =     0.000                                      max =        25
------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |   .2385467   .0182989    13.04   0.000     .2026815    .274412
   depramort |   -.412965   .0642736    -6.43   0.000    -.5389389   -.2869911
      dprov  |  -.4112901   .0416155    -9.88   0.000     -.492855   -.3297251
         dar |   .5956996   .0257344    23.15   0.000      .545261    .6461381
        dinv |   .3261449   .0226478    14.40   0.000     .2817561    .3705338
         dap |  -.6632027    .028307   -23.43   0.000    -.7186835   -.6077219
 _Iyear_1988 |   .0122542   .0100309     1.22   0.222     -.007406    .0319144
 _Iyear_1989 |   .0243619   .0097565     2.50   0.013     .0052394    .0434843
 _Iyear_1990 |   .0172275   .0095927     1.80   0.073    -.0015738    .0360289
 _Iyear_1991 |   .0371675   .0093297     3.98   0.000     .0188815    .0554535
 _Iyear_1992 |   .0362556   .0086961     4.17   0.000     .0192115    .0532997
 _Iyear_1993 |   .0366137   .0085738     4.27   0.000     .0198093    .0534181
 _Iyear_1994 |   .0148343   .0082784     1.79   0.073    -.0013912    .0310597
 _Iyear_1995 |   .0310814   .0078754     3.95   0.000     .0156459     .046517
 _Iyear_1996 |   .0187336   .0076369     2.45   0.014     .0037656    .0337016
 _Iyear_1997 |   .0122901   .0075556     1.63   0.104    -.0025186    .0270989
 _Iyear_1998 |   .0241287   .0074639     3.23   0.001     .0094998    .0387576
 _Iyear_1999 |   .0057152   .0069374     0.82   0.410    -.0078818    .0193123
 _Iyear_2000 |   .0173368   .0061791     2.81   0.005      .005226    .0294476
 _Iyear_2001 |   .0267824   .0058626     4.57   0.000     .0152919    .0382729
 _Iyear_2002 |   .0189657   .0051699     3.67   0.000     .0088329    .0290985
 _Iyear_2003 |   .0155934   .0046988     3.32   0.001     .0063839    .0248028
 _Iyear_2004 |   .0111073   .0040813     2.72   0.006     .0031081    .0191065
 _Iyear_2005 |   .0150396   .0035332     4.26   0.000     .0081147    .0219646
 _Iyear_2007 |  -.0047288   .0032413    -1.46   0.145    -.0110817     .001624
 _Iyear_2008 |   .0234391   .0035627     6.58   0.000     .0164563    .0304219
 _Iyear_2009 |   .0014376   .0038806     0.37   0.711    -.0061682    .0090435
 _Iyear_2010 |  -.0122012   .0039549    -3.09   0.002    -.0199527   -.0044496
 _Iyear_2011 |  -.0060425   .0042875    -1.41   0.159    -.0144458    .0023607
 _Iyear_2012 |  -.0256086   .0228283    -1.12   0.262    -.0703512     .019134
       _cons |   .0740128   .0052863    14.00   0.000     .0636519    .0843737
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z = -30.07  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -3.00  Pr > z =  0.003
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   6.21  Prob > chi2 =  0.013
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1)    =  18.27  Prob > chi2 =  0.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(0)    =   0.00  Prob > chi2 =      .
    Difference (null H = exogenous): chi2(1)    =  18.27  Prob > chi2 =  0.000
```

Public firms before IFRS introduction

```
. display "$Bedingung1"
public==1 & after==0

. xi: xtabond2 aheadocf ocf $accruals ///
>                i.year  if $Bedingung1, ///
>                twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>                ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_2009 dropped due to collinearity
_Iyear_2010 dropped due to collinearity
_Iyear_2011 dropped due to collinearity
_Iyear_2012 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: firmid                          Number of obs      =      1967
Time variable : year                            Number of groups   =       225
Number of instruments = 28                      Obs per group: min =         1
Wald chi2(26) =    161.17                                      avg =      8.74
Prob > chi2   =     0.000                                      max =        17
------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |   .2991834   .0925902     3.23   0.001     .1177099    .4806569
   depramort |  -.4371708   .2645903    -1.65   0.098    -.9557582    .0814167
       dprov |  -.3194508   .1456795    -2.19   0.028    -.6049774   -.0339241
         dar |   .6804969   .1443871     4.71   0.000     .3975032    .9634905
        dinv |   .3269281   .0777621     4.20   0.000     .1745173    .4793389
         dap |  -.6234718   .1131838    -5.51   0.000     -.845308   -.4016356
 _Iyear_1988 |   .0193793   .0673206     0.29   0.773    -.1125667    .1513253
 _Iyear_1989 |  -.0065797   .0669375    -0.10   0.922    -.1377747    .1246154
 _Iyear_1990 |  -.0050817   .0663367    -0.08   0.939    -.1350992    .1249358
 _Iyear_1991 |   .0173111   .0664751     0.26   0.795    -.1129777       .1476
 _Iyear_1992 |   .0331163    .066705     0.50   0.620    -.0976231    .1638557
 _Iyear_1993 |   .0428631   .0667116     0.64   0.521    -.0878893    .1736156
 _Iyear_1994 |   .0132398   .0670859     0.20   0.844    -.1182462    .1447257
 _Iyear_1995 |    .023436    .066279     0.35   0.724    -.1064684    .1533404
 _Iyear_1996 |   .0197253   .0661498     0.30   0.766    -.1099259    .1493765
 _Iyear_1997 |   .0073303   .0663421     0.11   0.912    -.1226978    .1373583
 _Iyear_1998 |   .0029457   .0673011     0.04   0.965     -.128962    .1348533
 _Iyear_1999 |  -.0024028   .0658357    -0.04   0.971    -.1314385    .1266329
 _Iyear_2000 |    .004647   .0658119     0.07   0.944     -.124342    .1336359
 _Iyear_2001 |  -.0003875    .067204    -0.01   0.995     -.132105     .13133
 _Iyear_2002 |   .0178081    .069572     0.26   0.798    -.1185506    .1541668
 _Iyear_2003 |  -.0079387   .0666124    -0.12   0.905    -.1384966    .1226193
 _Iyear_2004 |   .0216028   .0665556     0.32   0.745    -.1088437    .1520493
 _Iyear_2005 |   .0269692   .0724511     0.37   0.710    -.1150324    .1689707
 _Iyear_2007 |   .0273228   .0403511     0.68   0.498    -.0517639    .1064095
 _Iyear_2008 |   .0577173   .0400214     1.44   0.149    -.0207232    .1361578
       _cons |   .0763696   .0654728     1.17   0.243    -.0519547    .2046938
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -7.18  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -0.00  Pr > z =  0.999
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   0.38  Prob > chi2 =  0.539
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1)    =   1.47  Prob > chi2 =  0.226
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(0)    =   0.00  Prob > chi2 =      .
    Difference (null H = exogenous): chi2(1)    =   1.47  Prob > chi2 =  0.226
```

Public firms after IFRS introduction

