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# THE GOAL OF FORECASTING – PREDICTABILITY OF CASH FLOW REVISIONS IN CORPORATE FINANCE

*Research paper*

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## Abstract

*Accuracy of forecasts is essential for organizational units, such as accounting. The accuracy of business-related forecasts generally depends on individual and organizational biases. Biases, resulting from anchoring and adjustment heuristics, incentivization for earnings management as a personal objective, and company goals alter the forecaster's opinion on the future outcome. Studies in business analytics suggest that detectable forecasting patterns occur, if these biases are present. This paper argues that a bias not only distorts forecast revisions, but –depending on the importance level of the bias– that the goal to produce accurate forecasts has a marginalized influence in the presence of the bias. Such a bias supersedes the previous goal and recommends a disentanglement of the forecasting process. Empirical analysis of judgmental cash flow forecasts in a business corporation supports the hypothesis for an organizational bias. Concealment of information goes along with this bias, alters forecast revisions, and has a substantial impact on the forecasting process. Therefore, incorporation of the findings into future organizational arrangements, strategic understanding, and accounting information systems is necessary.*

*Keywords: Corporate Cash Flow Accounting, Forecast Revision Process, Earnings Management, Forecast Implications, Organizational Bias, Margin Target Orientation.*

## 1 Introduction

The pivotal role of cash flows in corporate finance of multinational firms has been addressed in several research papers (Almeida, Campello, and Weisbach, 2004; Graham and Harvey, 2001; Kim, Mauer, and Sherman, 1998; Lim and Wang, 2007; Martin and Morgan, 1988; Stulz, 1990). Underlying cash flow forecasts are crucial to corporate management activities in the finance sector, as management often uses these forecasts to determine foreign-exchange risks resulting from foreign business activities. Since accurate forecasts provide a basis for hedging options to cover currency exposures, inaccuracies in these forecasts can result in increased hedging costs or uncovered currency risks. Corporations that operate worldwide and manage these risks typically have at least one financial information system with forecasting processes on a regular basis (e.g., monthly or quarterly). The sequence of an initial forecast and revised forecasts is referred to as *forecasting process* and the sequence of revisions is usually referred to as *revisioning*. Subsidiaries of the corporation generate forecasts for cash flow items and send thousands of forecasts and revisions to corporate headquarters. These forecasts are aggregated and provide the basis for corporate-wide key performance indicators (KPIs) and management activities. One example of such a KPI (Marr, 2012) is the *Earnings Before Interest, Taxes, Depreciation, and Amortization* (EBITDA), which is important in the context of this paper, because it is one of the primary proxies for a company's current operating profitability.

However, most of today's forecasting processes are the result of human judgment (Sanders and Manrodt, 2003), and studies suggest that latent human influences must not be underrated, as they affect corporations' forecasting and planning in many ways (Hogarth and Makridakis, 1981). Several studies provide evidence

of the behavioral aspects that play a significant role in judgmental forecasting. A comprehensive literature research on this topic is given in Lawrence et al. (2006). Also, experiments reveal that several sources of information change the way in which forecasters adjust (Leitner and Leopold-Wildburger, 2011). The sources of information for forecasters inside subsidiaries are often heterogeneous, providing differing perspectives on the internal state of a subsidiary, while *organizational structures*<sup>1</sup> and dependencies of the corporation define a framework for each subsidiary (e.g., earnings thresholds as shown by Daniel, Denis, and Naveen, 2008), which can affect forecasts as well as forecast adjustments and introduce *organizational biases* (Knöll, Setzer, and Laubis, 2018).

For instance, operations ensure meeting specified EBITDA margin targets in organizations, which results in tendencies to control cash flows (Burgstahler and Eames, 2006; DeGeorge, Patel, and Zeckhauser, 1999). Therefore, the management of earnings may result in shifts of cash outflow realizations –within the terms of credit– forward to the next fiscal year, if the annual EBITDA margin is expected to be too low.

Besides the representation of the operating realizations, subsidiaries tend to align figures according to corporate planning (Kudla, 1976). The subsidiaries' operating managers try to reach planning figures, as most subsidiaries provide incentivization on a financial level (e.g. bonus payments), which might emotionally drive people decisions (Noval, 2016).

