What Determines Managers' Perceptions of Cash Flow Forecasting Quality?

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Abstract

In this paper we develop and test a model of the determinants of managers' perceptions of cash flow forecasting quality in nonfinancial companies. We expect and find that managers' perceptions of the quality of cash flow forecasts is determined by the perceived quality of the input data, the effort invested in forecasting and the efficiency of the related processes, and ultimately by a company's orientation toward financial goals. Our empirical analysis is based on data from a worldwide questionnaire survey conducted in 2010 at a German-based multinational industrial company. The analyses reveal that our model applies equally to the direct and the indirect cash flow forecasting method. We also find that information technology enhances forecasting quality perceptions only if systems match users' requirements and abilities.

Keywords: Cash flow forecasting, forecasting quality, managerial perceptions, direct method cash flow, indirect method cash flow

1 Introduction

Cash flow forecasting is a managerial instrument that is used in many, if not most larger companies. For example, liquidity management and hedging of financial risks are based on short-term cash flow forecasts, and investment and financing decisions are based on longer-term forecasts. The importance of financial planning and, especially, cash flow forecasting, has been underlined by the recent financial and economic crisis. As the crisis showed, capital markets can dry up quickly (e.g., Campello et al. 2011). Companies can react to the rise in uncertainty by increasing cash holdings and expanding credit facilities, but these measures are costly. Thus, in the face of higher uncertainty efficient liquidity management, based on reliable cash flow forecasts, becomes more important, not only for financial institutions but also for nonfinancial companies (Gamba and Triantis 2010, Gorbenko and Strebulaev 2010).

However, to our knowledge, despite its importance, cash flow forecasting and its determinants have not been investigated in the literature so far, either conceptually or empirically.[1] In this paper we address this void and investigate what determines managers' perceptions of cash flow forecasting processes and cash flow forecasting quality in a nonfinancial company. Managers' perceptions of managerial activities such as cash flow forecasting are interesting and practically relevant because, according to the bounded rationality framework (Simon 1957, 1979) and its concretization in form of the reasoned action approach (Fishbein and Ajzen 1975, 2010), human behavior is not determined directly by objective circumstances, but influenced via people's subjective perceptions or "beliefs".[2] We suggest that cash flow forecasting quality, and managers' perception thereof, depend on the quality of the input data, the effort invested in forecasting, the efficiency of the related processes, and the company's orientation toward financial goals. As cash flow forecasts can be based on either the direct or the indirect cash flow method (Shim et al. 2008), we examine whether perceptions of forecasting quality and their determinants differ between the two methods. Finally, we also analyze how information technology influences managerial perceptions of cash flow forecasting and forecasting quality.

Our research is exploratory and model-generating in nature (Jöreskog 1993). The aim is to generate insight into an area of corporate financial management and management accounting that is of

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[1] Graham and Harvey (2001) have studied financial objectives and risks as well as their implications for company management. Other scholars have examined the determinants of nonfinancial companies' cash holdings (Faulkender and Wang 2006, Lins et al. 2010). Forecasting quality is being analyzed in other areas of business research such as research on sales (Davis and Mentzer 2007, Hughes 2001, Mentzer and Cox 1984), production, and inventory planning (Zotteri and Kalchschmidt 2007).

[2] According to the reasoned action approach of Fishbein and Ajzen (1975, 2010), objective factors are fully mediated by beliefs. Other factors such as personality variables, values and demographic attributes (gender etc.) in turn influence the formation of beliefs. Human beings form subjective beliefs about the consequences and evaluation of behavioral outcomes, normative beliefs and control beliefs. The normative beliefs reflect the perceived expectations of reference groups and the control beliefs reflect how much they think they can influence decisions. Several meta-analyses summarizing hundreds of empirical studies have confirmed this basic model of reasoned action (e.g. Armitage and Conner 2001; Manning 2009; McEachan et al. 2011).

pivotal importance in practice, but not normally open to academic research. Based on a multi-year cooperation with a large German-based multinational industrial company, we were able to conduct a worldwide questionnaire survey amongst managers involved in cash flow forecasting and in using cash flow forecasts in their decision-making. The survey was conducted in 2010. It was addressed to 302 managers; 198 managers participated in the survey.

To take into account the complexity of the underlying organizational processes we employ structural equation modelling (SEM) to set up a model and test our predictions. SEM allows us to estimate simultaneously not only the direct effects of explanatory factors on managers' forecasting quality perceptions, but also interrelations between explanatory factors and thus their indirect and total effects (Bollen 1989). In contrast to classical simultaneous equation systems it also controls for random and nonrandom measurement errors. Using multigroup SEM (Kline 2011), we can also examine whether differences exist between the two cash flow methods.

In the descriptive part of the study we show that, although we have surveyed managers from just one company, the perceptions of the company's financial planning processes and of the quality of its financial forecasts differ considerably across the individual managers. This is explained by the fact that our sample company is a large multinational company and the managers who have taken part in our survey work in diverse management functions, in different business units and in practically all regions of the world. Hence, cash flow forecasting takes place world-wide, and forecasting processes and the quality of forecasts may thus differ across local entities. In addition, managers' perceptions are shaped by individual characteristics such as gender, age, education, personality, values and knowledge.

As we expected, managers' views on cash flow forecasting quality are embedded in their broader perceptions of their company's financial goals and financial management processes. This is in line with the more general formulation of the behavioral theory of the firm (Cyert and March 1963, 1992; Argote and Greve 2007). First, not surprisingly, according to the managers participating in the survey the quality of input data exerts a strong influence on the quality of cash flow forecasting. Second, communication and cooperation between different organizational units of the company play an important role for the perceived efficiency of cash flow forecasting and for forecasting quality (Armstrong 2001). Third, managers who believe their company attaches a lot of weight to financial goals also value forecasting effort and, especially, forecasting efficiency higher and evaluate cash flow forecasting quality more positively. Our analysis furthermore reveals that our model of managerial perceptions of cash flow forecasting generally applies to both the direct and the indirect cash flow forecasting method.[3] Finally, our

[3] In detail, however, managers perceive differences between the two cash flow forecasting methods. In particular, the managers believe that the efficiency of the direct forecasting process is higher than that of the indirect method. This is intuitive since (as will be explained in more detail below) indirect cash flow forecasting is based on a company's operational planning; it is highly complex and may be influenced by managerial objectives.

findings document that information technology supports forecasting processes and, thus, enhances output quality, only if the systems meet users' requirements and abilities. This suggests that attempts to employ information technology without efficient internal cooperation may actually have an adverse effect on forecasting quality.

Our research contributes to the literature by providing deep insights into cash flow forecasting at a large multinational nonfinancial company. Cash flow forecasting is an important managerial activity at the overlap of financial management and management accounting which has to date received scant attention in the academic literature. In fact, to the best of our knowledge, cash flow forecasting processes, or the quality of cash flow forecasts and their determinants so far have not been examined empirically. We develop predictions on how managers perceive quality of cash flow forecasts and its determinants. Using SEM, we then estimate the determinants' direct, indirect, and total effects on the perceived quality. We also compare our model across the two cash flow methods and we examine the impact of the methods on forecasting quality.

Our research may not only be interesting to academics, but also to practitioners who work in the area of financial management and cash flow forecasting and who want to understand the factors affecting forecasting quality. We provide an approach to identify drivers of the quality of cash flow forecasting, and to measure the relationships between them. Furthermore, in line with the concept of evidence-based management (Frese et al. 2012, Rousseau 2006), our work may be used to derive recommendations for companies on how to optimize financial management by enhancing cash flow forecasting.

2 Institutional Background

2.1 Cash Flow Forecasting and Cash Flow Methods

Cash flow forecasting is an important and pervasive managerial activity. For example, liquidity management and hedging of financial risks are based on short-term and medium-term cash flow forecasts and investment and financing decisions are based on longer-term forecasts. As will be discussed in more detail below, operations planning and budgeting are also closely related to cash flow forecasts.

The pivotal importance of cash flow forecasting for financial management has been reinforced by the recent financial crisis. The crisis has demonstrated that macroeconomic shocks can cause financial distress by decreasing corporate liquidity in the short run, but also by arousing concerns about companies' long-term solvency should cash flows decrease persistently (Gryglewicz 2011). Financial distress causes costs related to operating inefficiencies, missed investment opportunities, and reorganization. Preventing financial distress by building up cash reserves is also costly (Kim et al. 1998). Hence, financial risk management based on reliable cash flow forecasts can contribute to corporate value by reducing required cash holdings and still preventing costly external financing (Froot et al. 1993). Companies that forecast cash surpluses and shortfalls can anticipate needs for external financing and negotiate them well in

advance. Thus, cash flow forecasting lowers a company's sensitivity to liquidity shocks, enhancing financial flexibility and profitability (Lang and Maffett 2011, Martin and Morgan 1988).

There are two methods to estimate expected operating cash flows.[4] The first method directly anticipates cash inflows from sales to customers and cash outflows to suppliers, employees, lease holders, tax authorities, and others. With the second method, operational cash flow is derived indirectly from operating income by deducting noncash items such as depreciation and provisions, and by adding cash items that are not recorded in operating income such as tax payments and expected changes in working capital positions. In theory, the two methods should produce the same result. However, they differ in important ways that may affect the quality of the forecasts. The direct method is more intuitive, since it reflects a firm's cash conversion cycle and thus allows a transparent view of the sources of cash flow (FASB 2010, O'Leary 1988). In principle, direct estimation also facilitates variance analyses through comparisons of forecasted and actual cash flows broken down by component, as well as analyses of the sensitivity of cash flow components to changes in operating activities (FASB 2010). The indirect method, on the other hand, has the advantage that it explains differences between net cash flow and net income (IASB 2008, Nurnberg 2006), as well as changes in working capital (Krishnan and Largay 2000). However, with the indirect method, only net operating cash flow can be estimated, not gross cash inflows and outflows or their respective components. The indirect method is therefore deemed less insightful than the direct method (IASB 2008, Nurnberg 2006), and empirical studies find that direct method components incrementally improve predictions of earnings and cash flows, and thus improve investors' decisions (for an overview of this literature, see Hales and Orpurt 2013).

Cash flow forecasts made for the purpose of short-term liquidity management and the management of financial risks (credit risk, exchange risk) require the application of the direct method. Longer-term forecasts for financial management and for operations planning and budgeting, however, are usually based on the indirect method. The indirect method is also almost universally applied when companies present cash flow statements as part of their financial reporting (Hales and Orpurt 2013, Nurnberg 2006). The reason is that companies' reporting systems are designed to comply with financial and tax accounting standards that are accruals-based and thus require the recording of revenues and expenses rather than that of cash inflows and outflows. Furthermore, standards for cash flow reporting traditionally allow the reporting of cash flow indirectly derived from balance sheets and income statements.[5] As a consequence, companies' reporting systems in practice usually do not provide details on operating cash flows, and modifying the systems to give such information would entail considerable costs

[4] The two methods do not differ with regard to the calculation of investing and financing cash flows. The same two methods can be applied in reporting past realized cash flows. For details, see Shim et al. 2008.

[5] For example, see IAS 7, para. 18; SFAS 95, para. 28.

(IASB 2008).[6] Moreover, even if companies use direct cash flow forecasts for internal financial management, given the constraints of their reporting systems they often cannot compare the forecasted cash flow components with subsequent actual cash flows (see section 2.2, below).