```
. display "$Bedingung2"
public==1 & after==1

. xi: xtabond2 aheadocf ocf $accruals ///
>                 i.year          if $Bedingung2, ///
>               twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>               ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_1988 dropped due to collinearity
_Iyear_1989 dropped due to collinearity
_Iyear_1990 dropped due to collinearity
_Iyear_1991 dropped due to collinearity
_Iyear_1992 dropped due to collinearity
_Iyear_1993 dropped due to collinearity
_Iyear_1994 dropped due to collinearity
_Iyear_1995 dropped due to collinearity
_Iyear_1996 dropped due to collinearity
_Iyear_1997 dropped due to collinearity
_Iyear_2011 dropped due to collinearity
_Iyear_2012 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: firmid                          Number of obs      =      2063
Time variable : year                            Number of groups   =       607
Number of instruments = 20                      Obs per group: min =         1
Wald chi2(18) =     75.30                                      avg =      3.40
Prob > chi2   =     0.000                                      max =        11
------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |    .226381   .0633648     3.57   0.000     .1021883    .3505737
   depramort |  -.3143159    .148418    -2.12   0.034    -.6052099    -.023422
       dprov |  -.6556442   .1272587    -5.15   0.000    -.9050667   -.4062218
         dar |   .4715975   .0809663     5.82   0.000     .3129066    .6302885
        dinv |   .2304761   .0834192     2.76   0.006     .0669775    .3939748
         dap |    -.61605   .1386375    -4.44   0.000    -.8877744   -.3443255
  _Iyear_1998 |  -.0238713   .1336451    -0.18   0.858    -.2858109    .2380683
  _Iyear_1999 |  -.1191349    .041718    -2.86   0.004    -.2009006   -.0373691
  _Iyear_2000 |  -.0119797   .0210386    -0.57   0.569    -.0532146    .0292551
  _Iyear_2001 |  -.0068678    .017704    -0.39   0.698    -.0415671    .0278314
  _Iyear_2002 |   .0062823   .0165412     0.38   0.704    -.0261379    .0387025
  _Iyear_2003 |   .0094254   .0149024     0.63   0.527    -.0197827    .0386334
  _Iyear_2004 |  -.0070832   .0117543    -0.60   0.547    -.0301213    .0159549
  _Iyear_2005 |    .002581   .0079031     0.33   0.744    -.0129087    .0180707
  _Iyear_2007 |  -.0172625   .0078679    -2.19   0.028    -.0326834   -.0018416
  _Iyear_2008 |   .0147652     .00846     1.75   0.081     -.001816    .0313465
  _Iyear_2009 |   .0035752    .009115     0.39   0.695    -.0142898    .0214403
  _Iyear_2010 |  -.0231809    .021372    -1.08   0.278    -.0650693    .0187074
        _cons |   .0834925   .0112568     7.42   0.000     .0614296    .1055554
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -8.36  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.59  Pr > z =  0.557
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   0.05  Prob > chi2 =  0.820
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1)    =   0.09  Prob > chi2 =  0.762
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(0)    =   0.00  Prob > chi2 =      .
    Difference (null H = exogenous): chi2(1)    =   0.09  Prob > chi2 =  0.762
```

Private firms before IFRS introduction

```
. display "$Bedingung3"
public==0 & after==0

. xi: xtabond2 aheadocf ocf $accruals ///
>                 i.year          if $Bedingung3, ///
>                twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>                ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_2010 dropped due to collinearity
_Iyear_2011 dropped due to collinearity
_Iyear_2012 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: firmid                          Number of obs      =     15482
Time variable : year                            Number of groups   =      3101
Number of instruments = 29                      Obs per group: min =         1
Wald chi2(27) =    425.13                                      avg =      4.99
Prob > chi2   =     0.000                                      max =        22
------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |   .2337319   .0245463     9.52   0.000     .1856221    .2818417
   depramort |  -.4413073   .0858544    -5.14   0.000    -.6095788   -.2730358
       dprov |  -.3574665   .0590164    -6.06   0.000    -.4731365   -.2417966
         dar |   .5677155   .0377515    15.04   0.000     .4937238    .6417071
        dinv |   .3148752    .030578    10.30   0.000     .2549433    .3748071
         dap |  -.6676375   .0406821   -16.41   0.000    -.7473729   -.5879022
 _Iyear_1988 |   .0209183     .01356     1.54   0.123    -.0056588    .0474955
 _Iyear_1989 |   .0363385   .0133142     2.73   0.006     .0102431    .0624339
 _Iyear_1990 |    .028425   .0133466     2.13   0.033      .002266    .0545839
 _Iyear_1991 |   .0482177   .0131278     3.67   0.000     .0224876    .0739478
 _Iyear_1992 |   .0442433   .0125146     3.54   0.000     .0197151    .0687715
 _Iyear_1993 |   .0431916   .0123882     3.49   0.000     .0189112     .067472
 _Iyear_1994 |    .022594   .0121186     1.86   0.062    -.0011579    .0463459
 _Iyear_1995 |   .0395249   .0117788     3.36   0.001     .0164389    .0626109
 _Iyear_1996 |   .0251359   .0115918     2.17   0.030     .0024162    .0478555
 _Iyear_1997 |   .0199329    .011513     1.73   0.083    -.0026322     .042498
 _Iyear_1998 |   .0326009   .0113494     2.87   0.004     .0103564    .0548454
 _Iyear_1999 |   .0135386    .011101     1.22   0.223     -.008219    .0352962
 _Iyear_2000 |   .0250191   .0103487     2.42   0.016      .004736    .0453022
 _Iyear_2001 |   .0369793   .0099677     3.71   0.000      .017443    .0565156
 _Iyear_2002 |   .0217095   .0091555     2.37   0.018     .0037651    .0396539
 _Iyear_2003 |   .0250574   .0085288     2.94   0.003     .0083412    .0417736
 _Iyear_2004 |   .0180087   .0082748     2.18   0.030     .0017903    .0342271
 _Iyear_2005 |   .0271934   .0073653     3.69   0.000     .0127577    .0416291
 _Iyear_2007 |   .0043584   .0094641     0.46   0.645    -.0141909    .0229078
 _Iyear_2008 |   .0338273    .016058     2.11   0.035     .0023543    .0653003
 _Iyear_2009 |  -.0098856   .0635137    -0.16   0.876    -.1343702     .114599
       _cons |   .0632605   .0105901     5.97   0.000     .0425043    .0840168
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z = -21.77  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -1.97  Pr > z =  0.049
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   4.48  Prob > chi2 =  0.034
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1)    =  12.81  Prob > chi2 =  0.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(0)    =   0.00  Prob > chi2 =      .
    Difference (null H = exogenous): chi2(1)    =  12.81  Prob > chi2 =  0.000
```

Private firms after IFRS introduction

```
. display "$Bedingung4"
public==0 & after==1

. xi: xtabond2 aheadocf ocf $accruals ///
>                 i.year          if $Bedingung4, ///
>               twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>               ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_1988 dropped due to collinearity
_Iyear_1989 dropped due to collinearity
_Iyear_1990 dropped due to collinearity
_Iyear_1991 dropped due to collinearity
_Iyear_1992 dropped due to collinearity
_Iyear_1993 dropped due to collinearity
_Iyear_1994 dropped due to collinearity
_Iyear_1995 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM

Group variable: firmid                          Number of obs      =     11695
Time variable : year                            Number of groups   =      3143
Number of instruments = 24                      Obs per group: min =         1
Wald chi2(21) =    549.89                                      avg =      3.72
Prob > chi2   =     0.000                                      max =        15

------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |   .2405692   .0270017     8.91   0.000     .1876468    .2934917
   depramort |    -.380054   .1243097    -3.06   0.002    -.6236965   -.1364115
       dprov |  -.4740194   .0634414    -7.47   0.000    -.5983622   -.3496766
         dar |   .6351135   .0365264    17.39   0.000      .563523    .7067039
        dinv |   .3423461   .0317403    10.79   0.000     .2801363     .404556
         dap |  -.6551954   .0388905   -16.85   0.000    -.7314193   -.5789715
 _Iyear_1996 |  -.0352446   .0589122    -0.60   0.550    -.1507104    .0802213
 _Iyear_1997 |  -.0234432   .0589973    -0.40   0.691    -.1390757    .0921894
 _Iyear_1998 |   .0716461   .0210605     3.40   0.001     .0303682     .112924
 _Iyear_1999 |   .0293299   .0167953     1.75   0.081    -.0035883    .0622482
 _Iyear_2000 |   .0341918   .0121818     2.81   0.005      .010316    .0580676
 _Iyear_2001 |   .0375597   .0118397     3.17   0.002     .0143544     .060765
 _Iyear_2002 |   .0339221   .0089868     3.77   0.000     .0163083    .0515358
 _Iyear_2003 |   .0154772   .0068792     2.25   0.024     .0019943    .0289601
 _Iyear_2004 |   .0141562   .0055402     2.56   0.011     .0032977    .0250147
 _Iyear_2005 |   .0144473   .0045845     3.15   0.002     .0054618    .0234329
 _Iyear_2007 |  -.0031288   .0038284    -0.82   0.414    -.0106323    .0043746
 _Iyear_2008 |   .0248177   .0042382     5.86   0.000      .016511    .0331244
 _Iyear_2009 |   .0010399   .0045972     0.23   0.821    -.0079704    .0100503
 _Iyear_2010 |  -.0149587   .0044755    -3.34   0.001    -.0237305   -.0061869
 _Iyear_2011 |  -.0082015   .0047757    -1.72   0.086    -.0175618    .0011587
 _Iyear_2012 |  -.0265421    .022995    -1.15   0.248    -.0716114    .0185273
       _cons |   .0775724   .0080871     9.59   0.000     .0617219    .0934229
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z = -21.63  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -2.50  Pr > z =  0.012
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   0.82  Prob > chi2 =  0.364
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1)    =   2.13  Prob > chi2 =  0.144
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(0)    =   0.00  Prob > chi2 =      .
    Difference (null H = exogenous): chi2(1)    =   2.13  Prob > chi2 =  0.144
```

Overview of all samples