Detecting organizational and human biases in cash flows provides means to improve business performance, especially as corporations rely on risk minimization methods, such as currency hedging for the conservation of future cash flow values (Stulz, 1996). These methods require an adequate expectation of cash flow realizations, which are provided by the subsidiaries in the form of forecasts. In every subsidiary a manager dedicated to forecasting should provide accurate forecasts to the best of his knowledge for the corporation. A subsidiary's forecasts made by human individuals, however, might be biased by organizational structures. The aforementioned operations and planning activities might result in information asymmetry for the subsidiaries' forecasters, making it difficult to provide accurate forecasts to the corporation. For instance, these biases can result in subsidiaries trying to hide bad news (comparable to earnings forecasts as reported by Penman, 1980).

In other words, operational structures and business probably limits the predictability of cash flows by earnings management and managerial planning incentivization. However, interlinking organizational structures and personal incentives to corporate goals might be especially prone when the subsidiaries' forecasting managers are independent of the holding corporation. If corporations are unaware of these dependencies that affect the forecasts, inaccurate risk management may result. This may cause additional effort and costs (John, 1993), at the latest when forecasts are hedged.

While researchers mostly are aware of the challenges, there is practically no research available that empirically analyzes a corporation's internal forecasts in relation to the diverse managerial aspects (and biases) of planning, operations, and forecasting. As internal data is difficult to acquire, this would explain why there has not been any comprehensive analysis of internal cash flow forecasts and of how their revisions relate to these organizational biases to date. Thus, corporate financial departments have little guidance on how to assess the quality of their heterogeneous forecasts and how to reduce dependencies in order to improve forecasting processes.

Hereof, the method recently shown in Knöll and Simko (2017) for the proxies of return margins is applied to transfer findings from finance research (such as in earnings forecasts) to cash flow forecasting. This study provides the following contributions to the literature: First, it is argued that pursuing annual return targets introduces an organizational bias on forecast adjustments. Identifying the pattern of concealed information, which systematically influences the forecast revisions, this paper shows that forecast and their revisions probably do not reflect the entire internal view of a subsidiary. Second, analyses quantify dependencies of the assumed organizational bias on the corporation's purpose of forecasting processes.

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<sup>1</sup> This paper refers to organizational structures as “the existing parts within the organization or company and the processes of how these parts interact with each other.” A more detailed introduction to the terms can be found in Ranson, Hinings, and Greenwood (1980).

Here, the interpretation of the analyses reveals that managed cash flow earnings and pursued targets distort forecast revisions, thus undermining the original goal of forecasting processes – to receive an accurate representation of upcoming cash flows for the corporation. This study analyzes empirical data of existing forecasting processes, instead of relying on data from management surveys. Therefore, this paper avoids a biases that might be inherent in surveys: the additional workload for participants. Keeping in mind that the corporate privacy policies ensure anonymity for the subsidiary managers and make surveys impossible to relate the error, the subsequent analyses in this paper are expected to alter the understanding of “the goal of forecasting” in corporate processes with financial information systems.

The remainder of this paper is structured as follows. Section 2 describes the empirical dataset. Section 3 introduces the author’s notation and Section 4 introduces the research model for hypotheses, which is based on related work on finance theory. The empirical design, analytical results, and interpretation are then presented in Section 5. The final Section 6 of this paper discusses the implications and limitations of this work for assessing organizational structure.

## 2 Empirical Data

The data used in the analysis stems from a record of cash flow forecasts and realizations provided by a multinational sample corporation. The corporation is headquartered in Germany, but has worldwide operating subsidiaries. With about 110,000 employees, the company generates annual revenues in the billion Euro range. The corporation has more than 300 separate legal entities, including their subsidiaries. The subsidiaries are grouped into three distinct divisions, based on their fundamentally different business portfolios: “Agricultural products” (AP), “health and pharmaceuticals” (HP), and “industrial materials” (IM). Entities with business portfolios belonging to more than one division are summarized under a fourth artificial division, “diverse” (DV).

Each subsidiary officially operates independently of the corporation, even though there are some important dependencies in the organizational structure. (1) The figures of corporate planning are defined in agreement with the subsidiaries. Based on the set of local plans, the corporation re-adjusts the planning to an overall view and defines the requirements for local operations being rated as “successful” subsidiaries. (2) As the subsidiaries operate independently, they have their own financial system and a heterogeneous payment structure (e.g., incentivization bonuses), and they have to ensure liquidity for their operations (e.g., with earnings management processes). (3) Each subsidiary that participating in the forecasting process –mostly large-volume entities– enters their expectations on future cash flows in a corporate IT-system. Forecasts accessible are aggregated for corporate risk management to apply hedging measures and further instruments. Figure 1 depicts the interactions between the corporation and a subsidiary. Planning figures, forecasts, and realization volumes are needed to be communicated, but the responsible managers (planner, forecaster, and earnings manager) have mostly restricted access (as a personal view) to the internal state of the subsidiary.

