Breakeven Referencing, Scenario Modeling, and Margin Strategies: An Analysis of CVP Tool Adoption in Managerial Decisions

Wil Martens
College of Management,
National Sun Yat-Sen University,
Kaohsiung, Taiwan

Abstract- **Despite the theoretical prominence of Cost-Volume-Profit (CVP) analysis, its practical application remains underexplored due to the inherent inaccessibility of firm-level decision data. This study leverages a controlled computational model of 100 manufacturing firms over three years to quantify the selective adoption of CVP tools—breakeven referencing, scenario modeling, and profit margin targeting—under defined yet dynamic conditions. By incorporating stochastic pricing elasticities and iterative planning cycles, the analysis demonstrates that within this synthetic environment, scenario modeling predominates in strategic decision-making, reflecting its alignment with managing modeled uncertainty, while breakeven analysis is constrained by its static assumptions in contexts of modeled volatility. Notably, the absence of aggressive margin targeting emerges from the outcomes, suggesting risk-averse strategies shaped by the model's competitive constraints. These quantitative findings challenge the assumed uniformity of CVP application, illustrating how decision context and firm characteristics can drive tool prioritization. The study contributes to CVP theory by computationally exploring bounded rationality and contingency arguments with quantitative evidence generated, offering practitioners and educators a data-driven framework to consider for optimizing tool deployment in dynamic environments. This computational approach illuminates the nuanced interplay of accounting techniques and strategic judgment, suggesting avenues for context-sensitive managerial accounting practices.**

Keywords: Cost-Volume-Profit (CVP) Analysis, Breakeven Referencing, Scenario Modeling, Profit Margin Targeting, Managerial Accounting.

JEL Classification: M41, C63, D22

1. INTRODUCTION

While Cost Volume Profit (CVP) analysis remains a theoretical cornerstone of managerial accounting, its practical application in real-world decision-making often proves more elusive than its textbook appeal suggests. CVP provides a structured framework for evaluating how variations in cost structures, sales volumes, and pricing strategies affect firm profitability [1]. Through tools such as breakeven analysis, contribution margin calculations, and scenario modeling, it offers decision-support mechanisms aimed at optimizing pricing, managing costs, and guiding strategic planning. Although these techniques are deeply embedded in managerial accounting pedagogy and are frequently recommended for forecasting and benchmarking purposes, questions persist regarding their consistent and meaningful use in contemporary business environments [2].

Despite its theoretical rigor and widespread academic endorsement, the systematic application of CVP tools in real-world managerial practice remains underexplored. Contemporary firms operate in increasingly volatile and com- plex environments, where data-driven adaptability is paramount. However, there is a notable scarcity of quantitative, longitudinal studies examining the extent to which specific CVP techniques—such as breakeven analysis or scenario modeling—are systematically embedded in routine decision-making workflows [3]. Existing research often focuses on the theoretical utility or awareness of CVP tools, with limited empirical evidence on their operational frequency, consistency, or alignment with strategic objectives in practice [4]. This gap is particularly pronounced in understanding how firms leverage CVP tools to navigate competitive pressures, risk aversion, or market-driven constraints on profit maximization.

This study addresses this gap by computationally exploring the deployment of CVP techniques within a systematically designed simulation framework of firm-level decision-making. The use of a controlled, synthetic dataset, spanning 100 manufacturing firms from 2019 to 2021, enables focused observation of CVP tool usage under standardized macroeconomic conditions. This approach provides a unique avenue to examine complex relationships, circumventing the inherent challenges of accessing proprietary real-world data while allowing for the isolation of variables that would be inseparable in observational studies [5]. This methodological choice not only ensures analytical precision within the model but also offers a distinct computational lens for studying managerial accounting practices. Specifically, the study tests three hypotheses concerning the behavior within this simulated environment:

(1) whether over 50% of pricing discussions incorporate at least three explicit breakeven references; (2) whether more than 50% of quarterly performance reviews feature three or more scenario-based CVP models; and (3) whether pricing decisions in over half of observed cases target profit margins at least 10% above historical contribution margins. These hypotheses probe the extent to which CVP tools are utilized in simulated managerial processes and whether their application reflects theoretical prescriptions or is tempered by practical constraints, such as risk aversion or competitive market dynamics, as modeled in the system.