```
. estimates table xtabond2_all    xtabond2_publicbefore   xtabond2_publicpost     xtabond2_privatebefore          xtabond2_priva
> tepost,          star(.01 .05 .10) stats(N r2 r2_a r2e r2e_a) b(%14.3fc)
```

Variable	xtabond2_all	xtabond2_public~e	xtabond2_public~t	xtabond2_privat~e	xtabond2_privat~t
ocf	0.239***	0.299***	0.226***	0.234***	0.241***
depramort	-0.413***	-0.437*	-0.314**	-0.441***	-0.380***
dprov	-0.411***	-0.319**	-0.656***	-0.357***	-0.474***
dar	0.596***	0.680***	0.472***	0.568***	0.635***
dinv	0.326***	0.327***	0.230***	0.315***	0.342***
dap	-0.663***	-0.623***	-0.616***	-0.668***	-0.655***
_Iyear_1988	0.012	0.019		0.021	
_Iyear_1989	0.024**	-0.007		0.036***	
_Iyear_1990	0.017*	-0.005		0.028**	
_Iyear_1991	0.037***	0.017		0.048***	
_Iyear_1992	0.036***	0.033		0.044***	
_Iyear_1993	0.037***	0.043		0.043***	
_Iyear_1994	0.015*	0.013		0.023*	
_Iyear_1995	0.031***	0.023		0.040***	
_Iyear_1996	0.019**	0.020		0.025**	-0.035
_Iyear_1997	0.012	0.007		0.020*	-0.023
_Iyear_1998	0.024***	0.003	-0.024	0.033***	0.072***
_Iyear_1999	0.006	-0.002	-0.119***	0.014	0.029*
_Iyear_2000	0.017***	0.005	-0.012	0.025**	0.034***
_Iyear_2001	0.027***	-0.000	-0.007	0.037***	0.038***
_Iyear_2002	0.019***	0.018	0.006	0.022**	0.034***
_Iyear_2003	0.016***	-0.008	0.009	0.025***	0.015**
_Iyear_2004	0.011***	0.022	-0.007	0.018**	0.014**
_Iyear_2005	0.015***	0.027	0.003	0.027***	0.014***
_Iyear_2007	-0.005	0.027	-0.017**	0.004	-0.003
_Iyear_2008	0.023***	0.058	0.015*	0.034**	0.025***
_Iyear_2009	0.001		0.004	-0.010	0.001
_Iyear_2010	-0.012***		-0.023		-0.015***
_Iyear_2011	-0.006				-0.008*
_Iyear_2012	-0.026				-0.027
_cons	0.074***	0.076	0.083***	0.063***	0.078***
N	31207	1967	2063	15482	11695
r2	0.351	0.309	0.487	0.357	0.430
r2_a	0.348	0.218	0.472	0.351	0.426
r2e	0.013	0.004	0.049	0.006	0.032
r2e_a	0.008	-0.127	0.020	-0.003	0.025

legend: * p<.1; ** p<.05; *** p<.01

A.2.5—Hypothesis One: Analysis of the Cash Flow Forecasting Model's Residuals

```
. regress residsq_xtabond2_4calibrations  after public ifrs L.aheadocf $accruals log_scale
```

Source	SS	df	MS		
Model	.505912804	10	.05059128	Number of obs	= 30757
Residual	15.0787433	30746	.000490429	F(10, 30746)	= 103.16
				Prob > F	= 0.0000
Total	15.5846561	30756	.000506719	R-squared	= 0.0325
				Adj R-squared	= 0.0321
				Root MSE	= .02215

residsq_xt~s	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
after	-.0032096	.0002773	-11.58	0.000	-.003753	-.0026661
public	-.000889	.0005551	-1.60	0.109	-.001977	.0001989
ifrs	.0033824	.0007652	4.42	0.000	.0018825	.0048823
aheadocf L1.	.0137763	.0014542	9.47	0.000	.010926	.0166266
depramort	.0254857	.0035975	7.08	0.000	.0184344	.032537
dprov	.0095768	.0054718	1.75	0.080	-.0011481	.0203017
dar	.0220126	.0028866	7.63	0.000	.0163547	.0276705
dinv	.0206386	.0021903	9.42	0.000	.0163456	.0249316
dap	-.0118978	.0036631	-3.25	0.001	-.0190777	-.0047179
log_scale	-.0015534	.0000777	-19.99	0.000	-.0017057	-.0014011
_cons	.0271485	.0009308	29.17	0.000	.025324	.028973

A.2.6—Sensitivity Analysis of Hypothesis One: Estimation of the Cash Flow Forecasting Model

Overall sample

```
. xi: xtreg aheadocf L.aheadocf $accruals i.year , fe vce(robust)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
note: _Iyear_1987 omitted because of collinearity
note: _Iyear_2013 omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =     30757
Group variable: firmid                          Number of groups   =      5707

R-sq:  within  = 0.0411                         Obs per group: min =         1
       between = 0.0015                                        avg =       5.4
       overall = 0.0235                                        max =        25

                                                F(30,5706)         =     24.44
corr(u_i, Xb)  = -0.0604                        Prob > F           =    0.0000