Financial risk management is centralized, with the local subsidiaries reporting cash flows to the corporation’s central finance department. It receives cash flow forecasts generated by the subsidiaries worldwide, denominated in foreign currencies. After the realization date, the corporation receives the cash flow figures for realizations (hence, “actual”) every month. The forecasts and actual data available for the analyses cover invoices issued (*II*) and invoices received (*IR*) in the corporate IT system. Delivered by the subsidiaries on a quarterly basis, the forecasts cover intervals with horizons of up to 15 months (five quarters). The dataset for actual invoices ranges from January 2008 to December 2013 with the corresponding forecasts covering the actuals’ period. In total, actuals and forecasts are available for the 99 largest subsidiaries, while the generated forecasts of a subsidiary cover the individual subset of currencies in which it issues and receives invoices – resulting in 44 different currencies for the dataset. Overall, the raw dataset consists of 20,472 monthly invoice actuals, with five associated forecasts each. Table 1 gives a brief summary of the dataset.

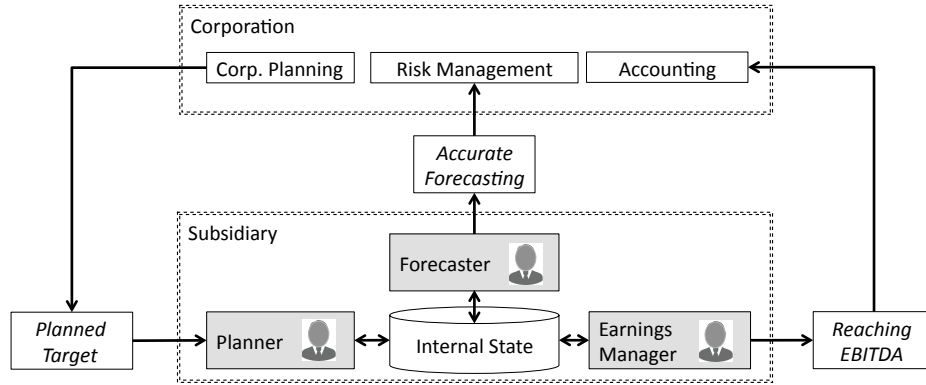


Figure 1. Organizational structure in corporate forecasting. The figure shows the corporation’s three directed dependencies for the managers within one exemplary subsidiary.

Divisions	Subsidiaries	Currencies	Actual Time Series	Forecasts
AP	12	16	70	17,010
HP	19	26	146	29,070
IM	13	8	52	13,460
DV	53	37	216	42,820
All	99	44	484	102,360

Table 1. The summary of available cash flow data.

Additionally, partial data from the corporation’s annual report are used for testing the hypotheses in Section 5. In the annual report 2011 the EBITDA margins listed are 22.8 % (AP), 27.4 % (HP), and 10.8 % (IM). Official figures for division DV were not reported separately. In 2012, the figures were: 24.0 % (AP), 27.2 % (HP), and 10.9 % (IM). The figures in 2013 were comparable in magnitude, namely, 25.5 % (AP), 28.2 % (HP), and 9.5 % (IM).

### 3 Notation and Forecasting Process

Denoting the *actual* (realization) of cash flow item  $i$  as  $A(i)$ , the *lead time*  $t$  of a *forecast*  ${}_tF(i)$  for  $A(i)$  refers to the number of revision periods (i.e., in terms of a quarter of the year) until the actual date ( $t = 0$ ). For instance, with an initial forecast at  $t = 5$  the earliest forecast  ${}_5F(i)$  is delivered with a lead time of five periods and is revised four times until the last one–period–ahead forecast  ${}_1F(i)$  is generated. Figure 2 visualizes the temporal structure of the *forecasting process* in five steps for an actual  $A(i)$ . Subscripts  $m$ ,  $y$ , and  $e$  denote the realization month, realization year, and the ID of the corresponding subsidiary of the actual. Superscript  $g$  denotes the type of the actual ( $g \in \{\text{invoice issued (II), invoice received (IR)}\}$ ). Therefore, the maximum indexing for an actual is  $A_{e,y,m}^g(i)$ . If an index is irrelevant or obvious in the context, the respective index is omitted for reasons of brevity. The use of  $F$  instead of  $A$  in the notation refers to individual forecasts.

