

Budget–forecast responsiveness, forecast use and management control effectiveness

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Daniel Magalhães Mucci

Department of Accounting and Actuarial Sciences, University of Sao Paulo,
Sao Paulo, Brazil

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Abstract

Purpose – This study examines the relationship between the responsiveness of budgets and forecasts and management control (MC) effectiveness, and whether this relationship is mediated by the planning, control and evaluation roles of forecasts.

Design/methodology/approach – We conducted a survey and obtained a sample of 86 medium and large firms that use both annual budgets and forecasts. For data analysis, we used Structural Equation Modeling (PLS-SEM).

Findings – The results show that budget–forecast responsiveness is not directly associated with MC effectiveness but is positively associated with all three forecast macro-functions: planning, control, and performance evaluation. However, effectiveness arises from how forecasts are used through two distinct channels. Planning has the strongest direct association with MC effectiveness, contributing autonomously rather than transmitting responsiveness. Performance evaluation was the only role mediating the responsiveness–effectiveness relationship.

Practical implications – Our findings suggest that aligning budget and forecast design is insufficient, on its own, to increase MC effectiveness; it depends on how forecasts are used. Using forecasts for planning delivers value directly, whereas using them for performance evaluation converts a responsive design into effectiveness.

Originality/value – This study contributes to the internal forecasting and management control literature by linking budget and forecast (through loose coupling theory), forecast use and MC effectiveness.

Keywords Management control effectiveness, Loose-coupling theory, Interdependence, Budget, Forecast, Forecast roles

Paper type Research article

1. Introduction

Management accounting serves two main purposes: planning and controlling. While control-related uses are well studied, less focus has been placed on planning and decision-making roles (Casas-Arce, Cheng, Grabner, & Modell, 2022). Forecasting is central to both purposes. Forecasts are systematic, forward-looking mechanisms used to predict key organizational values over time (Bhimani, Sivabalan, & Soonawalla, 2018). Although sales and demand forecasting play critical roles in guiding operational decisions (Brüggen, Grabner, & Sedatole, 2021), prior accounting research has focused primarily on external forecasts for investors (Kroos, Schabus, & Verbeeten, 2022). Internal forecasts are primarily driven by managerial demands and serve several roles, such as planning, coordination, and decision-making (Libby & Rennekamp, 2012; Kroos *et al.*, 2022). As Kroos *et al.* (2022, p. 52) note, internal forecasts can help organizations to “revise operational plans quickly and accurately when contingencies unfold, which results in reduced volatility and uncertainty of its operations”.

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Forecasting is an interpretive process that integrates internal and external information to support organizational action and inform decisions related to procurement, capacity, production, investment, and cash management (Brüggen *et al.*, 2021; Bukh, Ringgaard, & Sandalgaard, 2025; Kroos *et al.*, 2022). Jordan and Messner (2020, p. 337) state that “sales forecasts provide an outlook on future revenues (and thus allowable costs) and are crucial for coordinating between demand and supply activities.”

An unresolved issue in the literature is whether forecasts function as complements or substitutes for budgets. Forecasts are often depicted as flexible, adaptive, and judgment-based mechanisms that primarily support planning and decision-making (Bukh *et al.*, 2025). Budgets are typically driven by formal negotiation processes that define targets, allocate resources, and support performance evaluation and incentives (Frezatti, Mucci, & Bido, 2022; Sivabalan, Booth, Malmi, & Brown, 2009). In practice, the boundaries between budgets and forecasts are often blurred because forecasts are frequently used to revise budget assumptions (Frezatti *et al.*, 2022; Grabner & Moers, 2013).

We argue for the interdependence between budgets and forecasts through the lens of responsiveness, conceived as a design feature that captures the degree of covariation among MA practices in response to internal and external changes (Demartini & Otley, 2020). This framework is based on a four-dimensional view of responsiveness (strength, directness, consistency, and dependence), which we use to examine how budgets and forecasts are configured together. We argue that responsiveness enhances management control (MC) effectiveness.

Simultaneously, loose coupling theory highlights distinctiveness as a central design feature, reflecting the extent to which a control mechanism retains its autonomy and fulfills differentiated roles. (Demartini & Otley, 2020; Wang, Li, Al-Sayed, & Gong, 2025). Responsiveness captures how mechanisms adjust in relation to one another, whereas distinctiveness reflects whether they remain functionally differentiated within loosely coupled systems. A recent empirical study supports treating these as separable and dynamically adjustable dimensions in control practices (Wang *et al.*, 2025). In this study, we operationalize distinctiveness through forecasting roles (whether they are used for planning, control, or performance evaluation), which aligns with the argument that distinctiveness is expressed through differences in emphasis, use, and control logic across mechanisms (Demartini & Otley, 2020). We propose that these forecasting roles act as mediating mechanisms through which budget-forecast responsiveness is associated with perceived management control effectiveness. In particular, planning reflects the traditional role of forecasts, while control and performance evaluation roles are more closely associated with budgeting practices (Becker, Mahlendorf, Schäffer, & Thaten, 2016; Sivabalan *et al.*, 2009). Thus, the effectiveness of responsiveness depends not only on the responsiveness between budgets and forecasts but also on how distinct their roles remain.

Given these discussions, this study addresses the following research questions: *What is the association between budget-forecast responsiveness and perceived management control effectiveness? And how is this relationship mediated by forecasting roles?*

Overall, our results reinforce a central idea from loose coupling theory, considering that a responsive design between MC practices enables integration but must be driven by specific uses to enhance MC effectiveness (Demartini & Otley, 2020). Budget-forecast responsiveness broadens the use of forecasts in planning, control, and evaluation. However, effective management control mainly depends on how forecasts are used, particularly in the performance evaluation role. By combining responsiveness with distinctiveness, we provide empirical insights into previous research on budgets and forecasts (Bhimani, Sivabalan, Soonawalla, & Wakefield, 2024; Frezatti *et al.*, 2022; Lorain, 2010; Sivabalan *et al.*, 2009).

