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COST-VOLUME-PROFIT (CVP) ANALYSIS IN ASSESSING BREAK-EVEN POINT AND FLUCTUATION OF CONTRIBUTION MARGIN ON PRICING STRATEGY IN THE TRADE SECTOR

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Abstract

This study aims to analyze the application of cost-volume-profit (CVP) analysis in assessing the break-even point and contribution margin fluctuations for pricing strategy formulation in fresh commodity MSMEs, using a case study of Toko Mak Reva. A descriptive quantitative approach was employed, processing primary data from three ten-day observation periods in November 2025. The findings show consistent improvements in the contribution margin ratio and margin of safety across periods, indicating strong financial security. However, sensitivity analysis reveals the business's extreme vulnerability to purchase price volatility, where a 10% increase in variable costs would lead to losses. The study's theoretical contribution lies in integrating perishability risk into the CVP model through the concept of effective variable cost (EVC), which incorporates shrinkage rates into pricing decisions. The proposed framework offers a more adaptive pricing strategy for fresh commodity MSMEs, addressing the gap between conventional CVP analysis and the unique challenges of perishable product trading.

Keywords: *Break-Even Point; Contribution Margin; Cost Volume Profit; Perishability; Pricing Strategy*

1. Introduction

The selling price strategy is the most important managerial decision for business sustainability, especially in the highly competitive fresh commodity trade sector. Pricing is

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not merely an administrative process to determine the nominal value of a product, but rather a strategic tool to ensure that the company can cover all operational costs while achieving the desired profit target. Sales is an activity aimed at finding buyers, influencing them, and providing guidance so that buyers can adjust their needs to the offered products at a mutually agreed-upon price. Price is the value expressed in rupiah and defined as the amount paid by the buyer, acting as a way for business actors to differentiate their offerings from competitors. According to Neni et al. (2025), the selling price is the amount charged for a product to consumers that must cover production costs and generate a profit margin. Furthermore, according to Firmansyah et al. (2023), the selling price is an external influence of a product and is a direct stimulus that consumers can access. This aligns with Ritonga et al. (2023), who state that price is the most flexible market element and can change due to many influencing factors, such as supply and demand, product availability, price competition, and so onClick or tap here to enter text. That price is the most flexible market element and can change due to many influencing factors, such as supply and demand, product availability, price competition, and so on. Therefore, selling price determination must consider production costs, market conditions, the level of competition, and the company's profit objectives, with the main key being the cost of production, since if the cost of production is too high, the selling price of the product will also increase.

However, in the retail food commodity trade sector, business actors often fall into the trap of using instinct or simply following market prices in setting selling prices without precise margin calculations. Errors in determining the selling price are often made by small or medium-sized enterprises (MSMEs) because their decisions are not yet precise due to not being based on correct accounting principles, leaving business owners to rely only on estimates. Handayani et al. (2025) revealed that many MSMEs set selling prices only by estimate or by following market prices, without considering all cost components, which leads to inaccurate pricing. Meanwhile, Mufarokhah et al. (2025) stressed that understanding the cost of goods sold (COGS) is essential for MSMEs to set competitive and profitable prices. Errors in setting selling prices will result in an imbalance between revenue and costs, which can ultimately lead to business losses, declining profits, and financial instability (Hardina et al., 2022).

This phenomenon was explicitly found at Toko Mak Reva, a retail store selling various premium vegetable commodities. The fresh commodity trade sector has high uncertainty characteristics, directly influenced by the volatility of purchase prices and the risk of product damage. This forces Toko Mak Reva to reduce prices for damaged goods so they can still be sold, as well as variable costs that almost entirely come from suppliers' fluctuating capital prices. As a vegetable store owner, Toko Mak Reva is very vulnerable to external risks such as extreme weather changes and crop failure phenomena that cause unstable purchase prices. This condition is exacerbated by the risk of defective or

unsellable goods, forcing the owner to give sudden discounts to clear stock. Without a correct pricing strategy, Toko Mak Reva risks hidden losses because variable costs are not covered by the selling price, especially when sales volume decreases or product damage occurs. Price determination based solely on instinct, without considering variable costs and fixed costs, makes this business prone to unrecognized profit erosion.