Indirect cash flow forecasts are usually based on operational planning and budgeting, which involves internal target setting, resource allocation, control, and managerial remuneration as well as other managerial incentives, including career perspectives (e.g., Hansen and van der Stede 2004; Haka 2006; Malmi and Brown 2008; also see Luft and Shields 2003). In order to be consistent with external reporting, operational forecasts and operational performance information reported to top management by companies' business units are usually aligned with operating income according to Generally Accepted Accounting Principles (GAAP). Indirect cash flow forecasts can be easily and cheaply derived from operational forecasts, but have some disadvantages. First, indirectly forecasted cash flows may be biased by managerial or "political" considerations that may cause business units to make overoptimistic or overconservative operational forecasts (e.g., Anderson et al. 2010). Second, in the short run tradeoffs may exist between revenue- and income-based goals on the one hand, and cash-flow-based goals on the other hand. For example, towards the end of reporting periods managers may try to achieve revenue- and income-based goals through "real earnings management," with negative effects on working capital (e.g., Roychowdhury 2006). Third, operational planning is based on companies' internal organizational structures (business units, divisions, etc.), while short-term liquidity management and long-term solvency management must be oriented toward the company's legal structure, as all legal entities must be able to meet their obligations at all times. We return to this issue below, in Section 2.2.

2.2 Cash Flow Forecasting at the Sample Company

The research project presented in this paper is based on a long-term cooperation between the academic authors and the sample company. The company has worldwide industrial operations in three business areas; the group's legal structure comprises the holding company in Germany and more than 300 subsidiaries worldwide. With more than 100,000 employees, the company generates yearly revenues in the medium double-digit billion Euro range. About 40% of the revenues come from Europe, just over 20%

[6] In a joint project to amend their standards on cash flow reporting, the International Accounting Standards Board (IASB) and the US Financial Accounting Standards Board (FASB) several years ago proposed that companies should be required to disclose a disaggregation of operating cash flows according to the direct method (IASB 2008). During the deliberations on the project companies pointed out that such a requirement would entail considerable one-time costs (e.g., process redesign, documentation, testing, auditing) as well as ongoing costs (additional data management, auditing) (FASB 2010). In response, the standard setters are currently discussing a "derived approach" based on indirectly estimated direct cash flow components (FASB 2010). Research indicates that such an approach, while subject to estimation errors, is still more informative to users than the indirect cash flow method (e.g., Krishnan and Largay 2000, Orpurt and Zang 2009).

each from North America and the Asia/Pacific region, 12% from Latin America, and 5% from the Middle East and Africa. Yearly operating cash flows lie in the medium single-digit billion Euro range.

Financial management at the sample company is highly centralized, and its principal task is the management of the group's financial risks. A key requirement is that all of the legal entities be always capable of meeting their financial obligations on time. In a broader sense, financial management has the task of providing financial flexibility, to ensure that the group can implement its long-term strategies with minimal cost of capital. A related objective is to reduce the volatility of cash flows and thus further contribute to company value. The group's finance department is run as a cost center. Given the worldwide scope of the company's activities, financial management must take into account differences between national and regional financial markets (stage of development of markets, banking infrastructures, and other institutions; market conditions; legal and tax regulations; cultures; etc.). Furthermore, the group's three business areas follow different business cycles, affecting monthly cash flows.

The sample company employs both the direct and the indirect methods to forecast cash flows. Direct method forecasting forms the basis of liquidity management and of other forms of financial risk management, in particular foreign exchange risk management, for both the group and each legal entity. Indirect cash flow forecasts based on operational planning are used to measure performance as well as track changes in working capital.

Direct method cash flow forecasting is defined and steered by the company's central finance department. The forecasts are made on a worldwide basis; responsible for generating the forecasts are the financial management teams of the legal entities. The managers of the legal entities often base their forecasts of cash inflows from revenues and cash outflows from disbursements on the operational plans of the respective units. In other words, in practice not only indirect cash flow forecasts but, to a certain extent, also direct cash flow forecasts are based on operational planning. (Srinivasan and Kim [1986] describe this proceeding as the "traditional approach" to cash flow forecasting.) The legal entities transmit their cash flow forecasts to the central finance department, where they are validated and aggregated to reflect the perspective of the group.

Operational forecasting processes are coordinated by the group's central planning and management control department. Forecasts are generated at the company’s business units. After validation, they are consolidated for each of the group's three business areas. The legal entity perspective is not considered in operational forecasting, as it is irrelevant to steering the operating business.

Aligned with the company's regular operational planning and budgeting processes, both direct and indirect cash flow forecasts are generated quarterly. The forecasts cover monthly intervals with a maximum horizon of fifteen months. The two types of forecasts are reconciled with each other on the group level; differences between them are discussed and adjustments are made where appropriate. Reconciling direct and indirect forecasts on lower hierarchical levels is not possible because, as has been

explained above, cash flow forecasts according to the direct method are based on the group's legal structure (holding company, subsidiaries) while indirect cash flow forecasts are based on the managerial organizational structure (business areas).

Moreover, as in most companies, the sample company's reporting systems are designed to meet the requirements of financial and tax reporting, so they are oriented toward revenues (and other income) and expenses, not cash inflows and outflows. Hence, at the time of our survey realized cash flows could be estimated only indirectly from financial statements. Furthermore, the quality of forecasts could be assessed for the group as a whole and for the individual legal reporting entities and business areas, but only for aggregated cash flow, not for cash flow components. As a consequence, only major variances between forecasted and actual cash flows could be investigated on a case-by-case basis. However, the survey that generates the data for the present empirical study is part of a broader initiative to optimize financial planning and cash flow management at the sample company and, in the meantime, efforts have been made to amend reporting systems and to allow for systematic and ongoing comparisons of planned and realized cash flows broken down by component.

3 Model and Predictions

Our aim is to analyze how managers perceive cash flow forecasting quality and its determinants in a nonfinancial company. As was explained above, perceptions are relevant because human behavior is not determined directly by objective circumstances but influenced via people's perceptions or "beliefs" (Fishbein and Ajzen 1975, 2010). In other words, the perceptions mediate effects between objective factors (company goals, business considerations, etc.) and managers' intentions and behavior. Because of this, perceptions are also indicative of the economic factors they reflect. Since corporate cash flow forecasting has not been analyzed either theoretically or empirically, we base our predictions on basic economic reasoning, on studies in general financial management (e.g., Graham and Harvey 2001, Graham et al. 2005) and on studies that investigate forecasting quality in other fields of management, such as sales, production, and inventory planning (e.g., Davis and Mentzer 2007, Hughes 2001, Zotteri and Kalchschmidt 2007).

From a survey among 500 industrial companies, Mentzer and Cox (1984) find that company characteristics (e.g., size, industry) and forecast characteristics (e.g., forecast method, forecast aggregation level) explain only a small proportion of the variation in forecast accuracy. In line with the adage "garbage in, garbage out" (Chatfield 1995), they suggest that the major part of the variation is caused by the quality of the input data: its availability, its reliability, managers' understanding of trend patterns or seasonalities, and uncertainty. Accordingly, we posit that the (perceived) quality of cash flow forecasts depends on the (perceived) quality of the input data used in cash flow forecasting. Indirect cash flow forecasting depends on operational planning. All forms of forecasts are, to some degree, subject to error. Moreover, forecasts

can be systematically biased due to limitations of human information processing (cognitive biases) and agency problems and conflicts of interest (Hogarth and Makridakis 1981). We would expect this to hold especially for indirect cash flow forecasting because it being intertwined with operational planning and, thus, budgeting, resource allocation, managerial control and remuneration (e.g., Luft and Shields 2003).

Second, forecasts are the results of managerial activities such as collecting information, generating forecasts, modifying and updating forecasts, and assessing forecast accuracy (Zotteri and Kalchschmidt 2007). In large multinational companies, these activities span different functional and organizational units (Webby et al. 2001). Hughes (2001) suggests that effort and efficiency are critical. In her research on sales forecasting in Scottish companies she finds that lack of support by senior management and deficits in forecasting process implementation, in particular underfunding and inefficient linkages between different organizational units, impair forecasting quality. In line with this, the work of Kahn and Mentzer (1994) on sales forecasting indicates that team-based forecasting and involvement of representatives from different business functions tend to improve forecasts (also see Mentzer and Kahn 1997). With regard to cash flow forecasting, we therefore expect that the perceived quality of the forecasts is determined by the perceived effort managers put into forecasting processes, and by the perceived efficiency with which team members, especially members from different organizational units, cooperate in executing these processes (Hogarth and Makridakis 1981; Harvey 2001; Webby et al. 2001).

On a more fundamental and behavioral level, we propose that the quality of cash flow forecasting is affected by a company's orientation towards financial goals (Graham and Harvey 2001). Goal-setting theory, which is widely accepted in the field of organizational behavior (e.g., Guthrie and Hollensbe 2004, Knight et al. 2001), posits that goals improve performance. Goals direct management's attention to goal-related activities, and they motivate energy and persistence (Locke and Latham 1990). Goals improve managerial performance not only by individuals but by teams (e.g., Durham et al. 1997). Zotteri and Kalchschmidt (2007), in a survey among Italian manufacturing companies, find that goals greatly affect demand forecasting practices and accuracy. Similarly, Davis and Mentzer (2007), in a study on sales forecasting in global manufacturing firms, find that goals and reward alignment improve forecasting capabilities. We expect that managers' perception of the strength of their company's orientation towards financial goals also shapes their views on the efforts invested in cash flow forecasting, on the efficiency of the related processes, and possibly on the quality of the forecasting output.

> > Insert Figure 1 about here < <

Figure 1 gives an overview of our proposed model. In our empirical analysis we investigate whether our proposed model holds equally for direct and indirect cash flow forecasting. A priori, we believe that the model is generally applicable to both methods. However, we also believe that the two methods may differ in the mean levels of variables and the strength of some of the relationships between them. For example, we expect that managers will perceive a stronger association between financial goals

on the one hand and direct method forecasting processes and quality on the other hand than for the indirect method. This is because direct method cash flow forecasting is designed and implemented specifically for the purposes of financial management while indirect method cash flow forecasting is derived from operational planning. Second, the entire process of operational planning is highly complex, resource-intensive, and potentially fraught with agency problems and conflicts of interests. We therefore expect that for indirect cash flow forecasting the perceived level of effort is higher and the level of efficiency is lower than for direct cash flow forecasting. Finally, because of the task-specific design and the absence of obvious political influences we expect that managers attach higher quality ratings to direct method forecasts than to forecasts based on the indirect method.[7]

4 Research Design

To test our model and its predictions, we use structural equation modeling (SEM), a multivariate technique introduced by Jöreskog (1973). SEM offers important advantages over the estimation of single equations, especially when the researcher (as in our study) is interested in relationships between latent variables (theoretical constructs) that are not directly observable, such as attitudes, opinions and perceptions or potentially multifaceted concepts such as goal-orientation, effort, efficiency, quality, or performance. Using SEM one can measure the latent variables with multiple indicators while controlling for random and nonrandom measurement error. This allows estimating relations between latent variables instead of relations between unreliable indicators. SEM consists of two interrelated parts, the measurement model using factor analysis to compute loadings of directly observable variables on their posited latent variables (constructs), and the structural model defining causal linear relationships between these latent constructs (Goldberger 1971, Jöreskog and Sörbom 1984). SEM allows estimating not only direct relationships between variables, but also indirect (mediated) effects as well as total effects and their standard errors (Bollen 1987). SEM is widely used in various areas of business research such as marketing and strategic management, and is increasingly also applied in financial and management accounting research (e.g., Baines and Langfield-Smith 2003; Abernethy and Vagnoni 2004; Janke et al. 2014).