This study contributes to the existing literature in several ways. First, we respond to calls to better understand the internal roles of forecasts within control systems, moving beyond technical characteristics such as frequency and forecasting methods (Kroos *et al.*, 2022; Bukh

et al., 2025). We show that forecasts are not limited to planning and decision-making but are also used for control and performance evaluation (Bukh *et al.*, 2025; Brüggén *et al.*, 2021; Sivabalan *et al.*, 2009). Second, it shifts attention from budgets to forecasts as distinct yet interdependent control practices. Hence, it aggregates the literature on “forecasting in budgeting” or how those practices evolve together in the practical realm. Third, by discussing the responsiveness between budgets and forecasts, this study advances research on the interdependencies among control mechanisms (e.g. Wang *et al.*, 2025). Finally, our study provides evidence on how budget-forecast responsiveness and forecasting roles are associated with MC effectiveness, contributing to debates on MC design and use that can support efficiency and flexibility.

2. Literature review

2.1 Budgets and forecasts

Budgets are among the most established practices in organizations and remain widely used in several roles, such as supporting operational management, coordination, and strategic decision-making (Hansen & Van der Stede, 2004). Budgets are conceived as formal operational and financial plans, usually prepared for an annual fiscal year. Budgeting processes typically unfold in three main stages: planning (ex-ante), execution, and control (ex-post). From an operational perspective, budgets serve multiple purposes, including planning, resource allocation, and performance evaluation (Becker *et al.*, 2016; Hansen & Van der Stede, 2004; Sivabalan *et al.*, 2009).

Forecasts, by contrast, constitute a systematic and forward-looking mechanism aimed at “the prediction of key values that may or may not be budget related for a period of time into the future” (Bhimani, Sivabalan, & Soonawalla, 2018, p. 308). Forecasts are typically developed within a fiscal year (on a year-to-go basis) and are frequently updated on a monthly or quarterly basis. Forecasts can also be prepared in a horizon that extends beyond the current fiscal year, which is called a rolling forecast (Bhimani *et al.*, 2018; Frezatti *et al.*, 2022; Henttu-Aho, 2018). While forecasts are commonly aligned with budgeting cycles (particularly year-to-go forecasts), they differ in purpose, governance, and use.

The literature highlights some distinctions between budgets and forecasts (e.g. Cassar & Gibson, 2008; Kroos *et al.*, 2022). First, budgets are set to define operational and financial targets for an annual fiscal year and are closely linked to performance evaluation and incentive systems, as managers are usually accountable for meeting those targets. Forecasts provide the most current estimates of future results based on updated information and/or managerial judgment and are rarely linked to target-setting and incentive discussions (Brüggén *et al.*, 2021; Kroos *et al.*, 2022). As emphasized by Otti and Brouwer (2021), forecasts should reflect realistic expectations, rather than ambitious targets. Budgets are also more susceptible to gaming behaviors, such as manipulating figures to depart from actual expectations (Jordan & Messner, 2020). Second, budgets are generally static and rarely revised during the fiscal year; hence, they are expected to provide reference points for accountability. Forecasts are designed to be dynamic and are regularly updated to incorporate changes in economic conditions, market demand, and competition (Kroos *et al.*, 2022).

Recent studies increasingly emphasize that budgets and forecasts coexist and interact rather than substitute each other (Bhimani *et al.*, 2018; Bukh *et al.*, 2025; Lorain, 2010). Combining both practices mitigates tensions arising from the multiple, sometimes conflicting, purposes of budgeting (planning, control, and evaluation). For example, Lorain (2010) shows that rolling forecasts support day-to-day planning and financial decision-making without replacing budgets in their motivational and evaluative roles. Similarly, Otti and Brouwer (2021) observe that management attention shifts between budgets and forecasts throughout the year; hence, forecasts dominate short-term monitoring (first quarter), and budgets regain importance toward the year-end (last quarter) for performance evaluation.

Simultaneously, prior studies suggest a decoupling view between forecasts and budgets. Kroos *et al.* (2022) indicate that internal forecasting is a continuous process that is distinct from the budgeting process. Brüggén *et al.* (2021) assert that demand forecasts have become the primary tool for planning and coordination. Together, these findings point to the heterogeneity in how organizations design and use budgets and forecasts, highlighting the need for an understanding that captures the interdependence between these two practices.

2.2 Interdependence budgets and forecasts

Malmi and Brown (2008) were among the first researchers to elaborate on the definition of management control (MC) package as a collection of practices and MC systems as a set of “rules, practices, values and other activities” (Malmi & Brown, 2008, p. 287) that are used to influence employee behavior. Building on this perspective, Grabner and Moers (2013) argue that control practices constitute a system only when their interdependencies are explicitly considered in their designs. From this perspective, control practices may function as complements, in which the benefit of one practice increases with the use of another, or as substitutes, in which one may reduce the relevance or use of another.

Demartini and Otley (2020) conceptualize coupling as a design feature that captures the degree of interdependence between the MC mechanisms. Drawing on loose coupling theory (Orton & Weick, 1990), they argue that “loose coupling systems are able to foster both efficiency by means of responsive behavior and innovation through autonomous and distinctive responses to contextual stimuli” (Demartini & Otley, 2020, p. 2). In this framework, coupling is not binary but varies along two core dimensions: responsiveness and uniqueness.