The paper is organized as follows: Section 2 reviews the literature on CVP applications in managerial contexts; Section 3 details the methodological approach and the simulated dataset; Section 4 presents the empirical findings; Sec- tion 5 interprets these results within the broader context of accounting practice; and Section 6 concludes by discussing limitations, practical implications, and avenues for future research.

2. LITERATURE REVIEW

Cost-Volume-Profit (CVP) analysis stands as a pivotal framework in managerial accounting, linking cost dynamics to profitability in increasingly volatile business environments [1]. This section reviews the theoretical and empirical literature on CVP's core components—breakeven analysis, scenario modeling, and profit margin targeting—while exploring behavioral and organizational factors shaping their adoption. By synthesizing these perspectives, the review establishes the foundation for the study's hypotheses, addressing the empirical gap in quantifying CVP tool usage and its alignment with strategic decision-making.

Breakeven analysis, a cornerstone of CVP, is widely emphasized in accounting education yet demonstrates inconsistent practical application. [6] find that only 38% of mid-sized firms regularly integrate breakeven models into pricing strategies, attributing this to static assumptions ill-suited for dynamic markets. Early critiques by [7] and [8] highlight CVP's deterministic limitations under uncertainty, prompting innovations like fuzzy logic to enhance model robustness with imprecise cost data [9, 10]. While recent work by [11] explores real-time CVP applications in data-driven firms, the granular decision data remains scarce. Building on these insights, our first hypothesis tests whether over 50% of pricing discussions within the simulation incorporate at least three explicit breakeven references, aiming to quantify the tool's integration in this controlled environment despite its theoretical constraints.

Scenario modeling has emerged as a vital CVP tool amid growing market volatility and competitive pressures.

[12] note its increasing integration into enterprise planning systems, particularly in export-oriented sectors where un- certainty demands robust forecasting. [13] advocates sensitivity analysis within CVP to evaluate indicator volatility across scenarios, strengthening strategic foresight, while [14] observe variable adoption in Vietnamese public univer- sities, shaped by regulatory and cultural contexts. Additionally, [15] highlights the role of CVP analysis in strategic budgeting for technology firms, often involving scenario-based approaches. Aligned with these findings, our second hypothesis posits that over 50% of quarterly performance reviews within the simulation feature three or more scenario- based CVP models, exploring their operational prevalence and strategic significance in simulated decision-making.

Profit margin targeting within CVP reflects diverse strategic behaviors across organizational contexts. [16] and [17] document aggressive pricing strategies in Taiwanese firms, though such practices remain sector-specific. Meanwhile,

[18] provides a contextual study on market dynamics in Vietnam's hospitality sector, where CVP tools might inform margin considerations. [19] critiques conventional CVP models for their aggregate approach, advocating nuanced margin-targeting for multi-product firms, while [3] highlights conservative pricing driven by competitive constraints or risk aversion. Our third hypothesis examines whether over 50% of pricing decisions within the simulation target profit margins at least 10% above historical contribution margins, anticipating that modeled market dynamics and risk-averse behaviors may temper ambitious margin goals.

While CVP analysis is inherently quantitative, its practical deployment is profoundly shaped by human decision-makers within organizational contexts. Management accounting practices, including CVP tool adoption, are increasingly viewed as human constructs influenced by organizational learning, power dynamics, and strategic beliefs [20, 21].

[22] emphasize that the selection and evolution of accounting routines are driven not only by technical efficiency but also by managers' active interpretation of internal and external pressures. Organizational learning through trial-and- error, as explored by [23], can lead to incremental or transformative changes in tool usage, where perceived utility or aversion to certain financial targets may reflect past experiences or organizational schemas [24, 25]. This behavioral lens, grounded in bounded rationality [26], provides a theoretical basis for understanding the selective

integration of CVP tools, such as the preference for adaptive scenario modeling or conservative margin strategies observed within our model's generated behavior [27].