Our model consists of three equations, one for each of the dependent variables in Figure 1. The first equation describes the relationship between the effort invested in cash flow forecasting [EFFORT] and the company's orientation toward financial goals [GOALS], both as perceived by the managers participating in the survey, while controlling for the cash flow planning method [METHOD] and further control variables. Analogously, the second equation describes the relationship between the (perceived)

[7] Several studies investigate the predictive ability of direct and indirect method disclosures of cash flows. The results indicate that cash flow components disclosed under the direct method have incremental explanatory power for firms' performances in subsequent periods over and above indirect cash flow information (e.g., Krishnan and Largay 2000, Orpurt and Zang 2009).

efficiency of forecasting processes, on the one hand, and the company's (perceived) orientation toward financial goals [GOALS], METHOD and further control variables, on the other hand.

$$\text{EFFORT} = \beta_1\text{GOALS} + \beta_2\text{METHOD} + \sum\beta_j \text{ control variables} + \varepsilon_{\text{EFFORT}} \quad (1)$$

$$\text{EFFIC} = \beta_1\text{GOALS} + \beta_2\text{METHOD} + \sum\beta_j \text{ control variables} + \varepsilon_{\text{EFFIC}} \quad (2)$$

METHOD is an indicator variable representing the forecasting method applied. It is coded 1 for the direct cash flow method and 0 for the indirect method. Our measurement of GOALS, EFFORT, EFFIC, and the control variables used in these and the following equations are explained in more detail below. We generally expect that the effort managers invest in cash flow planning, and the efficiency of the related processes, will tend to be higher if a company is strongly orientated towards financial goals. We expect this relationship also to hold for the perceptions of the managers participating in our survey because all three factors, orientation towards financial goals, the effort invested in cash flow planning, and the efficiency of cash flow planning processes, are likely to differ world-wide across our sample companies' local entities.[8] Thus, we expect β_1 to be positive in equations (1) and (2). Furthermore, as was explained in Section 3, we expect β_2 to be negative in equation (1) and positive in equation (2).

Equation (3) describes the relationship between the quality of the perceived cash flow forecasting output [QOUT] and its determinants, namely forecasting effort [EFFORT], efficiency [EFFIC], the quality of forecasting inputs [QIN], and the forecasting method [METHOD]:

$$\text{QOUT} = \beta_1\text{EFFORT} + \beta_2\text{EFFIC} + \beta_3\text{QIN} + \beta_4\text{METHOD} + \sum\beta_j \text{ control variables} + \varepsilon_{\text{QOUT}} \quad (3)$$

Based on the reasoning outlined in the previous section, we expect positive values for the coefficients β_1, β_2, β_3, and β_4.

In all three equations, the influence of the cash flow forecasting method is represented by the indicator variable METHOD. In order to investigate further whether differences exist with regard to the determinants of the quality of direct and indirect cash flow forecasting, we apply multigroup SEM. We test not only for the invariance of our structural model, but also for the invariance of the measurement model (metric invariance), i.e. the relationships between the latent variables and the survey items with which we measure them.[9]

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[8] For example, the survey responses from a manager in an Argentine entity will reflect management's orientation towards financial goals, forecasting efforts and forecasting efficiency in that particular country or region and unit, while the responses from a manager in a Japanese subsidiary will reflect the particular local values of these factors.

[9] For details on multigroup SEM, see for example Byrne (2009) and Chen (2007).

5 Sample, Survey Method, and Variables

5.1 Sample and Survey Method

Our data comes from a worldwide, anonymous survey conducted in spring 2010 among members of the management of the sample company. The survey was initiated by the top management of the company as part of its regular efforts to review and, where possible, enhance financial management practices. Over the recent past, the survey findings have provided the basis for a series of workshops with company managers involved in cash flow forecasting at corporate headquarters and at overseas subsidiaries.

The survey addressees comprised 115 managers responsible for forecasting cash flow by using the direct method, 156 managers concerned with operational planning, which is the basis for cash flow forecasts according to the indirect method, and 31 managers of the central finance and management control departments who use these forecasts, for instance, in financing and risk management decisions and in operational planning and performance evaluation.

The questionnaire was discussed intensively with internal experts from different functions who are involved in cash flow forecasting. It was also pretested with representatives of each of the three target groups in order to ensure a correct and common understanding of all questions. The questionnaire was then emailed to the addressees by the chief financial officer of the sample company. In the email the addressees were asked to participate in the survey and were assured absolute anonymity. General reminders were mailed after 11, 18, and 21 days. The survey was closed after 26 days.[10]

Of the 302 managers addressed, 198, or 65.6%, participated in the survey: 82 managers involved in cash flow forecasting according to the direct method, 89 managers charged with operational planning, and 27 forecast users. Table 1 describes the sample distribution over business areas, regions, and size of the organizational units.[11] As the table shows, the survey data comes from company managers working in all of the business units and in practically all regions of the world.

> > Insert Table 1 about here < <

The questionnaire consisted of four sections: financial governance, forecasting processes and quality, information technology supporting cash flow forecasting, and information on the respondents' organizational units. In total, the questionnaire comprised 38 questions. However, each target group was sent only those questions relevant to its role in generating, or working with, cash flow forecasts.

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[10] Tests for late-response bias employing ANOVA do not show any significant results with one exception: Forecasters using the direct method who completed the questionnaire after the first reminder rated forecasting effort somewhat higher than those who responded earlier (F=2.820, p=0.066).

[11] As can be seen in Table 1, the response rate differs across the three target groups (Chi^2=14.712, df=2, p=0.001). Survey participation is highest amongst forecast users and lowest amongst operational planners. The differences in the willingness to participate can be attributed to the different degrees of involvement in liquidity management.

The section on financial governance was addressed to all managers. We asked the managers to assess the importance of financial goals and the strength of the sample company's focus on these goals. The second section contained questions on the effort managers at the sample company invest in forecasting activities, on the efficiency of forecasting processes, and on the quality of forecasting input. These questions were addressed only to managers involved in direct and indirect forecasting. Furthermore, we asked all survey participants to assess the quality of the forecasting output. Third, a further section of the questionnaire focused on the use of information systems within the finance domain of the sample company; due to their specific focus these questions were directed only to managers involved in direct cash flow forecasting. Finally, all participants were asked to provide basic information about their organizational units so as to allow to control in our analyses for possible differences in responses across business areas, regions, and sizes of organizational units.

In order to make optimal use of the survey data and get unbiased estimations in our empirical analysis (Schafer and Graham 2002), we do not list-wise delete incomplete responses but impute missing item values. Multiple imputation is a widely accepted method in the social sciences that has been shown to be superior to complete case analysis (e.g., Little and Rubin 1989, Schafer 1997). For our study, out of a total of 3,420 item values 122 values have been imputed (3.6%).[12]

5.2 Dependent Variable: Quality of Forecasting Output

An objective assessment of the quality of cash flow forecasts would require comparing the forecasts with the subsequent cash flow realizations. However, as has been explained in Sections 2 and 3, at the time of the survey detailed comparisons of this kind were not feasible due to limitations of the company's reporting systems. Furthermore, total realized cash flows may deviate from planned amounts for reasons that are unpredictable and have nothing to do with forecasting quality, such as acquisitions or divestments, or operational changes such as switches of invoicing currencies or reroutings of sales or procurements between company units. Within a worldwide group that comprises more than 300 legal units and thousands of individual sales transactions every month, effects of such events cannot be easily identified and excluded from the plan-to-actual differences. Reported total cash flow amounts are thus not helpful to assess the quality of cash flow forecasts.

For these reasons, we proxy the quality of our partner company's cash flow forecasts with data generated in our survey. Direct forecasters were asked to assess the quality of direct method forecasts, indirect forecasters were asked to assess operational planning, which forms the basis for indirect cash flow forecasts, and users of forecasts were asked to assess both types of forecasts. The survey participants were

[12] We impute data by maximum likelihood estimation employing PASW Statistics 18. Missing values are replaced by the averages of ten imputations (Arbuckle 2010).

asked to indicate their agreement to the statement "Overall, plan data is of a high quality" on a five-point Likert scale, where 1 meant "strongly disagree" and 5 meant "strongly agree." We also asked the survey participants to rate forecasting quality along the dimensions "reliability", "up-to-dateness", "timely provision", "completeness" and "transparency", also using a five-point Likert scale (for a similar approach see Wang and Strong 1996). When we use the composite quality score based on the five dimensions, or the single item with the overall assessment of forecasting quality, the results of our empirical model are very similar (see section 6.1, below). However, the use of the composite score lowers the statistical fit of the model. Thus, in order to reduce the complexity of the model and to increase statistical power by gaining degrees of freedom, we use the overall assessment of forecasting quality in our estimations.

> > Insert Table 2 about here < <

The results of the assessment of forecasting quality are reported in Table 2. As we explained above (see Section 3), we expected that managers would rate direct forecasts higher than indirect forecasts. The mean quality rating of the direct method forecasts is 3.84, which is indeed slightly higher than the mean rating of 3.76 for the indirect method forecasts. However, the difference is small and not significant according to either the t-test or the Mann–Whitney U-test (see Panel A of Table 2),.

A possible reason why the managers rate the quality of the two types of forecasts roughly equally may be that they evaluate them not against each other, but against their respective and rather different purposes—the specific liquidity management purpose of the direct method, and the broader, operational and financial management purpose of the indirect method. Since both types of forecasters were asked to evaluate their own performances, it is also possible that their responses are affected by in-group bias (Brewer 1979, Brewer and Kramer 1985). Therefore, we test whether the quality assessments of the forecasters differ from those of the forecast users, i.e. the managers who regularly use cash flow forecasts in their decision-making in liquidity and working capital management and in performance evaluation. The managers using the forecasts also regularly compare forecasted total cash flows of the group with total realized amounts which gives their assessment of the forecast quality an objective foundation. The result of the comparison is shown in Panel B of Table 2. We see that the forecast users rate the quality of both types of forecasts slightly lower than the forecasters themselves. However, the differences are small and statistically insignificant. Thus, in-group bias does not appear to be an issue. We conclude that using forecaster ratings to proxy the quality of cash flow forecasts does not distort our estimations.

5.3 Variables Influencing the Quality of Forecasting

Some of our variables consist of subconstructs that are in turn reflected in survey items. Following standard SEM procedure, we therefore test our underlying measurement model connecting the items with

the subconstructs with confirmatory factor analysis (see Brown 2006, Kline 2011). The test results are presented in Table 3.

> > Insert Table 3 about here < <

We conceptualized company orientation towards financial goals as consisting of four subconstructs: orientation towards investors, the role of financial risk management, the importance of cash-related goals, and the importance of cash flow forecasting. As Table 3 shows in detail, each subconstruct is measured by one or more items of our questionnaire survey. "Orientation towards investors" is measured by two items: the attention company management gives to the interests of present and potential shareholders and to those of creditors and rating agencies. The role of financial risk management is operationalized by three items rating the importance of liquidity risk management, financial flexibility, and capital cost optimization. The importance of cash-related goals is represented by one item, and the importance of cash flow forecasting is measured by four items that indicate how important survey participants deem cash flow forecasting is to secure liquidity, optimize capital cost, allow variance analyses of forecasted and actual cash flows, and derive appropriate measures to influence cash flow. For all items we asked the participants to indicate their assessments on five-point Likert scales ranging from 1 (low rating) to 5 (high rating). To test the convergent and discriminant validity of the different scales we performed a simultaneous confirmatory factor analysis (Brown 2006). It is based on the measurement model of our structural equation model with a good global fit as reported in section 6.1.