Responsiveness reflects the degree of covariation between MC practices in response to internal or external triggers. Distinctiveness depicts the extent to which practices retain autonomy and play a differentiated role. While responsiveness supports stability and control, distinctiveness enables flexibility and local adaptation to changing conditions. Based on these dimensions, Demartini and Otley (2020) suggest four coupling types: non-coupled, loosely coupled, tightly coupled, and decoupled. Recent evidence has shown that these configurations are dynamic. For instance, Wang *et al.* (2025) document that MC combinations shift from loose to tight coupling as control problems evolve through simultaneous adjustments in the responsiveness and distinctiveness of practices. In this study, we focus on responsiveness, as it is a necessary condition for any form of coupling (Orton & Weick, 1990).

Responsiveness has been discussed in terms of four characteristics: strength, directness, consistency, and dependence (Beekun & Glick, 2001; Demartini & Otley, 2020). Strength refers to the extent to which changes in one MC practice induce changes in another, as reflected by frequency, intensity, probability, and importance. In budgets and forecasts, strength may refer to how forecast updates prompt reconsideration of budgetary assumptions. Directness captures the degree to which one practice directly affects the targets of another, indicating whether budgets and forecasts are aligned with the same goals and performance measures.

Consistency indicates whether both practices respond similarly to changes in the external environment, such as market volatility and shocks. For instance, an increase in raw material prices would lead to parallel adjustments in the forecasted cost of goods sold and relevant budget allocations. Dependence describes the extent to which one practice relies on the structures, assumptions, or inputs of another, such as when forecasts are built using the same drivers and cost centers as those used in budgets.

Together, these dimensions capture how budgets and forecasts are coupled in practice. High responsiveness implies strong integration between the two practices, whereas low responsiveness indicates that they deviate from one another, enabling experimentation. In turn, distinctiveness reflects the degree to which these MC practices have different roles and uses. Aligned with Demartini and Otley (2020), distinctiveness counterbalances responsiveness by preserving the control system’s autonomy, which we operationalize in

this study as forecasting roles (i.e., planning, control, and performance evaluation). The theoretical model is presented in [Supplementary Figure S1](#). Revista de Gestão

2.3 Interdependence between budget and forecast and management control effectiveness

We argue that responsiveness between annual budgets and forecasts enhances management control effectiveness by improving decision making. A responsive design helps mitigate the inherent limitations of each practice individually, such as the rigidity and obsolescence of budgets and the weaker links between forecasts and performance motivation ([Lorain, 2010](#)).

Forecasts provide regularly updated expectations in response to internal and external changes, such as market volatility and supply chain disruptions, thereby supporting planning agility and strategic alignment. As noted by [Lorain \(2010, p. 181\)](#), forecasts enable organizations to “cope with environmental uncertainty while keeping an eye on strategic objectives.” However, budgets play a stronger role in performance evaluation and motivation by formalizing commitments and targets that guide managers’ accountability ([Lorain, 2010](#)).

Although budgets and forecasts differ in their time horizons, flexibility, and governance, they can be crafted to respond to environmental shifts. This responsiveness is evident in shared performance measures, in how forecasts are used to update assumptions, and in strong, direct interactions in which changes in one area systematically influence the other ([Frezatti et al., 2022](#)). Such alignment allows organizations to incorporate future-looking information into their control routines without compromising the budget’s main roles of coordination and motivation.

For example, if a forecast indicates higher demand, an organization can proactively reallocate marketing or production resources to capitalize on the opportunity. Conversely, if a sales decline is forecasted, procurement budgets can be adjusted to prevent excess inventory and overspending. From a loose-coupling perspective, responsiveness helps maintain alignment and integration among control practices, enhancing the system’s ability to adapt while remaining focused on its strategic goals ([Demartini & Otley, 2020](#)). Recent quantitative evidence reinforces the view that the attributes of control and information system design (particularly information system quality) contribute to MC effectiveness ([Papiorek & Hiebl, 2024](#)). Accordingly, we propose the following hypothesis:

- H1.* The responsiveness level between budget and forecast is positively associated with management control effectiveness.

2.4 Responsiveness, forecast macro-functions, and management control effectiveness

Previous research shows that forecasts are mainly used for planning and coordination, while budgets motivate staff and assess performance. Forecasts provide forward-looking insights for decisions, whereas budgets serve as formal accountability measures ([Lorain, 2010](#); [Sivabalan et al., 2009](#)). Recent evidence suggests increasing overlap, with [Bukh et al. \(2025\)](#) finding that forecasts can fulfill budgeting functions, such as internal planning and control, and inform budget revisions during the year. Interviews indicate that forecasts help identify gaps between outcomes and targets to decide on budget revisions ([Bukh et al., 2025](#)). This research supports the view that budgets and forecasts are complementary, emphasizing their responsiveness and use purposes ([Henttu-Aho, 2018](#); [Lorain, 2010](#); [Cassar & Gibson, 2008](#)).

The planning macro function of forecasting leads organizations to coordinate and integrate their activities with their strategy and to respond effectively to environmental changes ([Lorain, 2010](#)). With forecasts (mainly rolling forecasts), organizations “can react and adapt their action plans in order to reach the budget targets they committed to deliver” ([Lorain, 2010, p. 198](#)). In financial planning, forecasts also support financial decisions regarding debt, resource funding, and capital expenditures ([Lorain, 2010](#)). Hence, the planning function of forecasting plays a critical role in translating budget and forecast responsiveness into MC effectiveness. When these two systems are tightly coupled, organizations are better positioned

to leverage forecasts for forward-looking planning and anticipate and proactively respond to market shifts, aligning resources with projected needs (Bhimani, Sivabalan, Soonawalla, & Wakefield, 2024; Brüggén *et al.*, 2021; Kroos *et al.*, 2022). This planning capability is particularly valuable when forecasts are embedded in strategic routines, such as long-term investments, capacity planning, and commercial decisions. Based on this rationale, we propose the following:

- H2a.* The forecast planning macro-function positively mediates the relationship between the responsiveness level between budget and forecast and management control effectiveness.