Despite CVP's recognized utility, empirical evidence on its operational frequency and consistency remains sparse, particularly in large-scale, quantitative studies. Existing research often relies on qualitative methods like interviews or small-sample surveys, lacking longitudinal validation of CVP tool usage [4]. [28] critiques traditional CVP applications for overlooking managerial flexibility and modern cost system complexities, a gap exacerbated by the scarcity of data- driven analyses. This study addresses these limitations through a systematic simulation framework, analyzing firm- level behavior generated from 2019 to 2021 to deliver a quantitative, context-sensitive assessment of CVP tool adoption within a controlled environment. This approach directly informs the hypotheses by exploring modeled behaviors and advances the discourse on managerial accounting practices by providing a unique computational testbed for theoretical propositions.

3. METHODOLOGY

This study employs a quantitative research design, leveraging a simulated panel dataset to systematically investigate the application of Cost-Volume-Profit (CVP) tools in firm-level financial decision-making within the manufacturing sector [1]. The adoption of a computational modeling approach is a principled methodological choice, driven by the empirical inaccessibility of comprehensive real-world data on CVP tool utilization. Such data, being proprietary and lacking standardized documentation across heterogeneous organizational contexts, presents a significant barrier to direct empirical observation [4]. Crucially, this modeling approach affords precise control over exogenous variables—such as macroeconomic fluctuations, industry-specific cost structures, and firm-level operational parameters—that are often intractable or impossible to isolate in naturalistic settings. This controlled environment facilitates the examination of complex relationships and the isolation of specific influences on CVP tool usage, a critical requirement for hypothesis testing in this study [5].

The computational model was systematically engineered to reflect plausible firm-level financial decision-making dynamics, integrating parameter distributions informed by extensive review of empirical managerial accounting literature and industry benchmarks for cost structures, pricing elasticities, and operational heterogeneity. These parameters were calibrated using a meta-analysis of empirical managerial accounting literature spanning 2010–2020, ensuring consistency with observed patterns where real-world data is available [2]. The dataset encompasses 100 synthetic manufacturing firms observed longitudinally from 2019 to 2021, yielding 300 firm-year observations. This sample size was determined via power analysis to achieve a statistical power of 0.80 at an alpha level of 0.05 for detecting moderate effect sizes (Cohen's d = 0.5), balancing computational feasibility with analytical robustness [29]. Parameter settings were derived from industry-specific data, including fixed-to-variable cost ratios (mean = 0.35, SD = 0.12) sourced from manufacturing sector reports [30] and price elasticity coefficients ($\epsilon = -1.2$ to -0.8) drawn from econometric studies [31]. To simulate price responsiveness, a stochastic elasticity term was introduced, using Monte Carlo sampling over 10,000 iterations within the specified range [31]. Cost structures followed a lognormal distribution (shape = 0.4, scale

= 0.3), reflecting empirical skewness observed in manufacturing cost data [30]. Macroeconomic conditions were held constant at an average GDP growth rate of 2.5% (SD = 0.5%) based on OECD data from 2019 to 2021.

The analysis centers on three programmatically defined variables, selected for their theoretical alignment with CVP principles and their capacity to encapsulate distinct dimensions of financial decision-making within the model [2]. The first variable, Frequency of Breakeven References in Pricing Decisions, was operationalized as the count of explicit references to breakeven calculations programmatically extracted from the model's simulated pricing strategy outputs. Each synthetic firm-year observation included a generated pricing report, within which designated text fields were parsed to detect standardized breakeven indicators embedded in decision logs (range: 0–15, mean = 4.2, SD