As Table 3 shows, the factor loadings confirm that orientation towards investors, role of financial risk management, and importance of cash-related goals are validly and reliably measured by their indicators, as the standardized factor loadings are all higher than 0.5 (Brown 2006) and highly significant. However, against our expectations we find that the orientation towards financial goals and the importance of cash flow forecasting are distinct variables. As a consequence, we modify our model accordingly to treat them as separate factors. That is, we add an equation to our model that describes the (perceived) influence of financial goals on the (perceived) importance of cash flow forecasting: [13]

$$IMP = \beta_1 GOALS + \beta_2 METHOD + \sum \beta_j \text{ control variables} + \varepsilon_{EFFORT}$$

In order to measure the effort managers put into cash flow forecasting we asked them to estimate the "full time equivalent" number of employees assigned to direct and indirect cash flow forecasting, respectively, and the portion of the working time spent on forecasting. We also asked managers to evaluate forecasting

[13] The modified model is consistent with the concept of generalized and specific attitudes described in Eagly and Chaiken (1993), which suggests that specific attitudes (importance of cash flow forecasting) can be explained by general attitudes (financial goals).

effort on a five-point Likert scale with a range from 1 (low rating) to 5 (high rating). The responses to the former questions varied greatly. Thus, in order to be parsimonious and to reduce measurement error, we use only the latter item in our model. A further advantage of this measure is that its scale is standardized and consistent with the measurement applied for all other factors investigated.

The term "efficiency" describes the relationship between the effort invested in a process and the output that arises from it. We suggest that cash flow forecasting efficiency is captured by four observed variables from our survey, namely the managers' assessments of (1) the cooperation between local finance departments (responsible for direct cash flow forecasting) and local controlling departments (responsible for operational planning and, thus, indirect cash flow forecasting), (2) their cooperation with other internal counterparts, (3) their cooperation with other group companies, and (4) the overall efficiency of the forecasting process. We asked the survey participants to respond to these questions on five-point Likert scales where 1 indicated a very low satisfaction and 5 indicated a very high satisfaction.

Finally, we measure the quality of forecasting inputs analogously to our measurement of forecasting outputs quality. We asked participants to indicate their agreement with the statement "The input data provided to you for financial planning [budget planning and forecasting] is of a high quality" on a five-point Likert scale, where 1 meant "strongly disagree" and 5 meant "strongly agree."

> > Insert Table 4 about here < <

Table 4 presents descriptive statistics for the variables of our model. In the first set of columns we present data for the total sample; in the following two sets of columns we present data separately for direct cash flow forecasters and indirect cash flow forecasters (operational planners). In each part of the table we show the number of respondents, the mean response, and the standard deviation. The variance in the observed variables demonstrates that, even though all survey participants work for the same company, perceptions and attitudes differ. These differences reflect personal differences as well as heterogeneous organizational and regional work conditions, given that the managers participating in the survey work either at company headquarters or, in different countries around the world, for one of three rather relatively autonomous business units. The final two columns of Table 4 present the results from t-tests and Mann–Whitney U tests. The responses of the two subsamples do not differ much with regard to company orientation towards financial goals and the importance of cash flow forecasting. The exceptions are two items related to liquidity that are rated significantly higher by direct forecasters than by operational planners. There are also significant differences with regard to forecasting effort and forecasting efficiency. Forecasting effort is assessed lower and most items representing forecasting efficiency are assessed higher for direct method forecasting than for indirect method forecasting. This is intuitive and in line with our expectations, as has been discussed in detail in Section 3. Finally, as is true for output, the managers of our sample company see no significant difference in the quality of forecasting input between direct and indirect cash flow forecasting.

Table 5 shows the pairwise correlations of the various items. Naturally, items that belong to the same construct tend to have relatively high correlations (e.g., focus on liquidity risk management and focus on financial flexibility [corr=0.5090]; importance of cash flow forecasting to optimize capital cost and to secure liquidity [corr=0.5927]; information exchange between direct cash flow forecasters and operational planners and information exchange with other internal counterparts [corr=0.4773]). Correlations across constructs, on the other hand, are generally modest, indicating that multicollinearity does not pose a problem for our model.

> > Insert Table 5 about here < <

5.4 Control Variables

We include in the empirical model further variables to control for the potential influence of factors other than those included in our theoretical model. German labor law and the sample company's statutes severely limit the degree of detail of personal questions one may ask employees. For this reason, our respondents were assured complete anonymity. Therefore, we could ask only relatively few and relatively broad questions regarding their organizational units.

Company size is used in many empirical studies, for example, to control for organizational complexity or for the availability of specialized knowledge and sophisticated information systems. We control for the size of the respondents' organizational units (SIZE). The data for SIZE come from our survey, where participants were asked to indicate, within certain band widths, the revenues generated by their organizational units. SIZE takes the value 1 for units with a revenue of up to € 50 m, the value 2 (3) [4] for units with revenues between € 50 m and € 100 m (€ 100 m and € 500 m) [€ 500 m and € 1 bn], and the value 5 for units with revenues exceeding € 1 bn.

We also control for the units' geographical regions. Our sample company is a multinational corporation that is active in more than 100 countries around the world. Its national and regional markets differ strongly in dynamics of supply and demand, which influence the complexity and the degree of uncertainty related to operational planning and cash flow forecasting (Flores and Aguilera 2007). In addition, varying organizational structures of units in different regions may affect management procedures and, in particular, cash flow forecasting (Newman and Nollen 1996), as well as the quality of input data. Furthermore, national and regional financial market infrastructures as well as legal and tax regulations affect local managers' orientation towards financial goals, the importance they attach to cash flow forecasting, and, ultimately, forecasting processes and forecast quality. Empirical studies confirm that financial management practices differ across countries. For example, Baum et al. (2011), Dittmar et al. (2003), and Khurana et al. (2006) provide evidence that countries' financial development influences the cash flow sensitivity of firms’ cash holdings, and Ramírez and Tadesse (2009) document that culturally determined differences in uncertainty tolerance influence the level of companies' cash reserves.

The complexity of our model and the size of our sample limit the number of control variables we can employ. In the standard version of our empirical model we thus include only two regional indicator variables, one for respondents located in Anglo-Saxon countries (ANGLO) and one for respondents in Asian countries (ASIA). Consequently, the benchmark group comprises respondents in Continental Europe, the Middle East, and Africa (EMEA) and in Latin America (LATAM). In further robustness checks we tested whether systematic differences exist between the responses of managers residing in the EMEA countries and in Latin America. We find that respondents from EMEA rate the quality of cash flow forecasting output more highly than respondents from Latin America. This is plausible given the higher variability of economic conditions and the stricter regulation and more severe financial restrictions prevailing in Latin American countries, which may make forecasting cash flows more difficult. Otherwise, the inclusion of either EMEA or LATAM as a further control variable does not change the overall conclusions we draw from our model. In particular, the total effects of the independent variables on forecast quality remain qualitatively unchanged.

Finally, in the course of further robustness checks we also investigate whether significant differences exist in the response behavior of managers across the company's three business areas. We incorporate corresponding indicator variables in our model, and estimate the model separately with one of these variables at a time. Our main findings remain intact; the direct, indirect, and total effects of the original model remain almost unchanged.

6 Results

6.1 Estimation of Structural Equation Model (I): Determinants of Cash Flow Forecasting Quality

Our empirical model consists of the following simultaneous equation system encompassing four equations:

$$IMP = \beta_1 GOALS + \beta_2 METHOD + \beta_3 ANGLO + \beta_4 ASIA + \beta_5 SIZE + \varepsilon_{IMP} \quad (1)$$

$$EFFORT = \beta_1 IMP + \beta_2 METHOD + \beta_3 ANGLO + \beta_4 ASIA + \beta_5 SIZE + \varepsilon_{EFFORT} \quad (2)$$

$$EFFIC = \beta_1 IMP + \beta_2 METHOD + \beta_3 ANGLO + \beta_4 ASIA + \beta_5 SIZE + \varepsilon_{EFFIC} \quad (3)$$

$$QOUT = \beta_1 EFFORT + \beta_2 EFFIC + \beta_3 QIN + \beta_4 METHOD + \beta_5 ANGLO + \beta_6 ASIA + \beta_7 SIZE + \varepsilon_{QOUT} \quad (4)$$

We estimate the coefficients of the simultaneous equation system by applying maximum likelihood estimation, using Amos 19 (Arbuckle 2010).[14] To obtain robust results, we estimate coefficients and standard errors by using the bootstrap method.[15] As the number of relationships between the variables in our model is considerable in relation to our sample size, we apply a two-step approach. We first compute standardized regression coefficients and their significance. In a second step we trim the model by excluding variables from the equations if their corresponding direct and total effects turn out to be insignificant. The multivariate analysis reveals additional significant relationships that we did not anticipate in our theoretical model. We incorporate these relationships in our model, as described below.

Table 6 presents the results of the model estimation. In Panel A we report the direct effects, i.e., the standardized regression coefficients, and denote their significance. Indirect effects are presented in Panel B and total effects in Panel C. Additionally, the model results are shown graphically in Figure 2; significant direct effects are indicated by arrows. According to commonly followed cut-off criteria, structural equation models fit well with the empirical data if Chi^2/df is between 1 and 3 (Carmines and McIver 1981), and the fit is moderate if RMSEA is not greater than 0.1 (Browne and Cudeck 1993, Brown 2006). For our model, Chi^2/df is 1.671 and RMSEA is 0.063, thus satisfying the above criteria.

> > Insert Table 6 about here < <

> > Insert Figure 2 about here < <

Equation (1) describes the relationship between the company's orientation towards financial goals and the importance of cash flow forecasting, as perceived by the survey participants. The multivariate analysis indicates a significant positive association between the two variables (β_1=0.560, p=0.001). In other words, managers who believe that the company is strongly guided by financial objectives also tend to attach higher importance to cash flow forecasting. Equations (2) and (3) represent the relationships between the importance attached to cash flow forecasting and managers' assessment of forecasting effort and efficiency, respectively. The estimation results for equation (3) indicate that the importance attached to cash flow forecasting significantly affects the perceived efficiency of forecasting processes, as predicted (β_1=0.289, p=0.076). However, the results for equation (2) do not confirm that the importance managers attach to cash flow forecasting influences their perception of forecasting effort (β_1=0.049, p=0.656). Instead, the results reveal that the effort managers put into forecasting processes is directly influenced by their perception of the company's orientation towards financial goals (coefficient=0.170, p=0.089). Moreover, although we did not predict this on theoretical grounds, the empirical analysis reveals that EFFORT also has a significantly positive impact on the perceived efficiency of the forecasting

[14] It has been shown that maximum likelihood estimation is robust against deviations from the normal distribution (Hoogland and Boomsma 1998) and not biased by categorical data (e.g., Henly 1993).