Because the corporate planning is determined on an aggregate level the cash flow forecasts are accumulated up to this level. As a proxy for percentage return margin within a fiscal year for a specific subsidiary ( $e = E$ ), the computation of the entity’s *ratio*  $R$  uses aggregated revenues (II) and expenses (IR). The ratio for in the  $M$ -th month of a year  $Y$  and the  $K$  months ( $K < M$ ) before  $M$  is shown in Equation (1).

$$R^K(A_{Y,M}) = \frac{\sum_{1 \leq j \leq K} A_{y=Y,m=M-j}^{g=II}}{\sum_{1 \leq j \leq K} A_{y=Y,m=M-j}^{g=IR}} \quad \begin{array}{l} Y \text{ specific year} \\ M \text{ specific month} \\ K \text{ aggregated number of months} \end{array} \quad (1)$$

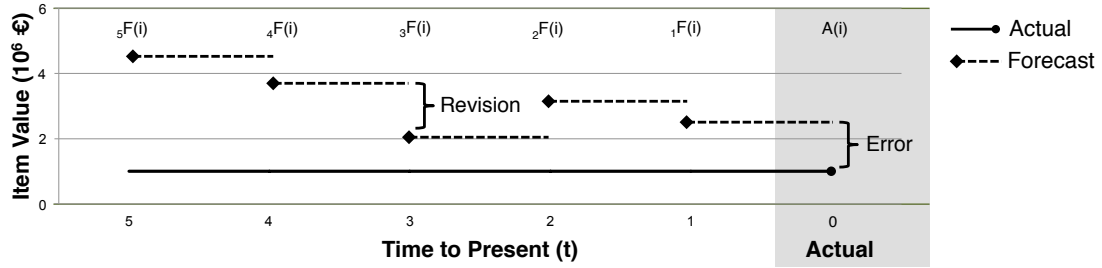


Figure 2. Temporal structure of cash flow forecasts  ${}_tF(i)$  for the corresponding actual  $A(i)$ .

For instance,  $R_{2010,11}^2$  refers to the ratio of all cash flows from September to November 2010, while a ratio above one indicates the presence of more revenues than expenses (positive return). The notation  $R(A_{Y,M})$  omits the superscript  $K$ , if  $K = M - 1$ , and is an aggregation of all realized cash flows in year  $y = Y$  up to (and including) month  $m = M$ . Since ratios are specific for an entity  $e$ , for reasons of comparability this work focuses on normalized ratios  $R^n$  with values between zero and one per entity. Normalized ratios are obtained by subtracting the minimum ratio within an entity from  $R$  and dividing by the difference of its maximum and minimum ratio.

The suggested annual return margin target (*target*) that an entity  $E$  has to reach at the end of the year is defined as  $T(A_{y=Y})$  in year  $y = Y$ , and  $T^n(A_Y)$  as the normalized target. As targets are unknown (to me), but business development measured with EBITDA figures seem rather stable over the years, the target in  $y = Y$  is estimated by averaging the December actual ratios of the three preceding years ( $R^n(A_{y=Y-j,m=12})$ , with  $j \in \{1, 2, 3\}$ ). The *revision* for ratios is defined as  ${}_{12}R^n = R^n({}_1F) - R^n({}_2F)$ , and describes the adjustment from the second last forecast to the last forecast before the actual. The paper uses the last revision because generally the latest judgmental forecast incorporates the most information and is the most accurate (McNees, 1990). The *difference from target* is defined as  $TargetDiff = T^n(A) - R^n({}_1F)$ . Finally, the *error* is  $Err^n = R^n(A) - R^n({}_1F)$ . Ratios and revisions are not stored in the database but derived from the invoice items as shown in Equation (1). Table 2 gives a brief overview of the defined metrics.

Notation	Metric	Notation	Metric
$R^n({}_1F)$	Forecast Ratio (normalized)	$TargetDiff$	Difference from target
$R^n(A_{y,m})$	Actual Ratio (normalized)	${}_{12}R^n$	Revision (normalized)
$T^n(A_y)$	Target (normalized)	$Err^n$	Error (normalized)

Table 2. Notation used in the analyses.