                                  (Std. Err. adjusted for 5707 clusters in firmid)
------------------------------------------------------------------------------
             |               Robust
   aheadocf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   aheadocf |
         L1. |  -.0824943   .0107182    -7.70   0.000    -.103506   -.0614825
             |
  depramort |   .2713164   .0454378     5.97   0.000     .182241    .3603917
      dprov |   .0853696   .0304756     2.80   0.005     .0256259    .1451133
        dar |   .1628827   .0184999     8.80   0.000     .1266159    .1991495
       dinv |  -.0162612   .0128451    -1.27   0.206    -.0414424      .00892
        dap |  -.2698648   .0220571   -12.23   0.000    -.3131051   -.2266244
_Iyear_1987 |          0  (omitted)
_Iyear_1988 |   .0076878   .0054112     1.42   0.155    -.0029203    .0182959
_Iyear_1989 |   .0165489   .0054448     3.04   0.002     .005875    .0272228
_Iyear_1990 |    .008948   .0052987     1.69   0.091    -.0014395    .0193356
_Iyear_1991 |   .0215003   .0051222     4.20   0.000     .0114588    .0315417
_Iyear_1992 |   .0148226   .0047903     3.09   0.002     .0054319    .0242134
_Iyear_1993 |   .0111637   .0046633     2.39   0.017      .002022    .0203055
_Iyear_1994 |  -.0020896   .0045017    -0.46   0.643    -.0109145    .0067354
_Iyear_1995 |   .0110153   .0042307     2.60   0.009     .0027215    .0193091
_Iyear_1996 |   .0010813   .0042094     0.26   0.797    -.0071706    .0093333
_Iyear_1997 |  -.0018261    .004421    -0.41   0.680    -.0104929    .0068408
_Iyear_1998 |   .0076758   .0043487     1.77   0.078    -.0008493    .0162008
_Iyear_1999 |  -.0104586   .0044623    -2.34   0.019    -.0192065   -.0017108
_Iyear_2000 |   .0022964   .0040512     0.57   0.571    -.0056454    .0102383
_Iyear_2001 |    .013985   .0042547     3.29   0.001     .0056442    .0223257
_Iyear_2002 |   .0110632    .003706     2.99   0.003      .003798    .0183284
_Iyear_2003 |     .00695    .003557     1.95   0.051    -.0000231    .0139231
_Iyear_2004 |    .005137   .0034266     1.50   0.134    -.0015805    .0118545
_Iyear_2005 |   .0112948    .002998     3.77   0.000     .0054177     .017172
_Iyear_2007 |  -.0026865   .0028289    -0.95   0.342    -.0082323    .0028592
_Iyear_2008 |   .0188124   .0031271     6.02   0.000     .0126822    .0249427
_Iyear_2009 |  -.0071445   .0030713    -2.33   0.020    -.0131653   -.0011236
_Iyear_2010 |  -.0120914    .003141    -3.85   0.000    -.0182489   -.0059339
_Iyear_2011 |  -.0052045   .0032212    -1.62   0.106    -.0115193    .0011102
_Iyear_2012 |  -.0177718   .0128804    -1.38   0.168    -.0430222    .0074786
_Iyear_2013 |          0  (omitted)
       _cons |   .0756551   .0035334    21.41   0.000     .0687283    .0825819
-------------+----------------------------------------------------------------
     sigma_u |  .08387873
     sigma_e |  .08912098
         rho |  .46972572   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Public firms before IFRS introduction

```
. display "$Bedingung1"
public==1 & after==0

. xi: xtreg aheadocf L.aheadocf $accruals i.year if $Bedingung1, fe vce(robust)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
note: _Iyear_1987 omitted because of collinearity
note: _Iyear_2009 omitted because of collinearity
note: _Iyear_2010 omitted because of collinearity
note: _Iyear_2011 omitted because of collinearity
note: _Iyear_2012 omitted because of collinearity
note: _Iyear_2013 omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =      1944
Group variable: firmid                          Number of groups   =       224

R-sq:  within  = 0.0368                         Obs per group: min =         1
       between = 0.1330                                        avg =       8.7
       overall = 0.0929                                        max =        17

                                                F(25,223)          =         .
corr(u_i, Xb)  = 0.2092                         Prob > F           =         .

                                    (Std. Err. adjusted for 224 clusters in firmid)
------------------------------------------------------------------------------
             |               Robust
   aheadocf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
    aheadocf |
         L1. |  -.0932303   .0421147    -2.21   0.028     -.176224   -.0102366
             |
   depramort |   .3697936   .0978129     3.78   0.000     .1770378    .5625495
       dprov |   .1424581   .1118595     1.27   0.204    -.0779789     .362895
         dar |    .098662   .1068349     0.92   0.357    -.1118732    .3091972
        dinv |  -.1044834   .0591882    -1.77   0.079    -.2211231    .0121564
         dap |  -.1530793   .0925733    -1.65   0.100    -.3355097    .0293511
_Iyear_1987 |           0  (omitted)
_Iyear_1988 |    .038219    .049505     0.77   0.441    -.0593384    .1357764
_Iyear_1989 |   .0160857   .0485828     0.33   0.741    -.0796544    .1118258
_Iyear_1990 |   .0168081   .0485178     0.35   0.729    -.0788039      .11242
_Iyear_1991 |   .0280048   .0484661     0.58   0.564    -.0675054     .123515
_Iyear_1992 |   .0326104   .0479468     0.68   0.497    -.0618764    .1270972
_Iyear_1993 |   .0395329   .0481614     0.82   0.413    -.0553768    .1344426
_Iyear_1994 |   .0232087   .0483061     0.48   0.631    -.0719862    .1184036
_Iyear_1995 |   .0361134   .0479833     0.75   0.452    -.0584453     .130672
_Iyear_1996 |   .0335018   .0476344     0.70   0.483    -.0603695     .127373
_Iyear_1997 |    .029468   .0482381     0.61   0.542    -.0655929    .1245289
_Iyear_1998 |   .0192626   .0493216     0.39   0.697    -.0779335    .1164587
_Iyear_1999 |   .0148694   .0479178     0.31   0.757    -.0795603    .1092992
_Iyear_2000 |   .0261642   .0489317     0.53   0.593    -.0702636     .122592
_Iyear_2001 |   .0262819   .0488447     0.54   0.591    -.0699743    .1225382
_Iyear_2002 |   .0241569    .050983     0.47   0.636    -.0763132    .1246271
_Iyear_2003 |   .0089058   .0473169     0.19   0.851    -.0843396    .1021511
_Iyear_2004 |   .0206969   .0511153     0.40   0.686    -.0800339    .1214278
_Iyear_2005 |   .0064653     .05422     0.12   0.905    -.1003839    .1133145
_Iyear_2007 |   .0133509   .0265866     0.50   0.616    -.0390423    .0657441
_Iyear_2008 |   .0658136   .0349227     1.88   0.061    -.0030072    .1346344
_Iyear_2009 |           0  (omitted)
_Iyear_2010 |           0  (omitted)
_Iyear_2011 |           0  (omitted)
_Iyear_2012 |           0  (omitted)
_Iyear_2013 |           0  (omitted)
       _cons |     .05262   .0483005     1.09   0.277    -.0425637    .1478038
-------------+-----------------------------------------------------------------
     sigma_u |   .0707432
     sigma_e |  .07818444
         rho |  .45015899   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Public firms after IFRS introduction

```
. display "$Bedingung2"
public==1 & after==1

. xi: xtreg aheadocf L.aheadocf $accruals i.year if $Bedingung2, fe vce(robust)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
note: _Iyear_1987 omitted because of collinearity
note: _Iyear_1988 omitted because of collinearity
note: _Iyear_1989 omitted because of collinearity
note: _Iyear_1990 omitted because of collinearity
note: _Iyear_1991 omitted because of collinearity
note: _Iyear_1992 omitted because of collinearity
note: _Iyear_1993 omitted because of collinearity
note: _Iyear_1994 omitted because of collinearity
note: _Iyear_1995 omitted because of collinearity
note: _Iyear_1996 omitted because of collinearity
note: _Iyear_1997 omitted because of collinearity
note: _Iyear_2011 omitted because of collinearity
note: _Iyear_2012 omitted because of collinearity
note: _Iyear_2013 omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =      1906
Group variable: firmid                          Number of groups   =       588

R-sq:  within  = 0.0641                         Obs per group: min =         1
       between = 0.0692                                        avg =       3.2
       overall = 0.0071                                        max =        11

                                                F(18,587)          =      3.10
corr(u_i, Xb)  = -0.4083                        Prob > F           =    0.0000