[15] Our estimations are based on 2,000 bootstrap samples (Arbuckle 2010).

processes (coefficient=0.205, p=0.017). We believe this finding is due to the central role operational planning plays in cash flow forecasting. Operational forecasting permeates all levels of the organization and requires intensive communication both vertically between headquarters and operational units and horizontally between different business units, and such communication requires managerial effort.

With equation (4) we posit that perceived cash flow forecasting quality is determined by the effort managers put into cash flow forecasting, the perceived efficiency of the related processes, and the perceived quality of the input data used. Contrary to our expectations, the estimated coefficient of the variable EFFORT is not significantly different from zero (β_1=0.033, p=0.586), implying that managers perceptions of forecasting output quality are not directly related to their perceptions of forecasting effort. The link between (perceived) forecasting efficiency and forecasting quality is also weak: the estimated coefficient of EFFIC in equation (4) fails to meet the 10% level (β_2=0.165, p=0.113). Instead, EFFORT (coefficient=0.114, p=0.078) and EFFIC (coefficient=0.511, p=0.001) influence the quality of the input data used in cash flow forecasting. According to the managers participating in our survey, input data quality in turn exerts the strongest direct impact on the quality of forecasting output (β_3=0.493, p=0.001). This finding is intuitive. Cash flow forecasting can be only as good as the data that are used to forecast cash inflows from customer receipts and other sources of income, and cash outflows from payments to suppliers, wages, interest, taxes, and other obligations. It is also intuitive that managers have more faith in the quality of the data inputs if there is a good mutual understanding between the managers who are responsible for cash flow forecasting and the managers in related functions who supply these data. Communicating data requirements in terms of quality and quantity, validating transmitted data, and reconciling data insufficiencies require managerial effort. By investing effort and by enhancing the communication between different organizational units, managers can improve the inputs in cash flow forecasting and ultimately the quality of the forecasts themselves.

Panel A of Table 6 also presents the estimation results regarding the cash flow method and the control variables ANGLO, ASIA, and SIZE. After we control for all other factors, METHOD does not directly affect the quality of forecasting output, confirming the earlier results of the univariate analysis. As expected, however, we find a significantly negative relationship between METHOD and forecasting effort (β_2=-0.315, p=0.001) and a significantly positive relationship between METHOD and forecasting efficiency (β_2=0.380, p=0.003). In other words, according to the managers participating in the survey indirect cash flow forecasting is associated with higher managerial effort than direct cash flow forecasting, and the processes related to direct cash flow forecasting are more efficient than those related to indirect forecasting. We come back to the influence of the cash flow forecasting method in the next section.

As for the control variables, respondents from both the ANGLO and the ASIA areas rated forecasting quality less highly than those from the EMEA/LATAM benchmark group (ANGLO: β_5=-0.086, p=0.062; ASIA: β_6=-0.118, p=0.078). In addition, ASIA shows a negative association with the

quality of forecasting input (coefficient=-0.174, p=0.002). Since Anglo-Saxon and Asian managers did not respond differently from EMEA and LATAM managers with regard to GOALS, IMP, EFFORT, or EFFIC, the significant effects on QOUT (and, in the case of ASIA, on QIN) cannot be attributed to general regional differences in response behavior. Instead, the more critical evaluation may be explained by the higher variability of economic conditions in these regions, which makes predictions more difficult. More specifically, at the time of the survey managers domiciled in Anglo-Saxon countries may have felt particularly strongly the effects of the financial crisis. The weaker development of the financial markets in some Asian economies (Tsoukas 2011), combined with restrictive local regulations, is likely to increase the attention given to forecasting quality in these countries.

The control variable SIZE is related positively with the importance managers attach to cash flow forecasting (β_5=0.172, p=0.018). In other words, there is a tendency for managers in larger areas of responsibility to be more aware of the need for cash flow forecasting. One reason for this might be the higher degree of specialization in larger business units. In addition, SIZE is negatively associated with forecasting efficiency (β_5=-0.208, p=0.034), indicating that the complexity of forecasting processes increases with the size of the organizational units. SIZE is not significantly related to forecasting effort nor to the quality of forecasting input and output.

SEM also allows estimating indirect (mediated) effects and total effects. Mediation explains through which channels independent variables cause effects on dependent variables. Following Baron and Kenny (1986), if X is the impulse variable and Y is the outcome variable, a third variable M is said to be a mediator if the following four conditions hold: (i) X is correlated with Y; (ii) X is correlated with M; (iii) M is also correlated with Y; (iv) when M is controlled, the association between X and Y is significantly reduced. The test for mediation and decomposition of effects into direct, indirect and total effects are performed using the program AMOS. Results are shown in Table 6; significant indirect effects are shown in Panel B, significant total effects in Panel C. We find a significant indirect effect of orientation towards financial goals on forecasting efficiency (coefficient=0.197, p=0.018), mediated mainly by the importance of cash flow forecasting but also by forecasting effort. Moreover, orientation towards financial goals indirectly affects the quality of both forecasting input and output, with coefficients of 0.188 and 0.153, respectively, and significance levels of p=0.011 in both cases. These findings suggest that company orientation towards financial goals, as perceived by managers, plays an important "background role" for the quality of cash flow forecasting through the importance attached to cash flow forecasting and its impact on forecasting processes. We also find that forecasting effort (coefficient=0.142, p=0.001) and efficiency (coefficient=0.252, p<0.001) indirectly influence the quality of forecasting output, mainly by mediation through input quality. METHOD also exerts indirect effects on the quality of both forecasting input and forecasting output (coefficients: 0.157 and 0.129, respectively; significance levels: p=0.016 in both cases), and both ASIA and SIZE indirectly but significantly decrease cash flow forecasting quality.

To sum up, as shown in Panel C of Table 6, all of the independent variables have significant total effects on the perceived quality of cash flow forecasts. Two factors stand out, however: forecasting efficiency (EFFIC) and the quality of forecasting inputs (QIN). These two factors have the strongest total effect strengths ($coefficient_{EFFIC}$= 0.417; $coefficient_{QIN}$= 0.493) and the highest levels of significance (p= 0.001 in both cases). Of the control variables, the total effect of ASIA is strongest, with a coefficient of -0.224 and a significance level of p=0.003.

Finally, as explained above (see Section 5.2), we also estimated our model using a composite score for forecasting quality based on five dimensions (reliability, up-to-dateness, timely provision, completeness and transparency). Using this alternative measure for forecasting quality does not change our main findings, but reduces the overall fit of the model. The main differences to the original model are that IMP, the importance managers attach to cash flow forecasting, loses its direct effect on forecasting efficiency and that the direct effects of EFFIC on QIN and of QIN on QOUT are estimated with stronger coefficients of 0.650 (p=0.001) and 0.639 (p=0.003), respectively.

6.2 Estimation of Structural Equation Model (II): The Influence of the Cash Flow Method

To investigate further whether direct and indirect forecasting have different determinants of quality, we apply multigroup SEM. The test procedure is as follows. We first estimate the structural equation system separately for our two subsamples of direct and indirect forecasters.[16] In this first step the structural equation system is unconstrained so that all parameters can vary across the two groups. In further steps, we add restrictions by setting model parameters equal across groups and reestimate the constrained models. We then compare the unconstrained model and the constrained, more parsimonious model (nested model comparisons) by setting the degrees of freedom gained in relation to the differences between the chi-squares of the models. If the Chi^2 statistic does not indicate a significant difference, one can accept that the model is invariant across groups (Byrne 2009). In addition to the Chi^2-difference test, we also apply the Chen criterion (Chen 2007), which is based on the comparative fit index (CFI) measure. According to Chen (2007), in order to be invariant CFI should not be reduced by -0.005 or more when models are stepwise constrained.

> > Insert Table 7 about here < <

The test results are presented in Table 7. The Chi^2-difference test indicates that the models do not differ significantly with regard to factor loadings, regression coefficients, or structural covariances. This suggests that the construction of the latent variables, the relationships between them, and the estimated effect sizes are equally valid for both subsamples. In other words, the quality of cash flow forecasts, as

[16] When estimating the model separately for our two subsamples we do not include the indicator variable METHOD.

perceived by managers, is determined by the same set of factors for both the direct and the indirect methods. According to the Chi^2-difference test the structural and measurement residuals do differ significantly between the two models, indicating differences in the amount of measurement errors and stochastic errors. However, this has no effect on the comparison of the regression coefficients between the samples (Vandenberg and Lance 2000). Chi^2/df and RMSEA show relatively good fits in both cases (direct method forecasting: $Chi^2/df = 1.457$, RMSEA = 0.075; indirect method forecasting: $Chi^2/df = 1.715$, RMSEA = 0.090), but the model fits slightly better to the data from the direct method subsample than to the data from the indirect method subsample. Given the higher complexity and the political dimensions of indirect cash flow forecasting, this result is plausible. The Chen (2007) criterion largely confirms the results of the Chi^2-difference test. As Table 7 shows, the first two steps (equal factor loadings, equal regression coefficients) are associated with small increases of CFI. The third step, in which we impose the constraint of equal structural covariances, leads to a decrease of CFI by -0.006, that is, we marginally exceed the critical threshold of -0.005. Consistently with the Chi^2-difference test, the restrictions of equal structural residuals and equal measurement residuals decrease CFI markedly, by -0.019 and -0.009 respectively, again implying differences in model fit.

6.3 The Role of Information Technology

In large organizations, forecasting usually implies using information systems to supply input data and to support forecast generation, analysis, and reporting. Operational forecasting is deeply intertwined with general management and operational procedures throughout all organizational levels, and the related information systems are highly differentiated and applied for a variety of purposes (e.g., Haka 2006). Therefore, our survey concentrated on information systems used in financial management that are specifically designed for direct cash flow forecasting.

Goodhue and Thompson (1995) find that task-technology fit—that is, the extent to which information technology fulfills task requirements and is aligned to users' capabilities (Goodhue 1995)—explains a major portion of variance in individual performance. By contrast, the degree of system use has limited impact. Goodhue and Thompson (1995) reason that extensive technology use does not improve performance as long as the task-technology fit is low. Accordingly, we posit that users will be satisfied with information technology if the system matches the user needs arising from the processes. Cash flow forecasting is not a continuous process but is conducted at certain points during the financial year, at relatively long time intervals (e.g., every quarter). Degree of use therefore does not seem an appropriate measure for evaluating cash flow forecasting information systems. Instead, in our survey we asked participants to assess how important cash flow forecasting information systems are for their work and how satisfied they are with them. We believe that importance can be assessed largely independently of frequency and duration of usage, and we expect that managers who attach a lot of importance to

information systems, and who are satisfied with them, will also rate forecasting output quality higher, both directly and indirectly through their evaluation of process efficiency.