## 4 Research Design

This section discusses the theoretical background for the hypotheses and additional assumptions before the four new hypotheses follow. The theoretical background is based on Burgstahler and Eames (2006), where the authors analyzed published cash flow forecasts and actuals of firms as a function of the expectations of market analysts. While Burgstahler and Eames (2006) focus the management of cash flows on the outer shell of firms, this paper analyzes the internal forecasts and actuals within the sample corporation. The first two hypotheses in this paper should be considered an advancement of the results of Burgstahler and Eames (2006), since the current data and hypotheses cover the internal firm forecasts and actuals – from which official market reports are derived later on. The background is further based on Easterwood and Nutt (1999), where the authors analyzed the impact of previous forecast errors on the change of following forecasts revisions. Their research led to the question of whether the forecast revisions are influenced by organizational structures (and not only by the error), resulting in the third and fourth hypotheses.

The difficulty for corporations lies in their need for a well-aligned management of planning, forecasting, and operations. To align the management to recent, current, and future business development, the corporation requires information from the subsidiaries. Information is provided through managers (and information systems) that have the possibility to access a perspective on the internal state of the subsidiary, which often requires preprocessing information to a view required by the corporation. The amount of work involved in planning, forecasting, and operations often implies sharing of tasks by several managers. When organizational structure motivates one manager (e.g. with incentivization payment), but not the other ones, an organizational biased view might occur for some of the information-giving managers. As a result, organizational biased forecasters might provide a view that incorporates inaccuracies in the forecast data. These inaccuracies originate partly from the *concealment of information*, defined as “the state when managers are not well aligned in terms of amount and quality of information”, e.g. when one side hides information (unintentionally). Hence, the following hypotheses are made:

**Hypothesis (H1).** *Organizational biases can result in forecasting that follows a pattern defined as the concealment of information.*

**Hypothesis (H2).** *Corporate planning (as an organizational bias) can pave the way for revision adjustments in decentralized forecasting processes.*

After identification of organizational biases in subsidiaries (concealment of information and corporate planning), it will be analyzed whether corporate operations are well aligned to the goal of accurate forecasting. Structures in processes of operations might alter the realizations (e.g., with earnings management) that are compared to forecasting figures. These changes can have serious implications on forecast error measures. These new hypotheses aim at disentangling the “goal of forecasting” for corporations from the managerial “goal of forecasting”, as influences of organizational structures are to be expected to alter the former goal.

The intention behind the corporation’s “goal of forecasting” is that forecasters should provide perspectives for future expectations and should try to minimize the forecast error, which can be understood as an organizational bias itself on forecast processes. The assumption is that forecasting process might have a random baseline, but more importantly, to underline the foretold intention, in a forecast process the forecasting adjustments should depend on actual realizations, which yields in the Hypothesis (H3).

**Hypothesis (H3).** *Organizational structures as a bias (i.e., the corporate goal of accurate forecasting) can alter or distort forecasting processes.*

**Hypothesis (H4).** *The goal for forecasters can change in dependence of organizational biases.*

When tasks of planning, forecasting, and accounting are interlinked to some extent, however, pursuing planned annual return targets can systematically influence both actual and forecast adjustments, with a comprehensive perspective being required. Tasks of forecasting, planning, and operations can be assigned to different managers. Forecasters who actually focus to intentionally give purposeful forecasts can, however, provide organizationally biased forecasts – suggesting a trade-off between the internal view they have, planned figures, and the operational view. This trade-off becomes even more rigid when the dedicated forecaster is also involved in planning and operating tasks within the subsidiary. For example, a forecaster tries to integrate known planning figures, previous and upcoming earnings management, with own expectations. But, however, this forecaster might give more credit to the expected annual return targets than to the internal state of the subsidiary. Depending on the importance of such biases, the combination of organizational biases can substantially distort the goal of forecasting from producing accurate forecasts to forecasting of ambiguous and even misleading organizational influences, resulting in Hypothesis (H4). While Hypothesis (H3) requires that accurate forecasting (the goal of forecasting for corporations) relates to revisions, this relation incidentally is a precondition for the analysis of (H4), requiring two competing goals.

## 5 Empirical Analysis

This section presents the test design for the hypotheses. In addition, empirical results based on linear regression analysis are provided, together with the interpretation of the results. For testing the hypotheses, it is assumed that the derived target ratios are linked to the percentage EBITDA margin figures of the company. This assumption seems to be plausible, as derived EBITDA figures result from realized revenues (by invoices issued) and expenses (by invoices received). The assumption is supported by the percentage EBITDA margin figures published in the annual report, which are in line with the ranks of division ratios for December values (not reported in this paper). This allows retaining a substitute for percentage EBITDA margins. Further, the experiments used the provided tools in R for linear regression and hypothesis testing (R Core Team, 2013).