In the context of fresh commodity trading, perishability presents unique challenges that conventional CVP analysis often overlooks. According to Yang et al. (2022), perishable goods retailers face significant risks from product deterioration, requiring adaptive pricing and ordering strategies that account for shrinkage costs. The intersection of CVP analysis and perishability has been explored in various studies. Yan et al. (2020) demonstrated that small and medium-sized enterprises in the fresh agricultural sector face capital constraints and perishability risks, making CVP analysis particularly critical. However, these studies predominantly focus on large-scale supply chains, leaving a gap in understanding how small retailers can practically apply CVP principles to manage perishability at the micro-level.

The research gap in current literature can be systematically identified along three dimensions. First, existing CVP studies on MSMEs primarily apply standard formulas without adapting to the specific characteristics of perishable commodities. Second, research on perishable inventory management predominantly focuses on large supply chains, with limited attention to small-scale retailers operating with thin margins and high price volatility. Third, while numerous studies have analyzed pricing strategies for vegetables and other fresh commodities, few have developed practical frameworks that integrate shrinkage costs into contribution margin calculations for daily operational decisions. This study addresses these gaps by adapting CVP analysis to the perishable commodity context, providing a measurable framework for pricing decisions that accounts for shrinkage risk at the individual commodity level.

To address this uncertainty, which demands a more dynamic and measurable pricing strategy, cost-volume-profit (CVP) analysis serves as a comprehensive operational solution. CVP analysis is an analytical tool used to understand the relationship between costs, sales volume, and profit in a company. It helps management in profit planning, pricing decisions, and operational performance evaluation by considering the structure of fixed costs and variable costs. Specifically, cost-volume-profit (CVP) analysis serves as a strategic management tool that enables business actors to understand the interrelationship between costs, sales volume, and profit, which is particularly critical for small and medium-sized enterprises (SMEs) in the fresh agricultural sector that face capital constraints and perishability risks (Yan et al., 2020). Rahmi et al. (2023) state that CVP analysis is very useful in planning and decision-making because it relates costs, sales volume, selling price, and all financial information within the company.

The novelty of this research lies in applying cost-volume-profit (CVP) analysis by considering fresh product shrinkage as part of the variable cost component in the context of small-scale vegetable trading businesses. This novelty can be further detailed into three specific contributions. First, this study introduces the concept of effective variable cost (EVC), which adjusts the purchase price by incorporating each commodity's shrinkage rate, providing a more realistic cost basis for pricing decisions in perishable goods trading. Second, this research develops a tiered discount policy framework with EVC as the floor price, enabling businesses to sell defective products without incurring losses. Third, this study empirically demonstrates that in fresh commodity trading with thin margins, sensitivity to increases in variable costs can exceed sensitivity to decreases in sales volume, challenging the traditional volume-centric focus of CVP analysis. This approach is used to provide an overview of the relationship between costs, sales volume, and selling price determination at the research object.

Therefore, the researcher adopts the cost-volume-profit (CVP) approach as an analytical tool to assess the application of the BEP method and the impact of contribution margin fluctuations on selling price determination, as well as to determine what percentage of sales volume above the break-even point is needed to achieve the desired profit level. In addition, the author will analyze the margin of safety to see how safe sales are against the risk of loss and perform a sensitivity analysis to consider changes in one or more variables and how sensitive the selling price set is to changes in variable costs at Toko Mak Reva. This research is expected to help and provide scientific guidance for business actors in the context of Toko Mak Reva to set more precise prices and mitigate the risk of loss due to uncertain commodity price dynamics.

2. Literature Review

2.1 Break-Even Point

The break-even point (BEP) occurs when total revenue equals total costs, resulting in neither profit nor loss (Kusumawardani & Alamsyah, 2020). Husna et al. (2024) emphasize that sales must exceed BEP to generate profit. BEP analysis helps determine the minimum sales volume needed to avoid losses and serves as a basis for decision-making (Aminus & Sarina, 2022; Krisdina, 2024). Several studies have applied BEP analysis to MSMEs. Saputra et al. (2024) found that a geprek chicken business required 908 portions per month to break even. Medyawati & Jamiah (2025) reported that although BEP increased over three years, actual sales remained above BEP with a margin of safety of 62.1%. Zalukhu et al. (2025) reported a BEP of 105 units per month for a lemang MSME. Gandi & Kusumastuti (2025), Hullah & Makalalag (2023), and Purwanti et al. (2025) confirmed that BEP analysis enables MSMEs to plan profits, manage costs, and minimize risks. Widiawati et al. (2024) added that CVP analysis helps classify costs and determine

BEP. However, Toko Mak Reva has not applied BEP analysis, so the business actors do not know the minimum sales limit to avoid losses.