Thus, we extend our equation system with two variables: the perceived importance of forecasting technology (FTIMP) and the degree to which the users are satisfied with this technology (FTSAT). As our analysis is focused exclusively on the direct forecasting method we omit the indicator variable METHOD. Hence, our amended empirical model consists of the following structural equation system:

$$IMP = \beta_1 GOALS + \beta_2 ANGLO + \beta_3 ASIA + \beta_4 SIZE + \varepsilon_{IMP} \quad (1a)$$

$$EFFORT = \beta_1 IMP + \beta_2 ANGLO + \beta_3 ASIA + \beta_4 SIZE + \varepsilon_{EFFORT} \quad (2a)$$

$$EFFIC = \beta_1 IMP + \beta_2 FTSAT + \beta_3 FTIMP + \beta_4 ANGLO + \beta_5 ASIA + \beta_6 SIZE + \varepsilon_{EFFIC} \quad (3a)$$

$$QOUT = \beta_1 EFFORT + \beta_2 EFFIC + \beta_3 QIN + \beta_4 FTSAT + \beta_5 FTIMP + \beta_6 ANGLO + \beta_7 ASIA + \beta_8 SIZE + \varepsilon_{QOUT} \quad (4a)$$

Based on the above argumentation, we expect β_2 and β_3 to be positive in equation (3a), and we also expect positive estimates for β_4 and β_5 in equation (4a). Both technology-related variables are measured by managers' responses to our questionnaire survey. Forecasting technology is a construct measured by three items that assess information system tools for data validation and forecast analysis. We asked managers involved in direct cash flow forecasting to assess the importance of these tools on a scale from 1 (not important at all) to 5 (very important). The scale for satisfaction also ranged from 1 (totally dissatisfied) to 5 (totally satisfied). Table 8 displays the loadings of the observed variables on the two latent constructs, as estimated by our model.

> > Insert Table 8 about here < <

We follow the same procedure as in our main analysis, that is, we estimate the model and then trim from the equations variables whose direct and total effects prove insignificant. Table 9 presents results for the reduced empirical model. The direct effects are presented in Panel A, indirect effects in Panel B, and total effects in Panel C. In addition, Figure 3 presents the model graphically; significant direct effects are depicted by arrows.

Despite the reduced sample size and the higher degree of complexity, the Chi^2/df of 1.725 and the RMSEA of 0.095 indicate a good overall fit of the model. We find most of the relationships of the original

model confirmed by the estimation of the modified model.[17] The effects are generally stronger and the significance levels higher than in the original model, in accord with our earlier observation that the model fit is higher for the subsample of direct forecasters than for the subsample of indirect forecasters (operational planners). For example, the direct effects of orientation toward financial goals on the importance of cash flow forecasting and on EFFORT are stronger than in the original model. Additionally we now find a significant positive direct effect on forecasting efficiency (coefficient= 0.442; p=0.001), and the total effect of GOALS on QOUT is now estimated with a coefficient of 0.374 (p<0.001) compared with a coefficient of 0.153 (p=0.011) in the original model.

> > Insert Table 9 about here < <

> > Insert Figure 3 about here < <

Equations (3a) and (4a), in addition to the variables already included in the original model, now also examine the impact of the importance attached to and the satisfaction with information technology on perceived forecasting efficiency and forecasting quality. As we expected, the estimation results indicate a significantly positive relationship between satisfaction with forecasting technology and forecasting efficiency (β_2=0.298, p=0.001). It is intuitive that managers who are satisfied with cash flow forecasting information systems also tend to believe that the forecasting processes are efficient. We do not find a direct effect of satisfaction with information systems on forecasting quality, but as Panel B of Table 9 shows, FTSAT exerts significantly positive indirect effects on QIN and on QOUT. Consequently, as Table 9, Panel C shows, the total effect of satisfaction with forecasting technology on perceived forecasting quality is positive (coefficient=0.221, p=0.001). This is in line with our expectations and with Goodhue and Thompson's (1995) concept of task-technology fit.

However, contrary to our expectations, the model estimation reveals a significant and rather strong negative impact of the importance attached to forecasting technology on forecasting efficiency (β_3=-0.401, p=0.001). There are at least two possible interpretations for this finding. One is that managers who are not fully satisfied with cash flow forecasting believe that the processes could be supported better by information systems. An alternative interpretation is that managers who deem information technology less important evaluate forecasting efficiency relatively highly, possibly because they have a preference for data reconciliation and analysis through direct personal communication with members of other organizational units rather than for technical data validation and analysis. It follows that stronger reliance on technical reconciliation may even impair forecasting quality if it is not accompanied by adequate communication.

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[17] An exception is the direct effect between the importance attached to cash flow forecasting and perceived forecasting efficiency which is no longer significant in the modified model (see Figure 3). However, this relationship is now mediated through FTSAT, satisfaction with forecasting information technology. As is shown in Table 9, Panel B, the indirect effect of IMP on EFFIC is significantly positive, with a coefficient of 0.121 and p<0.001.

The estimation results furthermore show a positive direct effect of the importance attached to forecasting technology on perceived output quality (β_5=0.124, p=0.024). At the same time, however, importance also exerts a significant and negative indirect effect on output quality, mediated through forecasting efficiency and input quality. The relatively strong negative indirect effect outweighs the positive direct impact, so that the total effect of importance on output quality is negative (coefficient=-0.103; p=0.075). In other words, there is a tendency for managers for whom information technology plays an important role in cash flow forecasting to rate the quality of forecasts rather critically. Or, vice versa, managers who have a relatively high opinion of the quality of forecasts do not put much weight on forecasting information systems. This result is not compatible with Goodhue's and Thompson's (1995) concept of task-technology fit, which, however, does not explicitly consider the role of internal communication and cooperation in performance.

Turning to the control variables, we find that managers in ASIA rate both the importance of and the satisfaction with forecasting technology more highly than managers of the EMEA and LATAM benchmark group (coefficients: 0.215 and 0.298, respectively, with significance levels of p=0.001). Furthermore, satisfaction with forecasting technology is also rated more highly in the ANGLO region (coefficient=0.125, p=0.073). One reason for this could be that managers in Asia and in Anglo-Saxon countries assess forecasting quality more critically than the benchmark group. They may therefore deem forecasting technology more supportive and, in Asia, more important to meet their local requirements. Finally, we find a significantly negative direct effect of SIZE on satisfaction with forecasting technology (coefficient=-0.202, p=0.001), which suggests that managers who work in larger and more complex organizational units may have a wider range of needs and may therefore tend to be less satisfied with standardized forecasting information systems.

7 Conclusions

In this study we investigate how managers in a large multinational non-financial company perceive the process of cash flow forecasting and the quality of the forecasting output. While cash flow forecasting is of great importance in practice it has received very little attention in the academic literature so far. Given the absence of an established theory in this field, we develop a simple model of managers' perceptions of cash flow forecasting quality and its determinants, derived from basic economic reasoning, work on general financial management, and studies that investigate forecasting quality in other fields of management. We operationalize and test the model using SEM. Our empirical analysis is based on data obtained by a worldwide questionnaire survey conducted in 2010 at a German-based multinational industrial company.

According to the managers who participated in our survey study, the strength of a company's orientation to financial goals is positively associated with the importance managers attach to cash flow

forecasting, which in turn increases the efficiency of forecasting processes. Furthermore, according to the managers the orientation towards financial goals also influences the effort invested in forecasting activities, and effort also increases the efficiency of the forecasting processes. We believe this is due to the pivotal role of communication and cooperation between different organizational units involved in financial forecasting and the fact that efficient information exchange requires managerial effort.

According to the managers' perceptions, forecasting effort and efficiency furthermore determine the quality of the input data used in cash flow forecasting. The input quality in turn exerts the strongest direct impact on the quality of forecasting output. All factors incorporated in our model have positive total effects on the quality of cash flow forecasts. However, forecasting efficiency and the quality of forecasting inputs show the strongest total effect strengths.

Our results also indicate that the variables in our model, the postulated relationships between them, and the estimated effect sizes are equally valid for both the direct and the indirect cash flow method. Thus, based on the managerial perceptions that we recorded in our survey, strengthening a company's orientation to financial goals and intensifying the effort management puts into efficient forecasting processes are likely to enhance both types of forecasts. Another finding of our research is that communication and cooperation between a company's organizational units are crucial for the cash flow forecasting process and ultimately for the quality of the forecasting output.

Furthermore, our findings indicate that information technology can improve forecasting output quality by supporting efficient forecasting processes. However, we also find that the importance that managers attach to forecasting technology is negatively related to their perceptions of forecasting efficiency, resulting in a negative total effect on perceived output quality. A possible interpretation of this particular result is that managers who are not fully satisfied with cash flow forecasting believe that the processes should be supported better by information systems. Another possible explanation is that managers who deem information technology less important may evaluate forecasting efficiency relatively highly, possibly because they prefer direct personal communication and reconciliation rather than technical data validation and analysis. If this interpretation is correct, strong reliance on technical reconciliation in financial forecasting processes could result in negative consequences for forecasting quality if it is not accompanied by adequate communication.

Our research is subject to some limitations. Our data has been generated through a questionnaire survey in a multinational company, and the variables in our model thus measure the participants' perceptions. However, according to Fishbein and Ajzen (1975, 2010) perceptions are important because they mediate effects between objective factors (company goals, business considerations, etc.) and managerial intentions and behavior. This is of particular relevance for the evaluation of cash flow forecasting quality which for practical reasons cannot be measured through deviations between forecasted and realized amounts. Also, while we have taken great care in the construction of our questionnaire,

involving experts from all groups of addressees and extensive pretests, it is possible that our results could be affected by misunderstood questions and incomplete or untruthful answers. Moreover, although absolute anonymity was guaranteed, some respondents may have answered some questions in ways they assumed they were expected to, rather than offering their true opinions. Given the assurance of complete anonymity, it was not possible to obtain demographic or other personal data about the survey respondents. This restriction and the complexity of our model limit the range of control variables we can employ. Furthermore, our use of one sample company may limit the generalizability of our findings. However, as our data comes from company managers working in diverse management functions, in several business units and in practically all regions of the world, this limitation is mitigated.

Our study is model-generating in nature. It is intended to initiate further research in the domain of cash flow forecasting which is of high importance in practice. Future empirical studies could extend this research to broader samples of companies to allow for a cross-sectional analysis of the determinants of cash flow forecasting, to cross-country or international samples, or to longitudinal studies, and to further research questions such as economic and cultural differences in cash flow forecasting.

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Figure 1 Determinants of Cash Flow Forecasting Quality: Theoretical Model

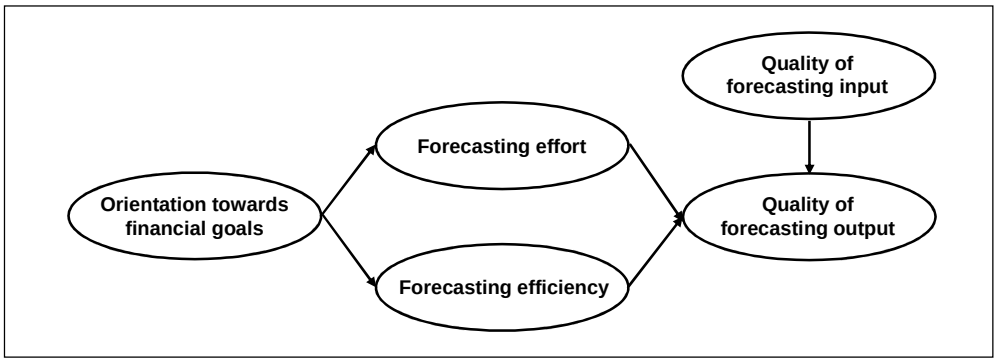

Figure 2 Determinants of Cash Flow Forecasting Quality: Direct Effects

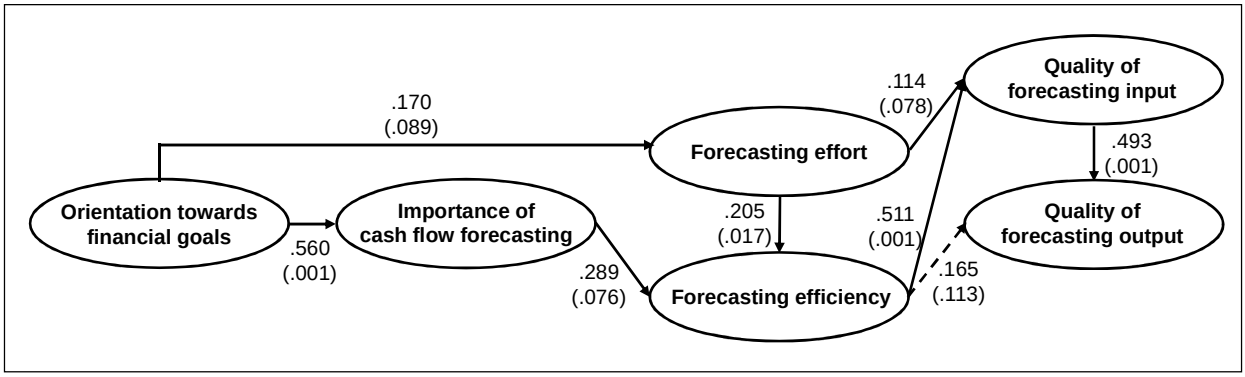

Figure 3 Determinants of Cash Flow Forecasting Quality, Taking Forecasting Technology into Account