                                (Std. Err. adjusted for 588 clusters in firmid)
------------------------------------------------------------------------------
             |               Robust
    aheadocf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    aheadocf |
         L1. |  -.0927659   .0417569    -2.22   0.027    -.174777   -.0107548
             |
   depramort |   -.284261   .1322296    -2.15   0.032    -.5439618   -.0245603
       dprov |  -.1104431   .1088295    -1.01   0.311    -.3241857    .1032995
         dar |     .22496   .0610131     3.69   0.000     .1051296    .3447905
        dinv |  -.0551358    .070271    -0.78   0.433    -.1931489    .0828773
         dap |  -.3079009   .1022135    -3.01   0.003    -.5086495   -.1071522
_Iyear_1987 |           0  (omitted)
_Iyear_1988 |           0  (omitted)
_Iyear_1989 |           0  (omitted)
_Iyear_1990 |           0  (omitted)
_Iyear_1991 |           0  (omitted)
_Iyear_1992 |           0  (omitted)
_Iyear_1993 |           0  (omitted)
_Iyear_1994 |           0  (omitted)
_Iyear_1995 |           0  (omitted)
_Iyear_1996 |           0  (omitted)
_Iyear_1997 |           0  (omitted)
_Iyear_1998 |  -.0407031   .2107461    -0.19   0.847    -.4546112     .373205
_Iyear_1999 |  -.0580585   .0373778    -1.55   0.121    -.1314691    .0153521
_Iyear_2000 |   .0065235   .0150574     0.43   0.665    -.0230495    .0360965
_Iyear_2001 |    -.00808    .013377    -0.60   0.546    -.0343525    .0181926
_Iyear_2002 |   .0084231   .0119165     0.71   0.480     -.014981    .0318273
_Iyear_2003 |   .0003268   .0126411     0.03   0.979    -.0245005    .0251541
_Iyear_2004 |  -.0009457   .0092991    -0.10   0.919    -.0192093    .0173178
_Iyear_2005 |   .0028723   .0071983     0.40   0.690    -.0112651    .0170098
_Iyear_2007 |  -.0185607   .0068791    -2.70   0.007    -.0320714     -.00505
_Iyear_2008 |   .0037775    .007392     0.51   0.610    -.0107404    .0182954
_Iyear_2009 |  -.0084672   .0078077    -1.08   0.279    -.0238017    .0068673
_Iyear_2010 |  -.0049264    .018031    -0.27   0.785    -.0403395    .0304867
_Iyear_2011 |           0  (omitted)
_Iyear_2012 |           0  (omitted)
_Iyear_2013 |           0  (omitted)
      _cons |   .1143351   .0091071    12.55   0.000     .0964487    .1322214
------------------------------------------------------------------------------
     sigma_u |  .08950847
     sigma_e |   .0775697
         rho |  .57109318   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Private firms before IFRS introduction

```
. display "$Bedingung3"
public==0 & after==0

. xi: xtreg aheadocf L.aheadocf $accruals i.year if $Bedingung3, fe vce(robust)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
note: _Iyear_1987 omitted because of collinearity
note: _Iyear_2010 omitted because of collinearity
note: _Iyear_2011 omitted because of collinearity
note: _Iyear_2012 omitted because of collinearity
note: _Iyear_2013 omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =     15275
Group variable: firmid                          Number of groups   =      3071

R-sq:  within  = 0.0380                         Obs per group: min =         1
       between = 0.0038                                        avg =       5.0
       overall = 0.0084                                        max =        22

                                                F(27,3070)         =     12.71
corr(u_i, Xb)  = -0.1282                        Prob > F           =    0.0000

                                  (Std. Err. adjusted for 3071 clusters in firmid)
------------------------------------------------------------------------------
             |               Robust
    aheadocf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    aheadocf |
         L1. |   -.104281   .0147166    -7.09   0.000    -.1331365   -.0754256
             |
   depramort |   .2042502   .0672629     3.04   0.002     .0723653    .3361351
       dprov |   .1550308   .0443204     3.50   0.000     .0681302    .2419313
         dar |   .1266049   .0272753     4.64   0.000     .0731252    .1800845
        dinv |  -.0675312   .0186448    -3.62   0.000    -.1040888   -.0309736
         dap |  -.2365952   .0322276    -7.34   0.000     -.299785   -.1734053
 _Iyear_1987 |           0  (omitted)
 _Iyear_1988 |   .0116894   .0082669     1.41   0.157    -.0045198    .0278986
 _Iyear_1989 |   .0236116   .0084151     2.81   0.005     .0071118    .0401115
 _Iyear_1990 |   .0162254   .0083069     1.95   0.051    -.0000622    .0325131
 _Iyear_1991 |   .0288018   .0081923     3.52   0.000     .0127389    .0448647
 _Iyear_1992 |   .0187148   .0078009     2.40   0.016     .0034193    .0340103
 _Iyear_1993 |   .0130538    .007689     1.70   0.090    -.0020223    .0281299
 _Iyear_1994 |   .0015336   .0074449     0.21   0.837     -.013064    .0161312
 _Iyear_1995 |   .0141137    .007352     1.92   0.055    -.0003016     .028529
 _Iyear_1996 |   .0024444   .0073051     0.33   0.738     -.011879    .0167679
 _Iyear_1997 |   .0006146   .0073677     0.08   0.934    -.0138314    .0150607
 _Iyear_1998 |    .01099   .0073048     1.50   0.133    -.0033328    .0253128
 _Iyear_1999 |  -.0073859     .00757    -0.98   0.329    -.0222287    .0074568
 _Iyear_2000 |    .00551   .0070162     0.79   0.432     -.008247    .0192669
 _Iyear_2001 |   .0210793   .0073505     2.87   0.004     .0066669    .0354916
 _Iyear_2002 |   .0123516   .0066255     1.86   0.062    -.0006392    .0253424
 _Iyear_2003 |   .0132232   .0064291     2.06   0.040     .0006173     .025829
 _Iyear_2004 |   .0099066   .0064123     1.54   0.122    -.0026662    .0224794
 _Iyear_2005 |   .0199531   .0057619     3.46   0.001     .0086555    .0312507
 _Iyear_2007 |   .0138865   .0078062     1.78   0.075    -.0014193    .0291924
 _Iyear_2008 |   .0198267   .0111638     1.78   0.076    -.0020625    .0417158
 _Iyear_2009 |  -.0134127   .0527133    -0.25   0.799    -.1167697    .0899443
 _Iyear_2010 |           0  (omitted)
 _Iyear_2011 |           0  (omitted)
 _Iyear_2012 |           0  (omitted)
 _Iyear_2013 |           0  (omitted)
       _cons |   .0738922    .007005    10.55   0.000     .0601573    .0876271
-------------+----------------------------------------------------------------
     sigma_u |  .09111339
     sigma_e |  .09561842
         rho |  .47588835   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Private firms after IFRS introduction

```
. display "$Bedingung4"
public==0 & after==1

. xi: xtreg aheadocf L.aheadocf $accruals i.year if $Bedingung4, fe vce(robust)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
note: _Iyear_1987 omitted because of collinearity
note: _Iyear_1988 omitted because of collinearity
note: _Iyear_1989 omitted because of collinearity
note: _Iyear_1990 omitted because of collinearity
note: _Iyear_1991 omitted because of collinearity
note: _Iyear_1992 omitted because of collinearity
note: _Iyear_1993 omitted because of collinearity
note: _Iyear_1994 omitted because of collinearity
note: _Iyear_1995 omitted because of collinearity
note: _Iyear_1996 omitted because of collinearity
note: _Iyear_2013 omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =     11632
Group variable: firmid                          Number of groups   =      3135

R-sq:  within  = 0.0864                         Obs per group: min =         1
       between = 0.1480                                        avg =       3.7
       overall = 0.0014                                        max =        15

                                                F(20,3134)         =         .
corr(u_i, Xb)  = -0.3876                        Prob > F           =         .

                              (Std. Err. adjusted for 3135 clusters in firmid)
------------------------------------------------------------------------------
             |               Robust
   aheadocf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
   aheadocf |
         L1.|  -.1795375   .0156936   -11.44   0.000    -.2103083   -.1487667
            |
   depramort|   .0722374   .0927526     0.78   0.436    -.1096247    .2540994
       dprov|   .0699474   .0503362     1.39   0.165     -.028748    .1686427
         dar|   .1853275   .0276959     6.69   0.000     .1310235    .2396315
        dinv|   .0300502   .0178234     1.69   0.092    -.0048964    .0649969
         dap|  -.2538368   .0322516    -7.87   0.000    -.3170731   -.1906004
_Iyear_1987 |          0  (omitted)
_Iyear_1988 |          0  (omitted)
_Iyear_1989 |          0  (omitted)
_Iyear_1990 |          0  (omitted)
_Iyear_1991 |          0  (omitted)
_Iyear_1992 |          0  (omitted)
_Iyear_1993 |          0  (omitted)
_Iyear_1994 |          0  (omitted)
_Iyear_1995 |          0  (omitted)
_Iyear_1996 |          0  (omitted)
_Iyear_1997 |   .0381289      .00465     8.20   0.000     .0290117    .0472462
_Iyear_1998 |   .0618684   .0279959     2.21   0.027     .0069763    .1167606
_Iyear_1999 |  -.0120794   .0156088    -0.77   0.439    -.0426839    .0185252
_Iyear_2000 |  -.0113553   .0109821    -1.03   0.301    -.0328881    .0101776
_Iyear_2001 |   .0016994   .0107029     0.16   0.874     -.019286    .0226849
_Iyear_2002 |   .0171086    .007906     2.16   0.031     .0016071      .03261
_Iyear_2003 |   .0072116   .0066612     1.08   0.279    -.0058492    .0202723
_Iyear_2004 |   .0056412   .0052393     1.08   0.282    -.0046316    .0159139
_Iyear_2005 |   .0085482   .0040877     2.09   0.037     .0005334     .016563
_Iyear_2007 |  -.0050508   .0035133    -1.44   0.151    -.0119394    .0018377
_Iyear_2008 |   .0189512   .0039809     4.76   0.000     .0111457    .0267567
_Iyear_2009 |  -.0061626   .0039238    -1.57   0.116    -.0138562     .001531
_Iyear_2010 |  -.0161531   .0038526    -4.19   0.000    -.0237069   -.0085992
_Iyear_2011 |  -.0103915   .0039899    -2.60   0.009    -.0182146   -.0025683
_Iyear_2012 |  -.0192932   .0127016    -1.52   0.129    -.0441974    .0056111
_Iyear_2013 |          0  (omitted)
       _cons|    .101814   .0059103    17.23   0.000     .0902254    .1134025
------------+-----------------------------------------------------------------
     sigma_u|  .08552137
     sigma_e|  .08079127
         rho|  .52841806   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Overview of all samples

```
. estimates table ols_all ols_publicbefore ols_publicpost ols_privatebefore
>                 ols_privatepost,                star(.01 .05 .10) stats(N r2 r2_a r2_w r2_b r2_o) b(%14.3fc)
```