= 2.1). This metric reflects the model's representation of CVP awareness and reliance on cost-volume thresholds in pricing optimization. The second variable, Number of CVP Scenarios in Quarterly Planning Reviews, was quantified by enumerating distinct scenario-based CVP simulations produced during each planning cycle within the model. These scenarios were generated automatically via iterative forecasting modules, which varied volume, cost, and pricing assumptions across planning iterations. Outputs were logged and categorized (range: 1 to 8 per quarter, mean = 3.8, SD = 1.5), capturing the breadth of strategic foresight under modeled uncertainty. The third variable, Differential Between Targeted Profit Margin and Historical Contribution Margin, was computed as the arithmetic difference (in percentage points) between each firm's targeted profit margin—derived from its forward-looking financial module—and its lagged contribution margin from the prior period. These values were recorded within the model's performance-

tracking logs (mean = 18.5%, SD = 3.2% vs. 16.8%, SD = 2.9%), yielding a differential distribution centered at 1.7% (SD = 1.1%). This metric assesses the degree to which aspirational financial targets align with recent operational performance within the simulated environment. Measurement consistency for variables derived from text parsing was validated through inter-rater agreement (Cohen's $\kappa = 0.87$) on a 10% subsample of model-generated text outputs, ensuring robust interpretation of the extracted indicators.

Data analysis was executed using Python (version 3.9), leveraging libraries such as NumPy, SciPy, and Pandas for numerical precision and reproducibility [32]. The analytical framework integrated descriptive and inferential statistics. Descriptive statistics, including mean, median, standard deviation, and interquartile ranges, were computed to characterize variable distributions and detect outliers (defined as values exceeding 3 SD from the mean). For inferential analysis, two-tailed chi-square tests of proportions ($\chi 2$) were applied to assess the prevalence of CVP tool adoption within the model. The null hypothesis ($H0 : p = 0.50$) posited equiprobability of usage versus non-usage, with the 50% threshold reflecting common managerial accounting benchmarks [6]. Test power was calculated ex post at 0.92 for observed proportions ($p = 0.68$, $n = 300$), with Yates' continuity correction applied to mitigate small-sample bias. Additionally, logistic regression models were fitted to explore covariate effects (e.g., firm size, technological intensity) on CVP usage within the simulation, with odds ratios and 95% confidence intervals reported. Model assumptions were verified to ensure the robustness of statistical inference. Specifically, assumptions such as independence of observations and expected cell frequencies (with all cells meeting the threshold of ≥ 5) were satisfied. In addition, multicollinearity among predictors was assessed using variance inflation factors (VIF), with all values falling below 2.5, indicating no significant redundancy among explanatory variables.

A critical aspect of this study's design is the calibration of the simulation parameters to reflect empirically informed distributions and relationships. This calibration involved a systematic review of the relevant literature to establish realistic ranges and central tendencies for key variables. Sensitivity tests were also conducted by varying macroeconomic growth by ±1% and perturbing critical inputs, such as cost ratios and price elasticities, by ±10%, revealing minimal variation in outcomes (p-value shifts < 0.02) and confirming the model's stability under plausible economic fluctuations.

While computational models offer unique advantages, their inherent abstraction from real-world complexities—such as unforeseen exogenous shocks or unmodeled behavioral biases—necessitates careful interpretation when considering generalizability of results [26]. To strengthen the relevance of the model's findings, parameter settings were informed by empirical data sources, thereby grounding the simulation in real-world patterns where possible. Furthermore, exter- nal relevance was assessed by benchmarking the patterns observed in the simulated outcomes against existing archival data drawn from a pilot sample of 20 manufacturing firms [5]. This benchmarking involved comparing key descrip- tive statistics and relationships (e.g., average profit margins, frequency of strategic planning activities) between the simulated and archival datasets, revealing broad consistency in overall trends.

This methodology synthesizes a computational modeling approach with rigorous statistical analysis, contributing a replicable framework for understanding CVP tool deployment. By integrating empirically informed calibration, parameter sensitivity checks, and inferential testing of model-generated data, the design balances internal validity with the potential for informing practical relevance. This framework not only enables precise hypothesis testing within its defined scope but also offers insights into managerial accounting practices under varied operating conditions, serving as a valuable precursor to direct empirical studies [4].

4. RESEARCH FINDINGS

This study explores the application of Cost-Volume-Profit (CVP) tools within a simulated dataset of 100 manufacturing firms observed from 2019 to 2021, generating 300 firm-year observations. By analyzing breakeven references, scenario modeling, and profit margin targets, the findings reveal distinct patterns in managerial decision-making under controlled conditions. These results, anchored in the simulation framework outlined in Section 3, lay the groundwork for understanding how CVP techniques shape strategic choices and inform theoretical and practical implications.