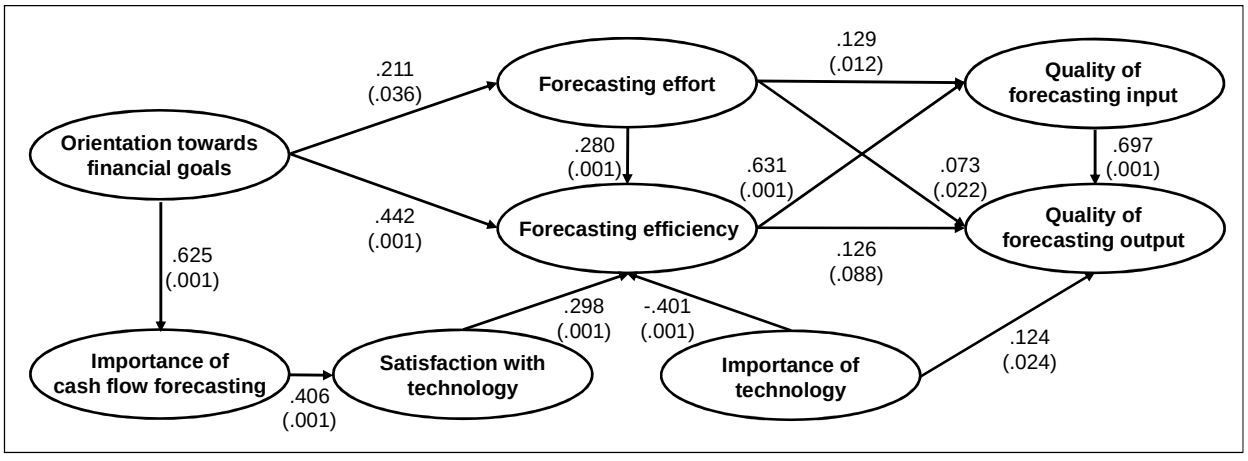

Table 1 Sample Overview

	Cash flow forecasters using the direct method			Operational planners providing the basis for the indirect method			Forecast users			Total		
	Invitees	Respondents	Response rate	Invitees	Respondents	Response rate	Invitees	Respondents	Response rate	Invitees	Respondents	Response rate
Total	115	82	71.3%	156	89	57.1%	31	27	87.1%	302	198	65.6%
Business areas												
Business Area I	12	9	75.0%	79	44	55.7%	1		0.0%	92	53	57.6%
Business Area II	14	11	78.6%	33	18	54.5%	1		0.0%	48	29	60.4%
Business Area III	17	5	29.4%	31	16	51.6%	1		0.0%	49	21	42.9%
not assigned	72	57	79.2%	13	11	84.6%	28	27	96.4%	113	95	84.1%
Regions												
Anglo-Saxon countries	13	7	53.8%	8	5	62.5%				21	12	57.1%
Asia	49	30	61.2%	61	36	59.0%				110	66	60.0%
EMEA (w/o UK and IR)	41	32	78.0%	55	33	60.0%				96	65	67.7%
Latin America	12	11	91.7%	32	15	46.9%				44	26	59.1%
not assigned		2			0		31	27	87.1%	31	29	93.5%
Size (based on yearly turnover in €)												
< 50m	9	6	66.7%		33	-				9	39	-
< 100m	16	10	62.5%		8	-				16	18	-
< 500m	37	29	78.4%		17	-				37	46	-
< 1bn	16	10	62.5%		8	-				16	18	-
>= 1bn	37	20	54.1%		6	-				37	26	-
not assigned		7		156	17	-	31	27	87.1%	187	51	-

Notes. The table presents the numbers of survey invitees and respondents, as well as response rates, by target groups. Rows show the sample distribution over business areas, regions, and unit sizes. Managers with overall responsibility are not assigned to a specific business area. Invited operational planners cannot be categorized by unit size because such breakdown was not available at the time of the survey.

Table 2 Quality of Forecasting Output, Rated by Cash Flow Forecasters, Operational Planners, and Forecast Users

Panel A

	Direct cash flow forecasters			Operational planners (indirect cash flow forecasters)			Difference in means	t-test		Mann–Whitney U test	
	N	Mean	Std-Dev.	N	Mean	Std-Dev.		T	p-level	Z	p-level
Quality of forecasting output (QOUT)	82	3.84	0.62	89	3.76	0.66	0.079	0.811	0.418	-0.430	0.667

Panel B

	Direct cash flow forecasters			Forecast users			Difference in means	t-test		Mann–Whitney U test	
	N	Mean	Std-Dev.	N	Mean	Std-Dev.		T	p-level	Z	p-level
Quality of forecasting output (QOUT)	82	3.84	0.62	27	3.77	0.85	0.066	0.441	0.660	-0.085	0.932

	Operational planners (indirect cash flow forecasters)			Forecast users			Difference in means	t-test		Mann–Whitney U test	
	N	Mean	Std-Dev.	N	Mean	Std-Dev.		T	p-level	Z	p-level
Quality of forecasting output (QOUT)	89	3.76	0.66	27	3.59	0.78	0.168	-1.108	0.270	-1.448	0.148

Notes. Panel A shows the mean quality ratings by direct and indirect cash flow forecasters, the standard deviations, and the statistics of the difference tests. Both tests reveal that the output quality of the two methods does not deviate significantly. In Panel B, the mean quality ratings of direct and indirect cash flow forecasters are compared to forecast users' evaluation. Again, the difference tests do not show any significant deviation.

Table 3 Factor Loadings

Latent constructs	Subconstructs	Factor loadings of subconstructs on constructs	Observed variables	Factor loadings of observed variables on subcontructs / constructs
Quality of forecasting output (QOUT)			Quality of forecasting output	1.000
Orientation towards financial goals (GOALS)	Orientation towards investors	0.664		
			Attention to shareholders' appraisal	0.550
			Attention to creditors' and rating agencies' appraisal	0.660
	Role of financial risk management	0.905		
			Focus on liquidity risk management	0.689
			Focus on financial flexibility	0.669
			Focus on capital cost optimization	0.630
	Importance of cash-related goals	0.620		
			Importance of cash-related goals	1.000
Importance of cash flow forecasting (IMP)			... to secure liquidity	0.774
			... to optimize capital cost	0.768
			... to allow variance analyses	0.515
			... to derive appropriate measures to influence cash flow	0.842
Forecasting effort (EFFORT)			Extent to which personnel resources are assigned	1.000
Forecasting efficiency (EFFIC)			Information exchange between direct cash flow forecasters and operational planners	0.609
			Information exchange with other internal counterparts	0.616
			Cooperation between group companies	0.568
			Overall efficiency of forecasting processes	0.771
Quality of forecasting input (QIN)			Quality of forecasting input	1.000

Notes. The table presents the specification of the latent constructs in our model. QOUT, IMP, EFFORT, EFFIC, and QIN are reflected in one or more items of our questionnaire survey. GOALS is defined by three subconstructs, each represented by one or more items. The factor loadings are standardized. All of them are significant at levels of less than 1%.

Table 4 Descriptive Statistics

	Panel A			Panel B										
	Direct cash flow forecasters and operational planners			Direct cash flow forecasters			Operational planners (indirect cash flow forecasters)			Difference in means	t-test		Mann–Whitney U test	
	N	Mean	Std-Dev.	N	Mean	Std-Dev.	N	Mean	Std-Dev.		T	p-level	Z	p-level
Orientation towards financial goals (GOALS)														
Orientation towards investors														
Attention to shareholders' appraisal	171	3.51	0.92	82	3.50	0.89	89	3.52	0.95	0.021	-0.149	0.881	-0.250	0.803
Attention to creditors' and rating agencies' appraisal	171	3.81	0.89	82	3.90	0.91	89	3.73	0.88	0.169	1.234	0.219	-1.250	0.211
Role of financial risk management														
Focus on liquidity risk management	171	3.83	0.80	82	4.04	0.76	89	3.64	0.79	0.402	3.389	***0.001***	-3.249	***0.001***
Focus on financial flexibility	171	3.75	0.83	82	3.83	0.89	89	3.68	0.77	0.142	1.118	0.265	-1.213	0.225
Focus on capital cost optimization	171	3.77	0.80	82	3.86	0.81	89	3.68	0.78	0.173	1.424	0.156	-1.622	0.105
Importance of cash-related goals	171	4.16	0.74	82	4.20	0.76	89	4.13	0.72	0.074	0.655	0.514	-0.660	0.509
Importance of cash flow forecasting (IMP)														
To secure liquidity	171	4.28	0.76	82	4.39	0.69	89	4.17	0.81	0.221	1.910	***0.058***	-1.776	***0.076***
To optimize capital cost	171	4.11	0.81	82	4.10	0.79	89	4.12	0.84	0.012	-0.096	0.924	-0.217	0.828
To allow variance analyses	171	3.99	0.83	82	3.94	0.85	89	4.04	0.81	0.099	-0.780	0.436	-0.718	0.473
To derive appropriate measures to influence cash flow	171	4.11	0.74	82	4.20	0.67	89	4.03	0.79	0.166	1.469	0.144	-1.340	0.180
Forecasting effort (EFFORT)	171	3.96	0.91	82	3.70	0.96	89	4.20	0.78	0.507	-3.756	***0.000***	-3.577	***0.000***
Forecasting efficiency (EFFIC)														
Information exchange between direct cash flow forecasters and operational planners	171	3.58	0.94	82	3.76	0.95	89	3.42	0.90	0.345	2.440	***0.016***	-2.512	***0.012***
Information exchange with other internal counterparts	171	3.62	0.82	82	3.66	0.82	89	3.59	0.82	0.066	0.529	0.597	-0.574	0.566
Cooperation between group companies	171	3.50	0.84	82	3.69	0.82	89	3.33	0.82	0.359	2.855	***0.005***	-2.654	***0.008***
Overall efficiency of forecasting processes	171	3.40	0.92	82	3.65	0.85	89	3.17	0.93	0.480	3.516	***0.001***	-3.430	***0.001***
Quality of forecasting input (QIN)	171	3.53	0.78	82	3.59	0.81	89	3.47	0.76	0.118	0.991	0.323	-1.300	0.193

Notes. Panel A shows the means and the standard deviations of the total sample for each observed variable in our model. Of a total of 3,420 item values, 122 items (3.6%) have been imputed. Imputation is explained in section 5. In Panel B, the sample is split by the cash flow method. The difference tests reveal significant deviations between the methods in several cases (in italics).