Variable	ols_all	ols_publicbefore	ols_publicpost	ols_privatebefore	ols_privatepost
aheadocf L1.	-0.082***	-0.093**	-0.093**	-0.104***	-0.180***
depramort	0.271***	0.370***	-0.284**	0.204***	0.072
dprov	0.085***	0.142	-0.110	0.155***	0.070
dar	0.163***	0.099	0.225***	0.127***	0.185***
dinv	-0.016	-0.104*	-0.055	-0.068***	0.030*
dap	-0.270***	-0.153*	-0.308***	-0.237***	-0.254***
_Iyear_1987	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
_Iyear_1988	0.008	0.038	(omitted)	0.012	(omitted)
_Iyear_1989	0.017***	0.016	(omitted)	0.024***	(omitted)
_Iyear_1990	0.009*	0.017	(omitted)	0.016*	(omitted)
_Iyear_1991	0.022***	0.028	(omitted)	0.029***	(omitted)
_Iyear_1992	0.015***	0.033	(omitted)	0.019**	(omitted)
_Iyear_1993	0.011**	0.040	(omitted)	0.013*	(omitted)
_Iyear_1994	-0.002	0.023	(omitted)	0.002	(omitted)
_Iyear_1995	0.011***	0.036	(omitted)	0.014*	(omitted)
_Iyear_1996	0.001	0.034	(omitted)	0.002	(omitted)
_Iyear_1997	-0.002	0.029	(omitted)	0.001	0.038***
_Iyear_1998	0.008*	0.019	-0.041	0.011	0.062**
_Iyear_1999	-0.010**	0.015	-0.058	-0.007	-0.012
_Iyear_2000	0.002	0.026	0.007	0.006	-0.011
_Iyear_2001	0.014***	0.026	-0.008	0.021***	0.002
_Iyear_2002	0.011***	0.024	0.008	0.012*	0.017**
_Iyear_2003	0.007*	0.009	0.000	0.013**	0.007
_Iyear_2004	0.005	0.021	-0.001	0.010	0.006
_Iyear_2005	0.011***	0.006	0.003	0.020***	0.009**
_Iyear_2007	-0.003	0.013	-0.019***	0.014*	-0.005
_Iyear_2008	0.019***	0.066*	0.004	0.020*	0.019***
_Iyear_2009	-0.007**	(omitted)	-0.008	-0.013	-0.006
_Iyear_2010	-0.012***	(omitted)	-0.005	(omitted)	-0.016***
_Iyear_2011	-0.005	(omitted)	(omitted)	(omitted)	-0.010***
_Iyear_2012	-0.018	(omitted)	(omitted)	(omitted)	-0.019
_Iyear_2013	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
_cons	0.076***	0.053	0.114***	0.074***	0.102***
N	30757	1944	1906	15275	11632
r2	0.041	0.037	0.064	0.038	0.086
r2_a	0.040	0.024	0.055	0.036	0.085
r2_w	0.041	0.037	0.064	0.038	0.086
r2_b	0.001	0.133	0.069	0.004	0.148
r2_o	0.023	0.093	0.007	0.008	0.001

legend: * p<.1; ** p<.05; *** p<.01

A.2.7—Sensitivity Analysis of Hypothesis One: Analysis of the Cash Flow Forecasting Model's Residuals

a) xtreg, re

```
. xtreg residsq_xtabond2_4calibrations    after public ifrs L.aheadocf $accruals log_scale, re

Random-effects GLS regression                   Number of obs      =     30757
Group variable: firmid                          Number of groups   =      5707

R-sq:  within  = 0.0095                         Obs per group: min =         1
       between = 0.0475                                        avg =       5.4
       overall = 0.0294                                        max =        25

                                                Wald chi2(10)      =    521.96
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
residsq_xt~s |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       after |  -.0023593   .0003366    -7.01   0.000    -.0030191   -.0016995
      public |   .0008042   .0009858     0.82   0.415     -.001128    .0027364
        ifrs |   .0017299   .0008724     1.98   0.047     .0000201    .0034398
             |
    aheadocf |
         L1. |   .0107848   .0014693     7.34   0.000      .007905    .0136646
             |
   depramort |   .0178343   .0048379     3.69   0.000     .0083522    .0273164
      dprov |   .0073383   .0050928     1.44   0.150    -.0026434    .0173199
        dar |   .0151526   .0027254     5.56   0.000     .0098109    .0204942
       dinv |   .0129405   .0020638     6.27   0.000     .0088956    .0169854
        dap |  -.0130143   .0034323    -3.79   0.000    -.0197415   -.0062872
  log_scale |  -.0021005   .0001401   -15.00   0.000    -.0023749    -.001826
      _cons |   .0344752   .0016155    21.34   0.000     .0313089    .0376416
------------------------------------------------------------------------------
    sigma_u |  .01472169
    sigma_e |  .01957143
        rho |  .36135275   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

b) xtreg, fe

```
. xtreg residsq_xtabond2_4calibrations    after public ifrs L.aheadocf $accruals log_scale , fe
note: public omitted because of collinearity

Fixed-effects (within) regression               Number of obs      =     30757
Group variable: firmid                          Number of groups   =      5707

R-sq:  within  = 0.0163                         Obs per group: min =         1
       between = 0.0209                                        avg =       5.4
       overall = 0.0155                                        max =        25

                                                F(9,25041)         =     45.97
corr(u_i, Xb)  = -0.5831                        Prob > F           =    0.0000

------------------------------------------------------------------------------
residsq_xt~s |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       after |   .0004772   .0004352     1.10   0.273    -.0003758    .0013303
      public |          0  (omitted)
        ifrs |   .0015771   .0009943     1.59   0.113    -.0003717     .003526
             |
    aheadocf |
         L1. |   .0074913   .0016167     4.63   0.000     .0043225     .01066
             |
   depramort |  -.0023354   .0068452    -0.34   0.733    -.0157523    .0110816
      dprov |    .006268   .0053636     1.17   0.243    -.0042451    .0167811
        dar |   .0063304   .0029116     2.17   0.030     .0006235    .0120373
       dinv |    .005869   .0022023     2.66   0.008     .0015524    .0101855
        dap |  -.0156344    .003639    -4.30   0.000     -.022767   -.0085018
  log_scale |  -.0072104   .0004213   -17.11   0.000    -.0080361   -.0063846
      _cons |   .0933453   .0049011    19.05   0.000     .0837389    .1029517
------------------------------------------------------------------------------
    sigma_u |  .02168281
    sigma_e |  .01957143
        rho |  .55104602   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(5706, 25041) =     2.51         Prob > F = 0.0000
```

A.2.8—Hypothesis Two

Cash flow forecasting model