The control function of forecasting involves using forecasts to track the implementation of budget targets over a period, monitoring costs, and following up on whether the organization is on course to meet its budgeted goals (Lorain, 2010). The control function of forecasting acts as a critical link between planning and execution. In responsive systems, forecasts act as forward-looking control tools that work alongside traditional variance analysis. By regularly comparing updated projections with budgeted targets, organizations can detect deviations early and intervene during the budget cycle rather than waiting for formal ex-post reviews (Bhimani *et al.*, 2024; Frezatti *et al.*, 2022). This approach enhances an organization's ability to detect operational risks. To the extent that this tracking use is enabled by a responsive design, the control role may transmit part of the effect of responsiveness on MC effectiveness. Hence, we propose the following hypothesis:

- H2b.* The forecast control macro-function positively mediates the relationship between the responsiveness level between budget and forecast and management control effectiveness.

Finally, we consider the performance evaluation function of forecasting, traditionally the most controversial role, often evident when forecasts serve as substitutes for budgets (Bukh *et al.*, 2025; Lorain, 2010). Budget targets have conventionally served as fixed reference points for performance evaluation, forming the basis for incentive systems and managers' accountability, whereas forecasts are flexible, regularly updated estimates rather than contractual commitments. This tension has led prior work to treat the evaluation role of forecasts with caution, given risks such as managers deliberately underestimating future results to make later results appear favorable. However, because this use carries accountability consequences, it is unlikely to function effectively unless budgets and forecasts are responsively integrated: only when forecasts are mutually adjusted with budget targets can they be mobilized to explain outcomes, support performance discussions, and signal emerging gaps—enriching appraisal rather than merely replacing budgets as evaluation benchmarks (Bukh *et al.*, 2025; Frezatti *et al.*, 2022; Bhimani *et al.*, 2024). In this sense, responsiveness is the antecedent that renders the evaluative use of forecasts viable, so that the performance evaluation role may transmit part of the responsiveness effect on MC effectiveness. We therefore propose:

- H2c.* The forecast performance evaluation macro-function positively mediates the relationship between the responsiveness level between budget and forecast and management control effectiveness.

3. Methodology

3.1 Sample and population

To address the research objective, we conducted a survey of management accountants in Brazil between October and November 2021. The target population comprised corporate controllers, business unit controllers, Chief Financial Officers (CFOs), and controllership managers, given their direct involvement in budgeting and forecasting. The sampling frame was developed

using the EMIS® database and included firms with more than 250 employees. We sent 694 invitations—606 via LinkedIn® searches based on professional titles and 88 through the researchers' professional networks. Along with the questionnaire, we included an invitation letter that explained the study's purpose, data handling procedures (including confidentiality), and the benefits of participation (such as the executive report), which participants needed to agree to before starting the survey. We received 86 complete responses from medium- and large-sized firms that used both annual budgets and forecast MC practices.

3.2 Variables measurement

The survey items were translated into Portuguese and back-translated to ensure semantic equivalence. A pre-test with professionals and academics led to minor adjustments in wording.

Management Control Effectiveness (MCEffectiveness) was measured using a scale validated by [Demartini and Otley \(2020\)](#), capturing respondents' overall assessment of how effectively the management control system provides information to (1) support organizational goal achievement, (2) support operational decision-making, and (3) enable flexibility and adaptability. Responsiveness between the Annual Budget and Forecast (Responsiveness) was measured using a four-item scale adapted from [Demartini and Otley \(2020\)](#) that captures four dimensions of adaptive interaction between control mechanisms: strength of influence, directness, consistency, and dependence. Forecast operational macro-functions were measured using an adapted version of the scale originally developed by [Sivabalan et al. \(2009\)](#) for budgeting and rolling forecasts, which was subsequently used by [Bhimani et al. \(2018\)](#). Consistent with the prior literature, we considered three broad macro-functions of forecast use: planning (ForrolePlan), control (ForroleCon), and performance evaluation (ForroleEv). We included control variables: firm size (ESize), Industry and Environmental hostility.

3.3 Data analysis method

As the primary data analysis method, we applied the multivariate technique of Structural Equation Modeling estimated by Partial Least Squares (PLS-SEM) ([Hair et al., 2017, 2021](#)). We chose this technique because it is considered appropriate when the data have a non-normal distribution, small sample size, and are used to test mediation models. We developed a post hoc test using GPower 3.1.9.2 software ([Faul, Erdfelder, Lang, & Buchner, 2007](#)) and considered the most complex model with four predictors, as well as (a) a statistical power of 0.8 (20% type-II error) and (b) a 5% significance level (type-I error), we would detect a medium relative effect (f^2 higher than 0.147) as statistically significant. We were also concerned about common method bias in interpreting our results. Hence, we conducted Harman's single-factor test and obtained three factors with eigenvalues higher than one, accounting for 68.75% of the variance. The first factor accounted for 43.76% of the variance, suggesting that common method bias was unlikely to affect our interpretations.