Table 5 Pearson Correlation Coefficients

		QOUT	GOALS						IMP				EFFORT	EFFIC				QIN	METHOD	ANGLO	ASIA
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
GOALS	1 - Attention to shareholders' appraisal	0.0971																			
	2 - Attention to creditors' and rating agencies' appraisal	0.2352*	0.3631*																		
	3 - Focus on liquidity risk management	0.1165	0.2042*	0.2226*																	
	4 - Focus on financial flexibility	0.2478*	0.1977*	0.2934*	0.5090*																
	5 - Focus on capital cost optimization	0.2538*	0.2870*	0.3832*	0.3919*	0.3849*															
	6 - Importance of cash-related goals	0.1019	0.1821*	0.2674*	0.3655*	0.3773*	0.3241*														
IMP	7 - To secure liquidity	0.1386*	0.2176*	0.1745*	0.3624*	0.3690*	0.2475*	0.3639*													
	8 - To optimize capital cost	0.1531*	0.1472*	0.0999	0.2748*	0.0779	0.3595*	0.2774*	0.5927*												
	9 - To allow variance analyses	0.0379	0.1183	0.0444	0.1202	0.1653*	0.0878	0.2142*	0.3742*	0.3772*											
	10 - To derive appropriate measures to influence cash flow	0.0952	0.2293*	0.1916*	0.3276*	0.2429*	0.3150*	0.3930*	0.6209*	0.6504*	0.4656*										
EFFORT	11 - Extent to which personnel resources are assigned	0.1860*	0.0645	-0.0678	0.1349*	0.1510*	0.0069	0.0604	0.0353	0.1089	0.1761*	-0.0082									
EFFIC	12 - Information exchange between direct cash flow forecasters and operational planners	0.2007*	0.1311*	0.1884*	0.1823*	0.1720*	0.2270*	0.2883*	0.3310*	0.2529*	0.0865	0.2498*	0.0376								
	13 - Information exchange with other internal counterparts	0.2827*	0.0907	0.0830	0.0891	0.0234	0.0253	0.1949*	0.0665	0.0960	0.0923	0.0966	0.1564*	0.4773*							
	14 - Cooperation between group companies	0.3495*	0.1080	0.1408*	0.2102*	0.1135	0.2254*	0.1663*	0.0636	0.0425	-0.0676	0.1529*	0.1782*	0.2691*	0.3371*						
	15 - Overall efficiency of forecasting processes	0.2872*	0.0832	-0.0216	0.2148*	0.1020	0.0394	0.1659*	0.2272*	0.2514*	0.2042*	0.2796*	0.1118	0.4603*	0.4648*	0.4371*					
QIN	16 - Quality of forecasting input	0.5995*	0.0623	0.1848*	0.1111	0.1465*	0.1351*	0.2740*	0.1457*	0.2115*	0.1866*	0.1642*	0.2245*	0.2641*	0.3670*	0.3651*	0.3751*				
METHOD	17 - Cash flow method	0.0623	-0.0115	0.0945	0.2522*	0.0857	0.1089	0.0503	0.1454*	-0.0074	-0.0599	0.1122	-0.2798*	0.1845*	0.0407	0.2145*	0.2611*	0.0760			
ANGLO	18 - Anglo-Saxon countries	-0.0056	-0.0281	0.1581*	0.0634	0.0020	0.1037	0.1083	-0.0535	0.0380	0.0808	-0.0151	0.0135	0.1566*	0.0331	0.0507	-0.0825	0.0981	0.0976		
ASIA	19 - Asian countries	-0.1710*	0.0322	-0.1172	0.0421	-0.0949	-0.0451	-0.1699*	0.0027	0.0026	0.0191	0.0396	-0.1109	-0.0346	0.0169	0.0119	0.1446*	-0.1584*	-0.0523	-0.2338*	
SIZE	20 - Yearly turnover in €	-0.0023	-0.1313*	0.1673*	0.0117	0.0067	-0.0264	0.0492	0.1914*	0.0875	0.1134	0.1746*	-0.2107*	0.0508	-0.0202	0.0110	-0.0229	0.0396	0.5013*	0.1655*	-0.1912*

Notes. The table presents the pairwise correlations of the items in our model. * denotes a significance level at least 10%. Items representing the same construct tend to have relatively high correlations whereas correlations across constructs are modest, indicating that our model is not affected by multicollinearity.

Table 6 Results of SEM Regression: Direct, Indirect, and Total Effects on Cash Flow Forecasting Quality

Panel A: Direct effects

	GOALS	IMP	EFFORT	EFFIC	QIN	QOUT
Equations		*(1)*	*(2)*	*(3)*		*(4)*
GOALS		0.560***	0.170*	0.134		
IMP			0.049	0.289*		
EFFORT				0.205**	0.114*	0.033
EFFIC					0.511***	0.165
QIN						0.493***
METHOD	0.168		-0.315***	0.380***		
ANGLO						-0.086*
ASIA			-0.117		-0.174***	-0.118*
SIZE		0.172**		-0.208**		

Panel B: Indirect effects

	GOALS	IMP	EFFORT	EFFIC	QIN	QOUT
GOALS				0.197**	0.188**	0.153**
IMP					0.148*	0.121**
EFFORT					0.105**	0.142***
EFFIC						0.252***
QIN						
METHOD		0.094*	0.029	-0.009	0.157**	0.129**
ANGLO						
ASIA				-0.024*	-0.026*	-0.106***
SIZE				0.050*	-0.081*	-0.066*

Panel C: Total effects

	GOALS	IMP	EFFORT	EFFIC	QIN	QOUT
GOALS		0.560***	0.170*	0.331**	0.188**	0.153**
IMP			0.049	0.289*	0.148*	0.121**
EFFORT				0.205**	0.219***	0.175**
EFFIC					0.511***	0.417***
QIN						0.493***
METHOD	0.168	0.094*	-0.286***	0.371***	0.157**	0.129**
ANGLO						-0.086*
ASIA			-0.117	-0.024*	-0.199***	-0.224***
SIZE		0.172**		-0.158*	-0.081*	-0.066*

Notes. This table reports the results of the model estimation. All coefficients are standardized. The independent variables are listed in the rows of the table. The columns show the dependent variables of the equation system. Panel A presents the direct effects, i.e., the regression coefficients. Panel B and Panel C show indirect and total effects, respectively.
*** (**,*) denotes significance at 1% (5%, 10%) level. The Chi^2/df of 1.671 and the RMSEA of 0.063 indicate a good overall fit of the model.

Table 7 Multigroup SEM Comparing the Submodels of the Direct and the Indirect Cash Flow Methods

	Panel A: Chi^2-difference test			**Panel B: Chen criterion**	
	Δ df	Δ Chi²	p-level	CFI	Δ CFI
Unconstrained				0.811	
Factor loadings	11	9.357	0.589	0.813	0.002
Regression coefficients	27	22.982	0.686	0.815	0.002
Structural covariances	33	35.539	0.350	0.809	-0.006
Structural residuals	41	62.206	0.018	0.790	-0.019
Measurement residuals	57	86.631	0.007	0.781	-0.009

Notes. The table presents the results of multigroup SEM. Panel A reports the changes of the Chi^2 statistic when the model is stepwise constrained, as well as their significance. The results indicate that the models do not deviate significantly with regard to factor loadings, regression coefficients, or structural covariances. However, the structural and measurement residuals differ significantly between the two models.
Panel B shows the changes in CFI when constraints are imposed on the model. Restrictions of factor loadings and regression coefficients slightly increase CFI, whereas constraining the structural covariances results in a decrease marginally exceeding the critical threshold of -0.005. Restricting the structural and measurement residuals decreases CFI markedly, confirming the results of the Chi^2-difference test.

Table 8 Factor Loadings of Technology-related Constructs

Latent constructs	Subconstructs	Factor loadings of subconstructs on constructs	Observed variables	Factor loadings of observed variables on subcontructs / constructs
Satisfaction with forecasting technology (FTSAT)			Invoicing forecast validation	0.910
			Foreign currency forecast validation	0.717
			Cash flow forecast analysis	0.724
Importance of forecasting technology (FTIMP)			Invoicing forecast validation	0.757
			Foreign currency forecast validation	0.809
			Cash flow forecast analysis	0.817

Notes. The table presents the specification of the technology-related latent constructs in our extended model. FTSAT and FTIMP are each reflected in three items of our questionnaire survey. The factor loadings are standardized. All of them are significant at levels of less than 1%.

Table 9 Results of SEM Regression, Taking Forecasting Technology into Account: Direct, Indirect, and Total Effects on Cash Flow Forecasting Quality

Panel A: Direct effects

Equations	GOALS	IMP *(1a)*	EFFORT *(2a)*	EFFIC *(3a)*	QIN	FTSAT	FTIMP	QOUT *(4a)*
GOALS		0.625***	0.211**	0.442***				
IMP						0.406***		
EFFORT				0.280***	0.129**			0.073**
EFFIC					0.631***			0.126*
QIN								0.697***
FTSAT				0.298***				0.053
FTIMP				-0.401***				0.124**
ANGLO			-0.089*			0.125*		-0.080***
ASIA	-0.273***	0.114**	-0.049	0.312***	-0.219***	0.215***	0.298***	-0.110**
SIZE		0.300***		-0.053		-0.202***		0.071**

Panel B: Indirect effects

	GOALS	IMP	EFFORT	EFFIC	QIN	FTSAT	FTIMP	QOUT
GOALS				0.135***	0.391***	0.254***		0.374***
IMP				0.121***	0.076***			0.090***
EFFORT					0.177***			0.248***
EFFIC								0.440***
QIN								
FTSAT					0.188***			0.168***
FTIMP					-0.253***			-0.227***
ANGLO				0.012	-0.004			-0.001
ASIA		-0.171***	-0.058**	-0.213***	0.049	-0.023		-0.067
SIZE				-0.024	-0.048*	0.122***		-0.047*

Panel C: Total effects

	GOALS	IMP	EFFORT	EFFIC	QIN	FTSAT	FTIMP	QOUT
GOALS		0.625***	0.211**	0.577***	0.391***	0.254***		0.374***
IMP				0.121***	0.076***	0.406***		0.090***
EFFORT				0.280***	0.306***			0.321***
EFFIC					0.631***			0.566***
QIN								0.697***
FTSAT				0.298***	0.188***			0.221***
FTIMP				-0.401***	-0.253***			-0.103*
ANGLO			-0.089*	0.012	-0.004	0.125*		-0.081***
ASIA	-0.273***	-0.057	-0.107*	0.099*	-0.170***	0.192***	0.298***	-0.177***
SIZE		0.300***		-0.076	-0.048*	-0.080		0.024

Notes. This table reports the results of the estimation of our extended model. All coefficients are standardized. The independent variables are listed in the lines of the table. The columns show the dependent variables of the equation system. Panel A presents the direct effects, i.e., the regression coefficients. Panel B and Panel C show indirect and total effects, respectively.
*** (**,*) denotes significance at 1% (5%, 10%) level. The Chi^2/df of 1.725 and the RMSEA of 0.095 indicate a good overall fit of the model.