### 5.1 Revision Strength Influenced by Reaching Targets

As noted before, organizational structures define that reaching planned targets is an important strategic goal. If subsidiaries' forecasts are adjusted to follow these targets, a pattern of concealing information inside the subsidiary may occur. The resulting pattern for Hypothesis (H1) will drive adjustments differently for revisions depending on the entities' current expected performance. Here, the performance above the target is perceived as good current state and a performance below the target as a bad current state. The target is expected to serve as a threshold value for the subsidiaries (as motivated by Daniel, Denis, and Naveen, 2008). In order to conceal bad news, adjustments should increase more strongly when the state seems bad (or not as good as required) and should decrease with a good state –but not as fast as the bad news. As a result, some of the good news can be held back for worse times of the subsidiary, which indicates the avoidance of bad news by using concealment. The expectation on Hypothesis (H2) is a dependency of the target and revision, together with a decrease of adjustments over time, as the current forecast ratio approaches to the target. A schematic diagram of the expected adjustments is given in Figure 3.

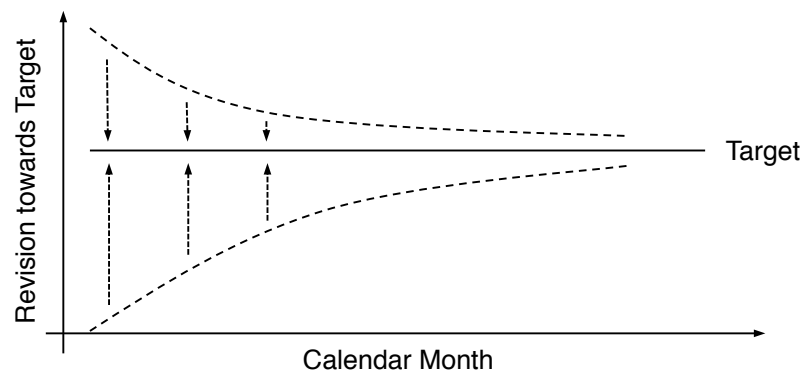


Figure 3. *Expected revision pattern to conceal bad news. Current performance below the target increases the revision upward and performance above the target decreases the revision. The magnitude of revisions for performance below the target should be much higher compared to a performance above the target.*

To test the relationship, the regression for  ${}_{12}R^n$  uses one boolean variable for the relation between annual target and forecast ratio ( $\text{TargetDiff}_{(+)}$ ), while the other state of the boolean variable is indicated by the intercept. Therefore, the intercept is renamed to “ $\text{TargetDiff}_{(-)}$ ”. Further the regression model uses the month and interaction effects of month and  $\text{TargetDiff}_{(+)}$ , shown in Equation (2).



$$\text{Model 1: } {}_{12}R^n = \beta_0(\text{TargetDiff}_{(+)}) + \beta_1(\text{TargetDiff}_{(-)}) + \beta_2(\text{Month}) + \beta_3(\text{TargetDiff}_{(+)} \times \text{Month}) + \varepsilon \quad (2)$$

where:

$\text{TargetDiff}_{(+)}$  = true (equals one) indicates that the forecast is below the target,

$\text{TargetDiff}_{(-)}$  = true (equals one) indicates that the forecast is above the target,

$\text{Month}$  = the number of the month in the fiscal year, and

$\text{TargetDiff}_{(+)} \times \text{Month}$  = interaction of the month of the fiscal year and the target relation, stating that the forecast is below the target.

Table 3 shows the resulting estimates of the model. The results indicate that experts adjust ratios to match these targets. The prediction for  ${}_{12}R^n$  is higher when the target ratio is underachieved ( $\text{TargetDiff}_{(+)}$  :  $R^n({}_1F) < T^n(A)$ ) compared to when it is overachieved ( $\text{TargetDiff}_{(-)}$  :  $R^n({}_1F) > T^n(A)$ ). A positive  $\text{TargetDiff}$  corresponds to an uptrend, while a negative  $\text{TargetDiff}$  relates to a downtrend. Especially bad performing ratio forecasts have a high absolute estimate to adjust to the target, while already met targets lead to a revision with an absolute estimate half that high, which supports Hypothesis (H1). The end of the fiscal year has a significant influence on the revision of the forecast ratio. The revision has a tendency to decrease over the year. But when the target is already met, the monthly reduction of revision is less reduced. This effect is obvious from the estimates when the  $\text{Month}$  and the interaction term are combined:  $-0.009 + 0.006 = -0.003$ . These results underline that the organizational target bias predefines the revisions, and (H2) is supported. Thus, the Model 1 supports the hypotheses for the concealment of bad news (H1) and link to planning figures (H2).