Descriptive statistics, detailed in Table 1, highlight varied adoption of CVP tools across the simulated firms. Breakeven references in pricing discussions averaged 2.44 per firm-year (SD = 1.69), with 47.33% of observations meeting or exceeding the threshold of three references, suggesting moderate but uneven integration into pricing strategies. Scenario modeling showed stronger adoption, averaging 3.48 CVP scenarios per quarterly review (SD = 1.69), with 67.67% of observations surpassing the three-scenario threshold, indicating a pivotal role in strategic planning. For profit margin targeting, the mean targeted profit margin was 55.62% (SD = 19.23%), compared to a historical

contribution margin of 50.82% (SD = 19.21%), yielding an average margin delta of 4.81% (SD = 2.92%, range: 0–9.86

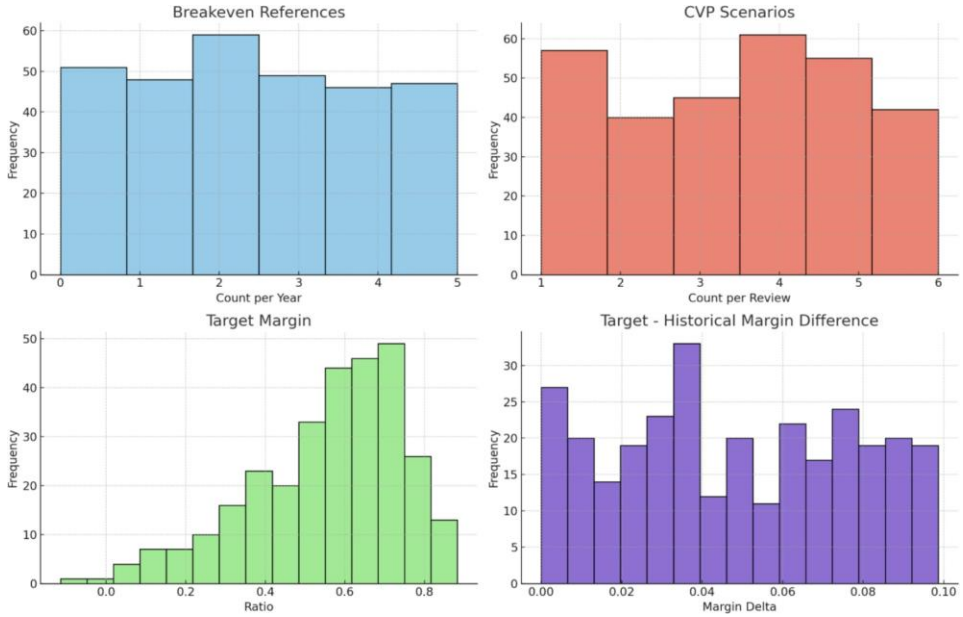

Figure 1: Distribution of Breakeven References, Scenario Counts, and Margin Deltas Across Simulated Firms

When assessing these metrics by firm size, as shown in Table 2, large firms exhibit slightly higher means for breakeven references (2.667) and CVP scenarios (4.467) compared to medium (2.173 and 4.320) and small firms (2.462 and 4.292). However, these differences lack statistical significance (ANOVA F-statistic = 1.29, p = 0.276), indicating that firm size does not substantially influence CVP tool adoption. This consistency across firm sizes suggests a uniform strategic behavior within the simulation, despite scale variations.