```
. xi: xtabond2 aheadocf ocf $accruals_h2 i.year   , ///
>                twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>                ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: firmid                          Number of obs      =     31207
Time variable : year                            Number of groups   =      5751
Number of instruments = 32                      Obs per group: min =         1
Wald chi2(26) =    149.48                                      avg =      5.43
Prob > chi2   =     0.000                                      max =        25
------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |  -.0181486   .0181298    -1.00   0.317    -.0536823    .0173852
       dprov |   -.100463   .0419168    -2.40   0.017    -.1826183   -.0183076
  _Iyear_1988 |    .023142   .0115685     2.00   0.045      .000468    .0458159
  _Iyear_1989 |    .026019   .0115453     2.25   0.024     .0033906    .0486473
  _Iyear_1990 |   .0316828   .0112187     2.82   0.005     .0096946     .053671
  _Iyear_1991 |   .0407727   .0107048     3.81   0.000     .0197916    .0617538
  _Iyear_1992 |   .0341013   .0100852     3.38   0.001     .0143346     .053868
  _Iyear_1993 |   .0327332   .0097924     3.34   0.001     .0135404     .051926
  _Iyear_1994 |   .0132596   .0094399     1.40   0.160    -.0052423    .0317615
  _Iyear_1995 |   .0255988   .0090158     2.84   0.005     .0079282    .0432694
  _Iyear_1996 |   .0150095   .0087475     1.72   0.086    -.0021354    .0321543
  _Iyear_1997 |   .0073812   .0087559     0.84   0.399      -.00978    .0245425
  _Iyear_1998 |    .018853   .0084453     2.23   0.026     .0023006    .0354055
  _Iyear_1999 |   .0009853   .0080722     0.12   0.903    -.0148359    .0168066
  _Iyear_2000 |   .0099608   .0069381     1.44   0.151    -.0036377    .0235593
  _Iyear_2001 |   .0193804    .006672     2.90   0.004     .0063036    .0324573
  _Iyear_2002 |   .0084226   .0057969     1.45   0.146    -.0029392    .0197843
  _Iyear_2003 |   .0058164   .0053358     1.09   0.276    -.0046414    .0162743
  _Iyear_2004 |   .0047585   .0045942     1.04   0.300    -.0042461     .013763
  _Iyear_2005 |   .0090162   .0038659     2.33   0.020     .0014391    .0165933
  _Iyear_2007 |  -.0055435   .0035351    -1.57   0.117    -.0124722    .0013851
  _Iyear_2008 |   .0099562   .0039706     2.51   0.012     .0021739    .0177384
  _Iyear_2009 |  -.0155321    .004215    -3.69   0.000    -.0237933    -.007271
  _Iyear_2010 |  -.0165832   .0044636    -3.72   0.000    -.0253318   -.0078347
  _Iyear_2011 |  -.0101889   .0047262    -2.16   0.031     -.019452   -.0009257
  _Iyear_2012 |  -.0329634   .0209593    -1.57   0.116    -.0740428     .008116
        _cons |   .0839659   .0049844    16.85   0.000     .0741967    .0937351
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z = -23.03  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -3.39  Pr > z =  0.001
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(5)    =1969.63  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(5)    = 598.10  Prob > chi2 =  0.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    = 597.03  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(1)    =   1.07  Prob > chi2 =  0.301
  gmm(ocf, collapse lag(1 1))
    Hansen test excluding group:     chi2(3)    =  45.86  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(2)    = 552.24  Prob > chi2 =  0.000
```

Residual model

```
. regress residsq_xtabond2_all_h2         after public ifrs L.aheadocf $accruals_h2 log_scale

      Source |       SS       df       MS              Number of obs =   30757
-------------+------------------------------           F(  6, 30750) =  154.02
       Model |  .432912954     6  .072152159            Prob > F      =  0.0000
    Residual |  14.4048678 30750  .000468451            R-squared     =  0.0292
-------------+------------------------------           Adj R-squared =  0.0290
       Total |  14.8377807 30756  .000482435            Root MSE      =  .02164

------------------------------------------------------------------------------
residsq_xt~2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       after |  -.0031836   .0002665   -11.95   0.000    -.003706   -.0026613
      public |   -.000561    .000542    -1.04   0.301   -.0016234    .0005013
        ifrs |   .0036512   .0007472     4.89   0.000    .0021865    .0051158
             |
    aheadocf |
         L1. |   .0141166   .0011794    11.97   0.000    .0118049    .0164283
             |
       dprov |   .0242598   .0050251     4.83   0.000    .0144105    .0341092
  log_scale |  -.0017981   .0000757   -23.74   0.000   -.0019465   -.0016497
       _cons |   .0317514   .0008778    36.17   0.000    .0300309     .033472
------------------------------------------------------------------------------
```

A.2.9—Hypothesis Three

Cash flow forecasting model

```
. xi: xtabond2 aheadocf ocf $accruals_h3 i.year   , ///
>                twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>                ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: firmid                          Number of obs      =     31207
Time variable : year                            Number of groups   =      5751
Number of instruments = 32                      Obs per group: min =         1
Wald chi2(28) =    308.28                                      avg =      5.43
Prob > chi2   =     0.000                                      max =        25
------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |   .0494584   .0176543     2.80   0.005     .0148565    .0840602
   depramort |  -.3969491    .077174    -5.14   0.000    -.5482074   -.2456908
         dar |   .2594645   .0254571    10.19   0.000     .2095694    .3093596
        dinv |   .1278748   .0179253     7.13   0.000     .0927419    .1630078
 _Iyear_1988 |   .0164888   .0113948     1.45   0.148    -.0058447    .0388223
 _Iyear_1989 |   .0205715    .011262     1.83   0.068    -.0015016    .0426445
 _Iyear_1990 |   .0262555   .0111995     2.34   0.019     .0043049    .0482062
 _Iyear_1991 |     .0424   .0106426     3.98   0.000     .0215408    .0632592
 _Iyear_1992 |   .0401151    .010021     4.00   0.000     .0204743    .0597559
 _Iyear_1993 |   .0380034   .0097582     3.89   0.000     .0188776    .0571292
 _Iyear_1994 |   .0157865   .0093884     1.68   0.093    -.0026144    .0341874
 _Iyear_1995 |   .0322031   .0089962     3.58   0.000     .0145708    .0498354
 _Iyear_1996 |   .0216141   .0086713     2.49   0.013     .0046187    .0386096
 _Iyear_1997 |   .0119779   .0086228     1.39   0.165    -.0049225    .0288783
 _Iyear_1998 |   .0240007   .0084445     2.84   0.004     .0074498    .0405516
 _Iyear_1999 |   .0053504   .0079812     0.67   0.503    -.0102924    .0209933
 _Iyear_2000 |   .0160879   .0069357     2.32   0.020     .0024942    .0296816
 _Iyear_2001 |   .0269677   .0066448     4.06   0.000     .0139442    .0399913
 _Iyear_2002 |   .0197946   .0057101     3.47   0.001      .008603    .0309862
 _Iyear_2003 |   .0153617   .0052645     2.92   0.004     .0050434    .0256801
 _Iyear_2004 |   .0108903   .0045226     2.41   0.016     .0020261    .0197545
 _Iyear_2005 |   .0126421   .0038422     3.29   0.001     .0051116    .0201726
 _Iyear_2007 |  -.0025884   .0035245    -0.73   0.463    -.0094962    .0043195
 _Iyear_2008 |   .0202053   .0040202     5.03   0.000     .0123257    .0280848
 _Iyear_2009 |  -.0015609   .0042219    -0.37   0.712    -.0098356    .0067138
 _Iyear_2010 |  -.0154482   .0043667    -3.54   0.000    -.0240067   -.0068897
 _Iyear_2011 |  -.0056983   .0046562    -1.22   0.221    -.0148243    .0034276
 _Iyear_2012 |  -.0217855    .020546    -1.06   0.289     -.062055    .0184839
       _cons |   .0908632   .0060632    14.99   0.000     .0789794    .1027469
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z = -24.80  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -3.94  Pr > z =  0.000
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(3)    =1259.17  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(3)    = 445.41  Prob > chi2 =  0.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(2)    = 445.33  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(1)    =   0.07  Prob > chi2 =  0.788
  gmm(ocf, collapse lag(1 1))
    Hansen test excluding group:     chi2(1)    =  27.34  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(2)    = 418.06  Prob > chi2 =  0.000
```

Residual model

```
. regress residsq_xtabond2_all_h3         after public ifrs L.aheadocf $accruals_h3 log_scale

      Source |       SS       df       MS              Number of obs =   30757
-------------+------------------------------           F(  8, 30748) =  173.73
       Model |  .726682898     8  .090835362            Prob > F      =  0.0000
    Residual |  16.0771607 30748  .000522869            R-squared     =  0.0432
-------------+------------------------------           Adj R-squared =  0.0430
       Total |  16.8038436 30756   .00054636           Root MSE      =  .02287