2.2 Contribution Margin

Contribution margin (CM) is the difference between selling price per unit and variable cost per unit, indicating how much each unit contributes to covering fixed costs and generating profit (Widayati, 2019). Sembiring et al. (2023) defined CM as the excess of sales revenue over variable costs. A high CM indicates greater capacity to cover fixed costs (Halawa & Palupiningtyas, 2024). CM is useful for product decisions, pricing policies, and marketing strategies (Rozi et al., 2024). It also serves as the basis for calculating BEP and margin of safety. Salsabila et al. (2025) showed that changes in sales mix affect CM per package. At Toko Mak Reva, CM has not been calculated, so the business does not know how much each product contributes to covering costs.

2.3 Margin of Safety

Margin of safety (MOS) is the difference between actual sales and BEP sales, measuring the company's safety against sales decline (Pelawiten & Ilat, 2014). A negative MOS indicates losses (Risdayani & Susilawati, 2024). Medyawati & Jamiah (2025) reported an MOS of 62.1% for a catering MSME, while Sultoni & Lestari (2024) reported 93.12% for a chip MSME, indicating low risk. Zalukhu et al. (2025) showed that increasing production volume improved MOS. Hayati & Sumarni (2025) confirmed that BEP and MOS calculations help creative economy MSMEs set safe sales targets.

2.4 Sensitivity Analysis

Sensitivity analysis measures the effect of changes in selling price, variable costs, fixed costs, and sales volume on profit (Sholihah & Jailani, 2023). It is essential for dealing with market uncertainty. Nisa et al. (2023) used CVP analysis to optimize profit in a food MSME, reporting a CMR of 36% and MOS of 85%. Ananta et al. (2023) demonstrated that CVP analysis assists in pricing and profit planning. Afriyanto et al. (2025) emphasized that small changes in variable costs significantly affect profit. Haeruddin et al. (2023) analyzed CVP during COVID-19 and found that CM, operating leverage, BEP, and MOS are essential for anticipating losses. Setiyani et al. (2025) confirmed that CVP helps MSMEs optimize pricing and plan production, which is highly relevant for fresh commodity trading.

2.5 Perishability and Shrinkage Management

Perishability is a defining characteristic of fresh agricultural commodities that significantly impacts pricing strategies and cost management. According to Yang et al. (2022), perishable goods are characterized by rapid quality deterioration, limited shelf life, and high waste rates, which create substantial challenges for inventory management and pricing. Shrinkage cost, defined as the loss of product value due to deterioration, spoilage,

or damage, represents a critical cost component that conventional CVP models often neglect. Research on perishable product management has addressed various dimensions of this challenge. Yan et al. (2020) specifically examined the fresh agricultural supply chain, demonstrating that SMEs face unique challenges due to capital constraints and perishability risks, which require adaptive financial and operational strategies. Yang et al. (2022) further emphasized that perishable goods retailers with zero-inventory and capital constraints face heightened vulnerability to product deterioration, making adaptive pricing strategies essential for business sustainability.

In the context of MSMEs, perishability management has received limited attention. Small retailers in developing markets often lack the infrastructure and analytical tools to quantify and manage shrinkage costs accurately. This gap is particularly significant because perishable goods retailers face heightened vulnerability to product deterioration. This study contributes to this literature by developing a practical EVC framework that enables small retailers to systematically integrate shrinkage costs into their pricing decisions, thereby addressing the theoretical and practical gap identified in previous research.

2.6 Selling Price

Pricing theory provides various frameworks for determining optimal selling prices. According to cost-plus pricing, the selling price is determined by adding a markup percentage to the total cost per unit (Drury, 2012). This approach ensures that all costs are covered while generating a desired profit margin. In the context of fresh commodity trading, pricing decisions must also consider market-based factors such as competitor prices, consumer willingness to pay, and product perishability (Kotler et al., 2018). Markup pricing is particularly relevant for agricultural and fresh product retailers, where purchase prices fluctuate daily. Firmansyah et al. (2023) emphasized that the selling price is an external attribute of a product and serves as a direct stimulus accessible to consumers. Ritonga et al. (2023) added that price is the most flexible marketing mix element, changing in response to supply and demand, product availability, and competitive dynamics. For MSMEs, pricing errors frequently arise from the absence of systematic cost accounting. Many small retailers rely on estimates or follow competitors' prices without considering their own cost structures (Handayani et al., 2025). This practice leads to underpricing or overpricing, both of which can harm business sustainability. Therefore, an effective pricing strategy must integrate cost analysis, market conditions, and business objectives to achieve profitability and competitiveness.