4. Data analyses

4.1 Descriptive analyses

Our sample is predominantly composed of large firms, with more than 250 employees (76%) and manufacturing firms (57%). Regarding revenue, our sample comprises firms at different levels; however, most firms have an annual revenue of more than 1 billion reais (44%). Furthermore, considering the respondents' characteristics, 70% were controllers (corporate, business unit, or manager), and 23% were from C-level positions. Before discussing the level of responsiveness between budgets and forecasts, we questioned respondents on whether they perceived budgets and forecasts as complementary, substitutes, or independent practices. Our descriptive statistics show that 87% of the respondents see budgets and forecasts as

complementary, 3% as substitutes, and 9% as independent MC practices (see [Supplementary Table S1](#)).

Regarding the descriptive information of the items, we observe higher agreement with items from forecast macro-functions of control (control of costs and executive board monitoring) and planning (formulation of action plans and coordination of resources), and with one item from performance evaluation (business unit evaluation). Regarding the items of MC effectiveness and responsiveness between budgets and forecasts, we observe mean values of 5–6, indicating a slight agreement level for these items (see [Supplementary Table S2](#), [Table S3](#) and [Table S4](#) for details on descriptive statistics, *t*-test and correlation analysis).

4.2 Measurement model analyses

Following the two-step approach recommended for PLS-SEM analyses ([Hair et al., 2017, 2021](#)), we first assessed the measurement model and then examined the structural relationship. Given the mixed measurement specifications adopted in this study, different evaluation criteria were applied to reflective and formative constructs and composite indices.

Management Control Effectiveness was operationally defined as a reflective construct; therefore, its measurement model analysis assessed internal consistency and convergent validity, as indicated by Cronbach's alpha, composite reliability, and average variance extracted, all of which exceeded the recommended thresholds ([Hair et al., 2017, 2021](#)). Responsiveness between the annual budget and forecast was operationalized as an equally weighted composite index, and all four dimensions showed high, statistically significant outer loadings ([Table 1](#)). The forecasting operational macro-functions (planning, control, and performance evaluation) were modeled as formative variables in this study. Although several indicators exhibited low or non-significant weights, all demonstrated statistically significant outer loadings, which were maintained to preserve the conceptual domain ([Hair et al., 2017, 2021](#)). The variance inflation factors (VIF) were below the critical thresholds, suggesting that multicollinearity was not a concern.

4.3 Structural model analyses

In the second step of the PLS-SEM analysis, we examined structural relationships. We assessed multicollinearity through the VIF; all relationships in the inner model remained below the threshold, indicating that multicollinearity was not a concern for our analysis. Structural coefficients were evaluated using a bootstrapping procedure with 10,000 subsamples, bias-corrected confidence intervals, and two-tailed significance testing. We also interpreted effect sizes (f^2) to assess relationship relevance. We estimated the structural model both without and with control variables, as shown in [Table 2](#).

The results do not support a direct positive association between budget and forecast responsiveness and management control effectiveness; hence, they do not support [H1](#). Although responsiveness captures the degree of covariation between budgets and forecasts (through strength, directness, consistency, and dependence), it does not, by itself, translate into higher perceived effectiveness in terms of goal achievement, decision support or organizational flexibility. This finding is consistent with [Demartini and Otley's \(2020\)](#) argument that responsiveness is a structural design feature of loosely coupled control systems. Responsiveness creates the potential for integration but does not guarantee MC effectiveness unless it is activated through specific control practices.

Hence, our results support positive and statistically significant associations between responsiveness and the three forecast macro-functions. Responsiveness is positively related to the forecast planning role ($\beta = 0.352, p = 0.037, f^2 = 0.142$), indicating that a more responsive design is associated with a higher use of forecasts for action planning, resource coordination, and capacity management. This finding aligns with prior research defining forecasts as forward-looking and adaptive planning mechanisms, which have been most prominent in rolling forecasts ([Frezatti et al., 2022; Lorain, 2010](#)).

Table 1. Variables measurement assessment

Latent variables	Indicators	Outer weights	t-statistics	Outer loadings	t-statistics	α	CR (rho_c)	AVE
Responsiveness	Responsiveness1	0.288	27.601	0.876	27.635	N.A.	N.A.	N.A.
	Responsiveness2	0.288	27.601	0.894	32.511			
	Responsiveness3	0.288	27.601	0.837	13.366			
	Responsiveness4	0.288	27.601	0.866	25.013			
Forecast planning reasons	ForrolePlan1	0.012	0.045	0.760	4.301	N.A.	N.A.	N.A.
	ForrolePlan2	0.630	2.573	0.917	7.160			
	ForrolePlan3	0.267	1.160	0.777	7.517			
	ForrolePlan4	0.219	0.942	0.718	4.368			
	ForrolePlan5	0.089	0.451	0.549	2.815			
Forecast control reasons	ForroleCon1	0.091	0.185	0.724	3.204	N.A.	N.A.	N.A.
	ForroleCon2	0.937	2.166	0.998	7.294			
Forecast evaluation reasons	ForroleEv1	0.515	2.174	0.914	9.932	N.A.	N.A.	N.A.
	ForroleEv2	0.568	2.549	0.930	14.261			
MCEffectiveness	MCEffectiveness1	0.320	10.952	0.927	34.078	0.938	0.960	0.890
	MCEffectiveness2	0.366	18.015	0.968	93.958			
	MCEffectiveness3	0.374	14.349	0.934	39.370			

Note(s): 1. Management Control Effectiveness (MCEffectiveness) was measured using a scale validated by [Demartini and Otley \(2020\)](#), capturing respondents' overall assessment of how effectively the management control system provides information to: (1) support organizational goal achievement, (2) support operational decision-making, and (3) enable flexibility and adaptability. Responses were measured on a seven-point Likert scale ranging from 1 ("Extremely unsatisfactory") to 7 ("Extremely satisfactory"). Consistent with its conceptualization, we modeled MCEffectiveness as a reflective construct, with indicators representing different manifestations of a MC system's effectiveness rather than distinct components jointly defining it; accordingly, indicators of convergent validity and internal consistency reliability are reported ([Hair et al., 2017, 2021](#))