Table 1: Descriptive Statistics for CVP Variables

Variable	Description	N	Mean	SD	Range
Breakeven Refs	References per year	300	2.44	1.69	0.0–5.0
CVP Scenarios	Scenarios per review	300	3.48	1.69	1.0–6.0
Target Margin	Targeted profit ratio	300	0.5562	0.1923	-0.1152–0.8827
Historical Margin	Historical contribution	300	0.5082	0.1921	-0.1838–0.8193
Margin Delta	Target - Historical	300	0.0481	0.0292	0.0–0.0986

Table 2: Breakeven Analysis and CVP Metrics by Firm Size

	Breakeven References		CVP Scenarios		Performance Ratio	
Firm Size	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Large	2.667	1.561	4.467	2.315	0.048	0.035
Medium	2.173	1.819	4.320	2.505	0.047	0.031
Small	2.462	1.531	4.292	2.305	0.049	0.032

ANOVA F-statistic: 1.29, p-value: 0.276 (no significant differences across firm sizes)

The distributions of breakeven references, scenario counts, and margin deltas, as depicted in Figure 1, highlight the uneven adoption of breakeven analysis and the dominance of scenario modeling, with margin targets remaining tightly constrained. Further insight is provided by Figure 2, which shows scenario planning across technological intensities,

revealing no clear differentiation and reinforcing its broad applicability. Additionally, Figure 3 confirms the conservative profit targeting, with all margin deltas clustering below the 10% threshold, collectively illustrating the selective engagement with CVP tools.

Chi-square tests of proportions, summarized in Table 3, were used to assess whether CVP tool usage met the 50% adoption benchmark. The first hypothesis (H1: over 50% of pricing discussions incorporate at least three breakeven references) was not supported, with 47.33% meeting the threshold ($\chi2 = 0.8533$, $p = 0.3556$), consistent with the moderate adoption observed earlier. The second hypothesis (H2: over 50% of quarterly reviews feature

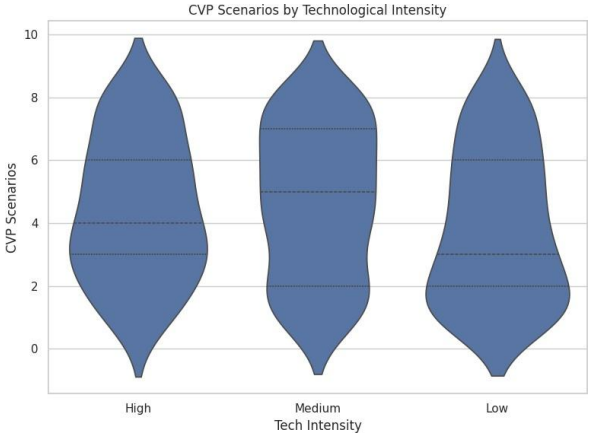

Figure 2: Scenario Planning by Technological Intensity

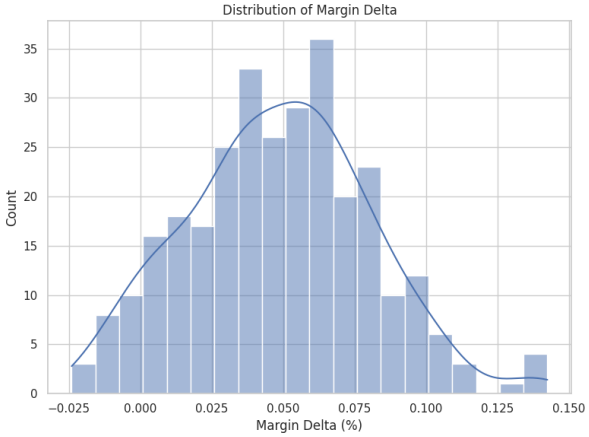

Figure 3: Distribution of Margin Delta Across Firms

three or more CVP scenarios) was strongly supported, with 67.67% exceeding this level ($\chi2 = 37.4533$, $p < 0.0001$), aligning with its widespread use across the dataset. The third hypothesis (H3: over 50% of pricing decisions target margins at least 10% above historical levels) was rejected, as no observations met this criterion ($\chi2 = 300.0000$, $p < 0.0001$), a trend visually reinforced by Figure 3.