3. Research Methods

This research uses a case study approach with descriptive quantitative analysis at Toko Mak Reva, a retail business selling ten types of vegetables, namely red chili, bird's eye chili, green chili, potatoes, eggplant, tomatoes, cabbage, carrots, chinese cabbage, and

bitter gourd. The selection of the object was based on the characteristics of the business, which has high purchase price fluctuations, the risk of product damage (perishability), and the availability of daily sales records. The research was conducted in November 2025, considering that this month does not coincide with major religious holidays or intensive harvest periods, thus representing normal operational conditions. The data were divided into three ten-day analysis periods, namely period I (1-10 November), period II (11-20 November), and period III (21-30 November), to capture short-term variations in costs, sales volume, and contribution margin.

The one-month observation period (November 2025) was chosen to capture normal operational conditions, as this month does not coincide with major religious holidays or intensive harvest periods in the Medan region. The three ten-day periods were designed to capture intra-month variability in purchase prices and sales volumes while maintaining data quality through manageable daily recording. The authors acknowledge that this limited period restricts generalizability to seasonal variations, a limitation further addressed in the conclusion section. However, for the purpose of developing and testing the EVC pricing framework, this period provides sufficient data to demonstrate the applicability of the proposed methodology.

The data used are primary data collected directly from the owner and sellers of Toko Mak Reva through three methods. First, daily recording using a Google Form filled out daily by the seller, covering the purchase volume per commodity, purchase price per kilogram, normal selling price per kilogram, normal sales volume, volume of defective goods sold at a discount, selling price of defective goods, and remaining unsold goods. Before use, the form was tested to ensure consistency of units (kilograms). Second, interviews with the store owner were conducted to identify fixed cost components, transportation and packaging costs, and pricing policies. Third, documentation in the form of purchase receipts from suppliers, daily inventory records, and product damage reports was used to verify the correctness of the recorded data.

Fixed costs are defined as costs that are relatively stable in the short term despite changes in sales volume. Based on interviews, the monthly fixed cost components include employee salaries, warehouse rent, cleaning fees, stall fees, parking fees, market levy fees, security fees, electricity bills, and employee meal allowances. The total of these nine components is calculated per month, then divided by three to obtain fixed costs per ten-day period. In addition, based on direct confirmation from the owner, daily transportation costs of IDR 12,000 and daily plastic packaging costs of IDR 7,000 are incurred every day regardless of sales volume, so both are also classified as fixed costs. For ten days, transportation costs become IDR 120,000 and packaging costs become IDR 70,000. Thus, total fixed costs per ten-day period are the sum of the nine fixed cost components per period plus IDR 120,000 and IDR 70,000.

Variable costs are defined as costs that change proportionally with changes in purchase or sales volume. In this study, variable costs only include the purchase price of vegetables from suppliers. Shrinkage costs due to product damage are not included as variable costs but are treated as a reduction in revenue (sales allowance) to avoid distortion of the contribution margin. Shrinkage costs are calculated as the difference between the potential sales value of defective products (if sold at normal price) and their actual sales value after discount. Shrinkage recording is carried out at the end of each operational day based on physical stock inspection by the owner, with the category of damaged products determined based on the physical condition of the vegetables (wilted, rotten, damaged).

To ensure the validity and reliability of shrinkage data, this study employed multiple verification procedures. First, the owner established a standard rubric for classifying damage levels consistently across all commodities: minor damage (less than 10% of product surface affected), moderate damage (10-30% affected), severe damage (more than 30% affected), and total loss (unsellable). This rubric was applied uniformly throughout the three observation periods. Second, data triangulation was performed by comparing daily shrinkage records with supplier purchase receipts and physical inventory checks conducted at the end of each operational day. Third, weekly verification meetings between the researcher and the store owner were held to review recording discrepancies and ensure accuracy. These procedures were implemented to maintain the reliability of shrinkage data and minimize subjective bias in classification. The shrinkage rate per product is calculated as the percentage of damaged units to total purchased units during the research period. Sales volume is calculated as the accumulation of total kilograms sold each day, consisting of normal sales and sales of defective (discounted) products. Total revenue is calculated as the accumulation of normal sales revenue and discounted sales revenue.