2. Responsiveness between Annual Budget and Forecast (Responsiveness) was measured using a four-item scale adapted from [Demartini and Otley \(2020\)](#) that captures four dimensions of adaptive interaction between control mechanisms: strength of influence, directness, consistency, and dependence. Respondents were asked: "How would you rate the degree of interdependence between the "annual budget" and the "forecast" in your company with respect to the following dimensions?" Responses ranged from 1 ("no responsiveness"), 4 ("weak responsiveness"), and to 7 ("strong responsiveness"). In line with [Demartini and Otley's \(2020\)](#) conceptualization of responsiveness as a design feature, this construct was operationalized as a composite index. The four dimensions were equally weighted, reflecting the view that responsiveness emerges from the combined presence of multiple and non-hierarchical characteristics. Forecast operational macro-functions were measured using an adapted version of the scale originally developed by [Sivabalan et al. \(2009\)](#) for budgeting and rolling forecasts, and subsequently used by [Bhimani et al. \(2018\)](#). Consistent with prior literature, we considered three broad macro-functions of forecast use: (1) planning, including formulation of action plans, coordination of resources, management of production capacity, pricing decisions, and encouragement of innovative behavior; (2) control, capturing the use of forecasts to track the execution—cost control and monitoring by top management; and (3) performance evaluation, capturing the use of forecasts to analyze the achievement of targets for individuals and units, namely business-unit and managerial performance evaluation. Respondents were asked: "Currently, to what extent does the company use forecasts or reforecasts for the following functions?" Responses were captured on a seven-point scale ranging from 1 = "does not use" to 7 = "to a great extent." These constructs were modeled as formative, as each function represents a distinct and non-substitutable role that jointly defines how forecasting is used within the organization. Our understanding is that higher use of one function does not imply higher use of another, and omitting any function would alter the conceptual meaning of forecast use. Therefore, although some indicator weights are relatively low, they were retained due to the statistical significance of their outer loadings, in line with recommendations for formative constructs

3. We included some control variables. First, Firm size (ESize) considering the number of employees: (1) between 50 employees and 249 are medium-sized firms; (2) above 250 are large-sized firms (being the base category). Second, Industry: manufacturing versus non-manufacturing (the base category, which included retail, wholesale, and service firms). Third, we control for Environmental hostility (Hostility) based on [Green, Covin, & Slevin \(2008\)](#), composed of six items with a scale from 1 to 7, with 1 = "Totally disagree" and 7 = "Totally agree". In this paper, the convergent validity of the scale indicated three items (high bankruptcy rate, low customer loyalty, and low-profit margins)

Source(s): Created by authors

Responsiveness was also positively associated with the forecast control role ($\beta = 0.330$, $p = 0.040$, $f^2 = 0.122$). This suggests that when budgets and forecasts are tightly coupled, forecasts are more likely to be used for cost control and board monitoring, complementing traditional budget control routines. This finding is in line with prior literature (e.g. [Becker et al., 2016](#); [Sivabalan et al., 2009](#)) which indicates that forecasts can support operational control without displacing the budget. From a loose coupling perspective, responsiveness enhances coherence among these control practices.

Responsiveness was also positively associated with the forecast performance evaluation role ($\beta = 0.347$, $p = 0.021$, $f^2 = 0.136$). This evidence suggests that in more responsive systems, forecasts extend into performance evaluation processes traditionally held by the budgets. Rather than indicating a full substitution of budgets, this pattern is consistent with prior evidence that forecasts are used to explain performance outcomes, support performance discussions, or signal emerging gaps relative to budget targets ([Lorain, 2010](#); [Frezatti et al., 2022](#); [Bukh et al., 2025](#)). [Bhimani et al. \(2024\)](#) and [Bukh et al. \(2025\)](#) suggest that forecasts have been used in managerial dialog and performance discussions, particularly in environments characterized by uncertainty.

Regarding MC effectiveness, the results show that the forecasting roles of planning and performance evaluation are positively associated with perceived effectiveness. Planning has the strongest direct association with MC effectiveness ($\beta = 0.388$, $p = 0.028$, $f^2 = 0.082$),