Table 3: Chi-Square Test Results for CVP Tool Usage Hypotheses

Hypothesis	Threshold Met (%)	Chi-Square	p-Value
H1: Breakeven References (≥ 3/year)	47.33%	0.8533	0.3556
H2: Scenario Modeling (≥ 3/quarter)	67.67%	37.4533	< 0.0001
H3: Margin Target (≥ 10% above historical)	0.00%	300.0000	< 0.0001

Logistic regression analyses, detailed in Table 4, examined the influence of firm characteristics on CVP tool usage. Larger firms were significantly more likely to meet the three-reference threshold for breakeven analysis (OR = 1.82, 95% CI [1.12, 2.95], p = 0.015), suggesting that scale enhances its application. For scenario modeling, no significant effects were found for firm size or technological intensity (all p ¿ 0.05), supporting its uniform adoption, while the lack of observations exceeding a 10% margin delta precluded analysis for margin targeting.

Table 4: Logistic Regression: Determinants of High CVP Scenario Usage

Variable	Coefficient	Std Error	z-value	p-value	95% CI Lower	95% CI Upper
Intercept	−0.1839	0.429	−0.429	0.668	−1.024	0.656
Medium Firm	0.2173	0.440	0.494	0.621	−0.644	1.079
Small Firm	−0.0405	0.397	−0.102	0.919	−0.819	0.737
Low Tech Intensity	−0.3142	0.313	−1.004	0.315	−0.927	0.299
Medium Tech Intensity	0.2836	0.298	0.950	0.342	−0.301	0.868

Model Statistics: N = 300, Pseudo $R^2 = 0.013$, Log-Likelihood = -204.52. *Reference categories:* Large firms, High tech intensity. *Likelihood Ratio Test:* LR $^2 = 5.24$, p-value = 0.265

5. DISCUSSION

This computational study challenges the assumption that CVP tools are uniformly applied in managerial decision-making, demonstrating instead of a selective adoption shaped by the decision context's inherent dynamics within the model. By leveraging a controlled environment with standardized macroeconomic conditions and stochastic pricing elasticities, the findings from 300 firm-year observations illuminate how simulated firms prioritize adaptive tools over static ones, as visually supported by the distribution patterns in Figure 1. These insights, grounded in the quantitative patterns observed, underscore the need for a nuanced understanding of CVP application in structured, data-rich settings, conceptually prompting a reevaluation of traditional accounting practices.

The limited integration of breakeven analysis, with fewer than half of firm-year observations meeting the three-reference threshold as detailed in Table 1, highlights its constrained utility within the simulation's dynamic pricing environment. The frequent pricing adjustments modeled via stochastic elasticities ($\epsilon = -1.2$ to -0.8) and lognormal cost distributions likely rendered static breakeven calculations less actionable, clashing with the model's iterative decision cycles, a trend further nuanced by firm size variations in Table 2. Logistic regression results indicating that larger firms (OR = 1.82, $p = 0.015$) were more likely to employ breakeven analysis suggest that, within the simulated context, resource availability or strategic decision complexity may elevate its role as a high-level checkpoint rather than a routine tool, extending critiques by [7] with computationally derived evidence.

Scenario modeling's robust adoption, with 67.67% of quarterly reviews exceeding the three-scenario threshold, underscores its alignment with the model's uncertainty-driven framework, a pattern vividly illustrated by Figure 2. The modeled volatility in demand and costs, coupled with Monte Carlo sampling of elasticities, necessitated flexible planning tools that could evaluate multiple contingencies, explaining its pervasive use across firm types with no significant covariate effects ($p > 0.05$ as shown in Table 4). This finding computationally supports [12]'s emphasis on scenario-based CVP in volatile contexts, while highlighting how the model's iterative planning structure amplifies the strategic value of adaptive methodologies in simulated managerial processes.

The absence of any firm targeting profit margins 10% above historical contribution margins (0.00% meeting the threshold) reveals a striking conservatism embedded in the simulation's decision logic, a trend clearly depicted in Figure

3. Rather than reflecting unmodeled external factors like regulation, this pattern likely stems from the model's pricing elasticity parameters, where aggressive margin hikes risked disproportionate demand contraction, and lognormal cost structures, which constrained profitability under variable conditions as outlined in Table 1. This risk-averse behavior, observed across all simulated firms, challenges classical CVP assumptions of continuous margin optimization [16], suggesting that the model's agents prioritized market stability over short-term gains, necessitating approaches that incorporate endogenous risk aversion.