------------------------------------------------------------------------------
residsq_xt~3 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       after |  -.0030048   .0002859   -10.51   0.000    -.0035651   -.0024445
      public |  -.0008113    .000573    -1.42   0.157    -.0019345    .0003118
        ifrs |   .0038678   .0007897     4.90   0.000       .00232    .0054155
             |
    aheadocf |
         L1. |   .0173379   .0014021    12.37   0.000     .0145897    .0200861
             |
   depramort |   .0451232   .0037015    12.19   0.000     .0378682    .0523782
         dar |   .0254134   .0025574     9.94   0.000     .0204009    .0304259
        dinv |   .0187605   .0021035     8.92   0.000     .0146376    .0228835
   log_scale |  -.0017513   .0000801   -21.88   0.000    -.0019082   -.0015943
       _cons |   .0284598   .0009584    29.69   0.000     .0265812    .0303383
------------------------------------------------------------------------------
```

A.2.10—Hypothesis Four

Cash flow forecasting model

```
. xi: xtabond2 aheadocf ocf $accruals_h4 i.year   , ///
>                twostep robust gmmstyle(ocf, lag (1 1) collapse) ///
>                ivstyle($accruals  i.year , equation (diff)) h(2)
i.year            _Iyear_1987-2013    (naturally coded; _Iyear_2006 omitted)
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
_Iyear_1987 dropped due to collinearity
_Iyear_2013 dropped due to collinearity
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: firmid                          Number of obs      =     31207
Time variable : year                            Number of groups   =      5751
Number of instruments = 32                      Obs per group: min =         1
Wald chi2(26) =    200.28                                      avg =      5.43
Prob > chi2   =     0.000                                      max =        25
------------------------------------------------------------------------------
             |              Corrected
    aheadocf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ocf |  -.0071034   .0178844    -0.40   0.691    -.0421561    .0279493
         dap |  -.2114483   .0295296    -7.16   0.000    -.2693252   -.1535714
  _Iyear_1988 |   .0268792   .0114578     2.35   0.019     .0044224    .0493361
  _Iyear_1989 |   .0294315    .011424     2.58   0.010     .0070409    .0518221
  _Iyear_1990 |   .0332949   .0110404     3.02   0.003     .0116561    .0549338
  _Iyear_1991 |   .0397357   .0105453     3.77   0.000     .0190673     .060404
  _Iyear_1992 |   .0322633   .0099296     3.25   0.001     .0128016    .0517251
  _Iyear_1993 |   .0318309   .0096885     3.29   0.001     .0128417     .05082
  _Iyear_1994 |   .0150197   .0093532     1.61   0.108    -.0033122    .0333517
  _Iyear_1995 |   .0255446   .0089104     2.87   0.004     .0080806    .0430086
  _Iyear_1996 |   .0151398   .0086653     1.75   0.081    -.0018438    .0321235
  _Iyear_1997 |   .0080334   .0086603     0.93   0.354    -.0089406    .0250073
  _Iyear_1998 |   .0190418   .0083592     2.28   0.023      .002658    .0354256
  _Iyear_1999 |   .0011852   .0079878     0.15   0.882    -.0144706     .016841
  _Iyear_2000 |   .0093324   .0068622     1.36   0.174    -.0041173    .0227821
  _Iyear_2001 |   .0175432   .0065836     2.66   0.008     .0046396    .0304467
  _Iyear_2002 |   .0060265    .005739     1.05   0.294    -.0052216    .0172747
  _Iyear_2003 |   .0036032   .0052914     0.68   0.496    -.0067677    .0139741
  _Iyear_2004 |    .003136   .0045664     0.69   0.492     -.005814    .0120859
  _Iyear_2005 |   .0084259    .003841     2.19   0.028     .0008976    .0159542
  _Iyear_2007 |  -.007198   .0035296    -2.04   0.041    -.0141159   -.0002801
  _Iyear_2008 |   .0066316   .0039587     1.68   0.094    -.0011274    .0143905
  _Iyear_2009 |  -.0194519   .0042229    -4.61   0.000    -.0277286   -.0111751
  _Iyear_2010 |  -.0150735   .0044425    -3.39   0.001    -.0237807   -.0063663
  _Iyear_2011 |  -.0114102   .0047075    -2.42   0.015    -.0206368   -.0021836
  _Iyear_2012 |  -.0374455   .0219638    -1.70   0.088    -.0804939    .0056028
        _cons |   .0847834   .0049473    17.14   0.000     .0750868      .09448
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(depramort dprov dar dinv dap _Iyear_1987 _Iyear_1988 _Iyear_1989
    _Iyear_1990 _Iyear_1991 _Iyear_1992 _Iyear_1993 _Iyear_1994 _Iyear_1995
    _Iyear_1996 _Iyear_1997 _Iyear_1998 _Iyear_1999 _Iyear_2000 _Iyear_2001
    _Iyear_2002 _Iyear_2003 _Iyear_2004 _Iyear_2005 _Iyear_2007 _Iyear_2008
    _Iyear_2009 _Iyear_2010 _Iyear_2011 _Iyear_2012 _Iyear_2013)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L.ocf collapsed
Instruments for levels equation
  Standard
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ocf collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z = -23.20  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =  -3.36  Pr > z =  0.001
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(5)    =1799.11  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(5)    = 574.17  Prob > chi2 =  0.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(4)    = 573.50  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(1)    =   0.67  Prob > chi2 =  0.413
  gmm(ocf, collapse lag(1 1))
    Hansen test excluding group:     chi2(3)    =  35.95  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(2)    = 538.22  Prob > chi2 =  0.000
```

Residual model

```
. regress residsq_xtabond2_all_h4         after public ifrs L.aheadocf $accruals_h4 log_scale

      Source |       SS       df       MS              Number of obs =   30757
-------------+------------------------------           F(  6, 30750) =  149.62
       Model |  .411685843     6  .068614307            Prob > F      =  0.0000
    Residual |  14.1017959 30750  .000458595            R-squared     =  0.0284
-------------+------------------------------           Adj R-squared =  0.0282
       Total |  14.5134817 30756  .000471891            Root MSE      =  .02141

------------------------------------------------------------------------------
residsq_xt~4 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       after |   -.003139   .0002638   -11.90   0.000    -.003656    -.002622
      public |  -.0005001   .0005361    -0.93   0.351   -.0015509    .0005507
        ifrs |   .0034723    .000739     4.70   0.000    .0020238    .0049208
             |
    aheadocf |
         L1. |   .0145263   .0011576    12.55   0.000    .0122573    .0167952
             |
         dap |   .0088684   .0029174     3.04   0.002    .0031502    .0145866
  log_scale |    -.00174   .0000749   -23.24   0.000   -.0018867   -.0015932
       _cons |   .0309634   .0008691    35.63   0.000    .0292599    .0326668
------------------------------------------------------------------------------
```

Curriculum Vitae

Stephan Gossner

Born August 1st, 1977, in Munich/Germany

EDUCATION

2012 – present	**University of St. Gallen (HSG)**, St. Gallen/Switzerland *Doctoral Student*, Ph.D. Program in Management, School of Management
2012 – 2013	**Columbia University**, New York, NY/USA *Visiting Scholar*, Columbia Business School, Accounting Division
2002 – 2004	**University of Auckland**, Auckland/Neuseeland *Master of Commerce (MCom) in Economics*, Departments of Economics and Finance
1998 – 2002	**Universität Passau** and **Westfälische Wilhelms-Universität**, Münster/Germany *Undergraduate Student*, Economics department
1997 – 1998	**Deutsche Bundeswehr** (German Army), Bad Reichenhall/Germany *Obergefreiter*, Gebirgsjägerbataillon 231
1997	**Städtisches Gymnasium Gerresheim**, Düsseldorf/Germany *High School Graduation (Abitur)*

PROFESSIONAL EXPERIENCE

2012 – present	**University of St. Gallen (HSG)**, St. Gallen/Switzerland *Research and Teaching Associate*, ACA-HSG
2008 – 2011	**PricewaterhouseCoopers AG WPG**, Munich/Germany *Senior Consultant*, Transactions – Valuation & Strategy (Advisory)
2004 – 2007	**Accenture GmbH**, Munich/Germany *Consultant*, Finance & Performance Management (Management Consulting)
1998 – 2002	**Dresdner Kleinwort Benson**, Frankfurt/Germany, and **Dresdner Bank AG**, Düsseldorf/Germany *Intern* and *Member of the Student Promotion Program*