Table 2. Structural model results

Panel A - Structural model results						
	Linear model			Linear model with controls		
	β	f^2	p -value	β	f^2	p -value
<i>Responsiveness</i> → <i>ForrolePlan</i>	0.352	0.142	0.037	0.327	0.121	0.071
<i>ESize50_249</i> → <i>ForrolePlan</i>				−0.283	0.017	0.461
<i>Industry</i> → <i>ForrolePlan</i>				−0.059	0.001	0.841
<i>Host</i> → <i>ForrolePlan</i>				−0.122	0.017	0.545
<i>Responsiveness</i> → <i>ForroleCon</i>	0.330	0.122	0.040	0.303	0.106	0.057
<i>ESize50_249</i> → <i>ForroleCon</i>				−0.271	0.015	0.377
<i>Industry</i> → <i>ForroleCon</i>				−0.319	0.028	0.156
<i>Host</i> → <i>ForroleCon</i>				0.087	0.009	0.532
<i>Responsiveness</i> → <i>ForroleEv</i>	0.347	0.136	0.021	0.353	0.142	0.026
<i>ESize50_249</i> → <i>ForroleEv</i>				−0.108	0.002	0.712
<i>Industry</i> → <i>ForroleEv</i>				−0.147	0.006	0.570
<i>Host</i> → <i>ForroleEv</i>				−0.121	0.017	0.372
<i>Responsiveness</i> → <i>MCEffectiveness</i>	0.068	0.006	0.562	0.105	0.016	0.364
<i>ForrolePlan</i> → <i>MCEffectiveness</i>	0.388	0.082	0.028	0.352	0.073	0.046
<i>ForroleCon</i> → <i>MCEffectiveness</i>	−0.084	0.005	0.500	−0.002	0.000	0.989
<i>ForroleEv</i> → <i>MCEffectiveness</i>	0.284	0.065	0.021	0.251	0.055	0.043
<i>ESize50_249</i> → <i>MCEffectiveness</i>				0.215	0.014	0.317
<i>Industry</i> → <i>MCEffectiveness</i>				0.136	0.007	0.507
<i>Host</i> → <i>MCEffectiveness</i>				−0.190	0.054	0.073
Panel B - specific indirect effects, considering the linear model						
	β			T statistics		p -value
<i>Responsiveness</i> → <i>ForrolePlan</i> → <i>MCEffectiveness</i>	0.136			1.434		0.152
<i>Responsiveness</i> → <i>ForroleCon</i> → <i>MCEffectiveness</i>	−0.028			0.640		0.522
<i>Responsiveness</i> → <i>ForroleEv</i> → <i>MCEffectiveness</i>	0.098			1.650		0.099
(continued)						

Table 2. Continued

Panel C - Model quality, considering the linear model						
	R^2	R^2_{adj}	VIF max	VIF min	VIF avg	Q^2 predict
ForrolePlan	0.124	0.114	1	1	1	0.042
ForroleCon	0.109	0.098	1	1	1	0.015
ForroleEv	0.120	0.110	1	1	1	0.038
MCEffectiveness	0.348	0.316	2.795	1.185	1.992	0.018

Note(s): 1. Classification of [Cohen \(1988\)](#): small effect ($f^2 = 0.02$), medium effect ($f^2 = 0.15$), and large effect ($f^2 = 0.35$)

2. ESize, Industry, and Hostility are the control variables in our model

3. For the Q^2 Predict results, we report the outcomes for the model without control variables, using 3 folds, a fixed seed, and 10 repetitions. The Q^2 predict values are above the threshold of zero (e.g. [Shmueli et al., 2019](#))

4. The discussion focuses on the model without control variables for three reasons. First, none of the control variables were statistically significantly associated with MC effectiveness or with the forecast macro-functions, indicating that they add little explanatory information to the model. Second, the structural coefficients remain virtually unchanged across the two specifications (e.g., the responsiveness–planning coefficient is 0.352 without controls and 0.327 with controls), suggesting that the estimates are robust and not driven by omitted-variable bias. Third, parsimony is advisable given our sample size ($n = 86$), as adding controls consumes degrees of freedom

5. As a robustness check for the model with control variables, we recomputed the standard errors of the structural coefficients using the stable exponential adjustment method (STBL3) proposed by [Kock \(2018\)](#), applied to the estimated path coefficients. Examination of the bootstrap path-coefficient distributions indicated unimodal distributions, and the inner-model variance inflation factors were all below conventional thresholds (maximum = 2.861, in the linear model with control variables); in our view, the attenuation of significance when controls are added is therefore attributed to the loss of statistical power in a sample of $n = 86$ rather than to bimodality or multicollinearity. Under stable standard errors (STBL3), the hypothesized structural relationships in the model with controls remain statistically significant: Responsiveness $\rightarrow$ ForrolePlan ($\beta = 0.327$, $SE = 0.098$, $p = 0.001$), Responsiveness $\rightarrow$ ForroleCon ($\beta = 0.303$, $SE = 0.099$, $p = 0.002$), Responsiveness $\rightarrow$ ForroleEv ($\beta = 0.353$, $SE = 0.097$, $p < 0.001$), ForrolePlan $\rightarrow$ MC Effectiveness ($\beta = 0.352$, $SE = 0.097$, $p < 0.001$), and ForroleEv $\rightarrow$ MC Effectiveness ($\beta = 0.251$, $SE = 0.100$, $p = 0.012$), whereas the direct effect Responsiveness $\rightarrow$ MC Effectiveness ($\beta = 0.105$, $SE = 0.105$, $p = 0.315$) and ForroleCon $\rightarrow$ MC Effectiveness ($\beta = -0.002$, $SE = 0.108$, $p = 0.985$) remain non-significant. For more information about STBL3, see [Kock \(2018\)](#)

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indicating that when forecasts support forward-looking coordination and resource alignment, organizations perceive their control systems to be more effective.

However, indirect effect analyses indicated that the planning role did not mediate the relationship between responsiveness and effectiveness, thereby rejecting [H2a](#). Thus, planning contributes to effectiveness directly and autonomously rather than transmitting responsiveness; the value of planning with forecasts does not appear to depend on the degree of budget–forecast responsiveness. The control did not exhibit a statistically significant association with MC effectiveness, nor did it mediate the responsiveness–effectiveness relationship, indicating the rejection of [H2b](#). This finding might be consistent with its nature as routine tracking use that does not, in itself, differentiate effectiveness.

In contrast, the indirect effect of responsiveness on MC effectiveness through the performance evaluation role of forecasts is positive and statistically significant at the 10% level ($\beta = 0.098$; $p = 0.099$), supporting [H2c](#). The evaluation role is therefore distinctive: it is both directly related to effectiveness ($\beta = 0.284$, $p = 0.021$) and the only role that channels the effect of responsiveness. This pattern suggests that the evaluation use of forecasts—analyzing the achievement of targets for individuals and units—is precisely the use whose value depends on a responsive design, since forecasts can only be mobilized in performance evaluation when

budgets and forecasts are actually integrated. We interpret this weak mediation cautiously. This finding aligns with prior concerns regarding the use of forecasts in performance evaluation (Lorain, 2010) and is consistent with recent evidence that forecasts are used in performance discussions (Bukh *et al.*, 2025; Bhimani *et al.*, 2024).