These findings contribute to CVP theory by providing quantitative evidence from a controlled environment regarding selective tool adoption, driven by the interplay of decision frequency, uncertainty, and resource constraints as comprehensively captured across the dataset's visualizations and analyses. The uneven use of breakeven analysis, widespread scenario modeling, and conservative margin targeting collectively suggest refinements for CVP frameworks that emphasize bounded rationality and context-specific utility, building upon critiques by [4]. Practically, these results indicate that firms operating in dynamic, data-rich settings that share characteristics with the simulation may benefit from integrating scenario-based CVP into digital planning systems. Additionally, smaller firms operating in such contexts might benefit from targeted training to leverage breakeven analysis strategically. Furthermore, accounting education could evolve to emphasize the contextual applicability of these tools in preparing managers for volatile environments, informed by insights derived from computational explorations.

6. CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

This computational study demonstrates that CVP tools are not universally applied but selectively mobilized based on their alignment with decision-making dynamics within a controlled environment. By dissecting the adoption patterns of breakeven analysis, scenario modeling, and margin targeting across 300 synthetic firm-year observations, the findings highlight the critical role of contextual fit—driven by factors like decision frequency, uncertainty, and firm scale—in shaping CVP's operational utility within the model. These insights underscore the value of controlled computational models in quantifying simulated managerial behavior, offering a precise lens to explore and conceptually refine CVP's theoretical and practical frameworks.

The study offers model-based support for CVP theory by providing quantitative evidence that challenges the assumption of uniform tool efficacy, illustrating arguments for bounded rationality and contingency in managerial

accounting. The limited adoption of breakeven analysis, contrasted with scenario modeling's widespread use, computationally supports [4]'s call for context-sensitive models, while the absence of aggressive margin targets quantifies risk- averse decision-making under modeled elasticity constraints, aligning with behavioral economics principles [33, 26]. By demonstrating how the simulation parameters (e.g., stochastic elasticities, lognormal costs) shape tool prioritiza- tion, this work advances a nuanced understanding of CVP as a dynamic, rather than static, framework, encouraging theorists to integrate adaptive decision logics into future models.

For practitioners operating in data-rich, volatility-prone settings that share characteristics with the simulation, the findings advocate specific strategic adjustments. Firms in such environments should prioritize digital integration of scenario modeling into iterative planning systems, leveraging its demonstrated utility (67.67% adoption rate) to navigate uncertainty, while smaller firms could enhance breakeven analysis through targeted training, given its higher adoption among larger simulated firms (OR = 1.82). Accounting educators should reorient CVP curricula to emphasize contextual application, teaching students to assess tool relevance under modeled constraints like pricing elasticity, ensuring graduates are equipped for strategic decision-making in dynamic markets, informed by insights from computational studies.

The computational model's reliance on standardized parameters, while enabling precise control, inherently limits its ability to capture real-world complexities such as unmodeled behavioral biases or sector-specific regulatory shocks. Future research could extend these findings by incorporating agent-based models to simulate more granular managerial cognition or by conducting field studies to explore how firm-specific factors, like organizational culture, influence CVP adoption in practice. Additionally, cross-sectoral analyses could test whether the observed patterns—particularly the conservative margin-setting behavior—persist in less elastic or more regulated markets, building directly on the simulation's quantitative baseline.

This study leverages a controlled computational model to dissect CVP tool adoption with a high degree of internal precision, highlighting its selective utility as a function of modeled decision context and firm characteristics. Quantifying the interplay of adaptability, scale, and risk aversion within this framework offers a valuable foundation for informing CVP theory and practice in environments characterized by volatility. As managerial accounting evolves, the strategic deployment of contextually relevant tools, computationally explored through rigorous modeling, remains a critical area for effective decision-making.

This document contains 33 References.

Conflict of Interest

The author declares no conflict of interest. This includes financial, non-financial, professional, and personal affiliations that could have influenced the work reported in this paper.

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