Dep. Variables for ${}_{12}R^n$	Estimates Model 1
$\text{TargetDiff}_{(+)}$	0.145 ***
$\text{TargetDiff}_{(-)}$	- 0.063 ***
Month	- 0.009 ***
$\text{TargetDiff}_{(+)} \times \text{Month}$	0.006 **
Significance levels: * $p < 0.1$ ; ** $p < 0.05$ ; *** $p < 0.01$ ; Observations: 2,355.	

Table 3. Analytical model regressing revision with dependencies of  $\text{TargetDiff}$  and  $\text{Month}$ . The result shows that revision in ratio is higher, if the forecast is below the target ( $\text{TargetDiff}_{(+)}$ ) when compared to forecasts above the target ( $\text{TargetDiff}_{(-)}$ ).

## 5.2 Target Influence on Revision

Forecast adjustments that are strongly influenced by the target, giving rise to the question what influences would justify the revisions of the expert with regard to the Hypotheses (H3) and (H4). The intention is to analyze what influences a model considers to be essential for revisioning. For this purpose, the manager's revisioning is regressed with a model that can access actuals, and another model that can additionally access suggested earnings targets. By analogy with the approach in Easterwood and Nutt (1999), this paper uses the methodology to perform a regression of the revision using forecast errors. But contrary to the analysis of the impact of last year's error this paper analyzes the impact of the current error ( $\text{Err}^n$ ) on the revision. The intention is to determine the biases that influence the revision. Additional explanatory variables could then be taken into account for future analyses. Due to the chronological sequence of forecasts and actuals, this approach does not allow the revision to be predicted, but rather possible influences for the revision to be determined (as retrospective analysis).

First, Model 2 analyzes the dependency of revisions on the difference from the actual ratio (Equation 3). Revision  ${}_{12}R^n$  is expected to be dependent on the actual error  $Err^n$  (minimization of  $R^n(A) - R^n({}_1F)$  symbolizes the goal of forecasting) and to be independent of the *Constant* (symbolizes indistinguishable biases in forecasting, including target focus and operational earnings management). In the resulting model, *Constant* should have a small estimate of low significance, while  $Err^n$  should have a significant influence. If  $Err^n$  has an insignificant estimate, this would suggest that the revision is not influenced by the corporation’s goal of forecasting, to provide accurate forecasting to the corporation.

Second, (H4) requires a comprehensive perspective on dependencies. Integrating the previous organizational bias of (H2) leads to the disentanglement of the effect *TargetDiff* from the *Constant*, resulting in the Model 3 (Equation 4). The expectation according to the Hypothesis (H4) requires *TargetDiff* to play a significant role in the regression model. The revision’s dependency on *TargetDiff* should imply a significant estimate with higher magnitude in comparison to the other variables ( $Err^n$  and *Constant*).

$$\text{Model 2: } {}_{12}R^n = \beta_0 + \beta_1(Err^n) + \varepsilon \tag{3}$$

$$\text{Model 3: } {}_{12}R^n = \beta_0 + \beta_1(Err^n) + \beta_2(\text{TargetDiff}) + \varepsilon \tag{4}$$

The results are presented in Table 4. Model 2 shows that *Constant* is not significant, while  $Err^n$  has a significant effect on  ${}_{12}R^n$ , which supports the Hypothesis (H3). Model 3 shows that revisions are organizationally biased by  $Err^n$  and experts adjust the ratio in relation to *TargetDiff*. As anticipated from the results of the Hypotheses (H1) and (H2), the organizational bias *TargetDiff* distorts the forecasting process in Model 3. Expecting that accurate forecasting is the primary goal of forecasting processes, the strength of the estimate of  $Err^n$  is expected to be the highest. However, estimates clearly show that *TargetDiff* overlays this goal with an estimate nearly five times that high. These estimates suggests that the model assigns more importance to the target ( $T^n(A)$ ) than to the actual ratio ( $R^n(A)$ ) for the forecaster’s revisioning ( ${}_{12}R^n$ ). The goal of managers seems to be different from the corporation’s original goal of the forecasting process, which supports the Hypothesis (H4). However, the comparison shows that the integrated variables all have negative estimates. This states that revisioning depend on organizational structures – but at least their impact is not diametrically to each other in the practical application.

Dep. Variables for ${}_{12}R^n$	Estimates Model 2	Estimates Model 3
Constant	– 0.003	– 0.002
$Err^n$	– 0.246 ***	– 0.049 *
TargetDiff	(Not Utilized)	– 0.242 ***
Significance levels: *p<0.1; **p<0.05; ***p<0.01; Observations: 2,355.		