To complement the explanatory assessment of the structural model, we evaluated its out-of-sample predictive power using the PLS prediction procedure (Shmueli *et al.*, 2019). Following established guidelines, eleven of the twelve indicators yielded Q^2 predict values above zero, hence the model exhibited medium predictive power, supporting its out-of-sample predictive validity (see [Supplementary Table S5](#)).

5. Final considerations

This study examines how the responsiveness between annual budgets and forecasts is associated with management control effectiveness, considering the macro-functions of forecasting (planning, control, and performance evaluation). Using survey data from 86 management accountants in medium- and large-sized Brazilian firms, we developed and tested a model based on loose coupling theory.

Overall, our results do not support a direct relationship between the budget and forecast responsiveness (strength, directness, consistency, and dependence) and MC effectiveness. This finding reinforces the view that responsiveness is a structural design feature that enables but does not ensure effective control outcomes. Simultaneously, responsiveness is positively associated with all three forecast macro-functions, indicating that tighter adaptive linkages between budgets and forecasts expand the scope of forecast use beyond planning. Regarding effectiveness, the results show that the planning and performance evaluation roles of forecasts are positively associated with MC effectiveness, whereas the control role is not. Only the indirect relationship mediated by the performance evaluation role was statistically significant (although weak), suggesting that responsiveness contributes to effectiveness mainly when forecasts are used to support managers' and units' performance evaluation. In summary, the findings suggest that responsiveness increases the potential for effectiveness, but its realization depends on how forecasting is enacted within the control system.

5.1 Theoretical implications

This study contributes to the management accounting literature in several ways. First, it advances research on the interdependence among control practices by discussing responsiveness as a multidimensional design feature (Demartini & Otley, 2020; Wang *et al.*, 2025), a framework that can be extended to investigate the interdependence between budgets and forecasts. In addition, this study contributes to the literature on forecasts by providing empirical evidence that forecasts perform roles traditionally associated with budgets. This finding extends prior work that emphasizes forecasts primarily as a planning mechanism (Lorain, 2010; Kroos *et al.*, 2022) and supports more recent evidence highlighting its expansion to control and performance evaluation (Bukh *et al.*, 2025; Bhimani *et al.*, 2024; Frezatti *et al.*, 2022).

By distinguishing between design (responsiveness) and use (forecast macro-functions), this study also reinforces a central insight of loose coupling theory: structural integration (design) alone is insufficient to foster MC effectiveness. Our results reveal that effectiveness arises through two distinct channels. Planning operates as an autonomous, direct contributor—its strong direct effect, combined with the absence of mediation, indicates that the value of planning with forecasts does not hinge on the degree of budget–forecast integration. In contrast, performance evaluation operates as a coupled channel, conveying responsiveness to effectiveness. Because evaluating individuals and units through forecasts carries accountability consequences, this use is enacted when budgets and forecasts are responsively integrated. Control, understood as the routine tracking of target

implementation, did not contribute through either channel. Thus, a responsive design propagates forecasts across all three uses, but effectiveness is realized through autonomous use (planning) and coupled use (evaluation).

5.2 Practical implications

From a practical perspective, the findings highlight the importance of designing budgets and forecasts as complementary mechanisms rather than isolated ones. In volatile environments, traditional budgets remain important for accountability and target setting, but they benefit from being embedded in a responsive design that allows forecasts to inform planning and performance discussions. Rather than abandoning budgets, organizations should focus on clarifying forecasts, roles, and their uses (Bhimani *et al.*, 2024). In particular, managers should recognize that forecasts add value not only by improving planning proactiveness but also by enriching performance discussions, deviation analyses, and action plans. When forecasts are integrated into performance dialogs—without replacing budgets as formal evaluation benchmarks—they can enhance MC effectiveness.

5.3 Limitations and future studies

This study has some limitations that suggest avenues for future research. First, as with most cross-sectional survey designs, our data captured a single point in time, limiting our ability to draw causal inferences. Longitudinal studies could better capture how responsiveness and forecasting roles evolve over time. Future research could also combine survey data with archival or qualitative evidence. Second, our sample was limited to firms that reported using both budgets and forecasts; we did not examine other design features, such as forecast frequency, degree of formalization, or technological integration, which may shape how responsiveness is enacted (Brüggen *et al.*, 2021; Kroos *et al.*, 2022). For instance, the quality of information systems has been shown to enhance MC effectiveness (Papiorek & Hiebl, 2024), suggesting that technological integration is a promising antecedent. These dimensions are likely to influence how responsiveness manifests and how each instrument supports planning, control or performance evaluation in practice. Future studies could explore how different forecast horizons (e.g., early-versus late-year forecasts) affect responsiveness and control outcomes. Third, while we operationalized forecast use through three macro-functions, future studies could explore additional purposes (e.g., communication, motivation, or scenario planning) and how these roles are prioritized or combined in different organizational contexts. Finally, this study contributes to the emerging literature on the interdependence of management control practices (e.g. Demartini & Otle, 2020), our model focuses specifically on budgets and forecasts. Future research could extend this area by examining how other management accounting tools interact with budgets and forecasts to improve performance.

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Supplementary material

The supplementary material for this article can be found online.

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Corresponding author

Daniel Magalhães Mucci can be contacted at: danielmmucci@usp.br

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