Table 4. Comparison of models to explain the revision in ratio. Estimates show that revision is strongly influenced by the actual error  $Err^n$ , as long as *TargetDiff* is not included.

### 5.3 The Goal of Forecasting

The results with support for Hypotheses (H3) and (H4) might seem simple, but their implications are wide-ranging, which will be stated with the following conjecture: If theoretically perfect information of the forecaster is assumed by knowing the actual ratio in advance, the estimates of Model 3 indicate that revisioning behavior primarily depends (linearly) on the difference from the target compared to the information an expert could use to maximize the accuracy. This conjecture gives further support for the Hypothesis (H4). Summarizing: From the perspective of the forecaster, the models emphasizes that providing accurate forecasts is not as important as pursuing an annual earnings target. But, other influencing biases on revisions could exist besides the earnings target’s influence and managed earnings, and could be integrated into the regression, dampening the effects.

## 6 Conclusions and Outlook

Analyzing the cash flow forecast data of a large multinational corporation, this paper provides one of the first empirical revision analysis of financial forecasting processes with managerial accounting–related organizational biases. The analysis of corporate margins reveals that forecasting processes with organizational biases exist. These organization–level biases relate to behaviors in operations management, e.g. earnings management, and awareness of planned activities, e.g. difference from target, and lead to systematic biasing of revisions of the forecasting processes. Results indicate that including organizational biases into accounting is the key to explaining results in business forecasting.

In this research, two research gaps are addressed: First, providing insights into corporate invoice forecast processes and revisioning and, second, uncovering systematic effects and biases on the aggregate level, where hedging takes place. For corporations, it is important to understand how business environment–related strategies may affect forecasting accuracy in order to decrease hedging costs. In particular, risk management must incorporate planning figures and earnings management to some degree for reaching an unbiased perspective. Otherwise, the biased perspective would impair risk management and hedging activities. In view of the fact that netting effects take place, with positive invoices (II) canceling the effect of negative invoices (IR), the influence of the findings must not be underrated for skewed distributions of invoices that would create additional risks or costs for unnecessary hedging.

From a managerial perspective, the results provide new insights into how organizational structures influence the purpose of the forecasting task. The endeavor to align forecasts to target figures determines how revisions are made. The accuracy and the forecast quality seem to become less important for the human forecasters than other external and organizational influences. This does not mean that the human forecasts have a bad accuracy per se. The analyses revealed that reaching the target does not conflict with accurate forecasting for the revision behavior. But aligning the goal of forecasting for individuals with the corporation’s goals seems to be beneficial. As a result, organizations that want accurate forecasts for invoice margins from managers should consider motivating purposeful forecasts, for example through dedicated incentives for forecasters.

In sum, the findings bridge the gap between forecasting research and organizational biases within management research for digital innovation in corporations. The results provided are relevant to corporate leadership, management strategies, information technology, and business analytics. Altering the understanding of “the goal of forecasting”, corporate leaders can iteratively measure the impact of a managerial incentive system and build strategies to change organizational structures and their dependencies. For instance, to improve awareness of upcoming earnings management activities, the information might be communicated to the forecasters within an IT system. Business analytics benefits from the information provided, as forecast correction services could incorporate dependencies stored in the IT system in order to improve the forecast accuracy. First experiments with forecast correction techniques based on this research were successful. This led to a project with the research partner, the corporation that provided the analyzed data, to realize automated checks of the validity of aggregated forecasts within a forecast support system.

The study is subject to a few limitations. The pursuit of annual return targets and forecast accuracy can be relevant in many companies. But the combination of incentivization, earnings management, and organizational planning leads to revisions most likely depending on the business context and organizational structure. The dependencies can look different in the case of another structure, business models, or organizational biases.

Improvement processes of corporate risk assessment have an essential need of understanding interlinks of organizational structures and individuals, especially beyond the organizational borders of the corporation. An approach for improvement should account for all relevant organizational levels, and besides taking managerial actions, future research work might reveal alternatives. The analyzed organizational target bias and further measurement of so far unknown biases might disclose the latent motivations of forecasts in detail. It is concluded that the knowledge of these biases, together with the predictive value for decision

support systems, drives subsequent forecast correction approaches to retrieve highly accurate forecasts for accounting information systems. The effort to implement these information processes might be high, but the resulting opportunities seem to be even greater.

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