Data analysis was performed using the cost-volume-profit (CVP) model. This research framework consists of five sequential phases as illustrated in Figure 1.

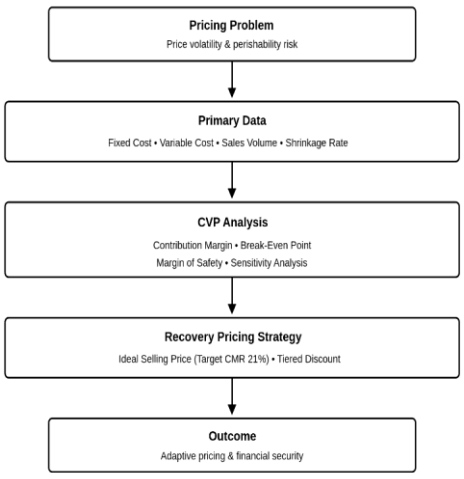

Figure 1. Research Framework

Contribution margin (CM) is calculated in aggregate for each period using the formula total revenue minus total variable costs. Contribution margin ratio (CMR) is calculated by dividing CM by total revenue. Break-even point in rupiah is calculated using the formula fixed costs per period divided by CMR. In contrast, break-even point in kilograms is calculated by dividing fixed costs per period by the weighted average CM per kilogram, where weighted average CM per kilogram is obtained from total CM divided by total units sold in the same period. Margin of safety (MOS) is calculated in rupiah as the difference between actual total revenue and the break-even point, and in percentage as MOS in rupiah divided by actual total revenue multiplied by 100 percent.

Sensitivity analysis was carried out to measure the impact of changes in key variables on business profit stability, considering that the fresh commodity sector has high uncertainty. Two scenarios were simulated using period I data as the basis, considering that period I had the lowest sales volume and thus represented the most critical condition. The first scenario was an increase in variable costs by 5%, 10%, and 20% from the actual condition, assuming selling price and sales volume remain constant. The second scenario was a decrease in sales volume by 10%, 20%, 30%, and 40% from the actual condition, assuming the selling price per kilogram remains constant (using the average actual selling price of period I) and fixed costs remain constant.

The selling price strategy was developed using a recovery pricing approach that considers shrinkage risk and the target contribution margin ratio. The target CMR is normatively set at 21% as the minimum operational safety limit, based on the consideration that at this level the business can cover fixed costs and generate a positive profit. Effective variable cost (EVC) for each commodity is calculated using the formula purchase price per kilogram divided by (1 minus shrinkage rate). The ideal selling price is then calculated using the formula EVC divided by (1 minus target CMR), or equivalently EVC divided by 0.79. Discounts for defective products are given up to the limit where the discounted price is not lower than EVC, with a maximum discount percentage equal to the target CMR (21%). For field operations, discounts are categorized based on the level of damage: 5% for minor damage, 10% for moderate damage, 15% for fairly serious damage, and 21% for severe damage.

This research has several limitations that need to be acknowledged. The observation period is only one month, so seasonal patterns are not fully represented. Shrinkage classification is carried out subjectively by the owner based on physical condition without a standard rubric, although consistency is maintained through daily recording. CVP analysis assumes a linear relationship between costs and volume, while in the fresh commodity business, purchase prices can change at any time. The results of the analysis are contextual to Toko Mak Reva and cannot be generalized to the entire fresh commodity trading sector without verification on different objects.

4. Results and Discussion

4.2 Result

The research was conducted at Toko Mak Reva, a fresh vegetable retail business, over three ten-day periods in November 2025 (Period I: 1–10 November, Period II: 11–20 November, Period III: 21–30 November). Total fixed costs per period were IDR 4,993,333, consisting of nine fixed cost components (IDR 4,803,333) plus daily transportation (IDR 12,000/day → IDR 120,000 per 10 days) and daily plastic packaging (IDR 7,000/day → IDR 70,000 per 10 days). The details of fixed costs are presented in Table 1.

Table 1. Details of Fixed Costs of Toko Mak Reva for November 2025

No,	Fixed Cost Component	Average per 10 days (IDR)	1 Month (IDR)
1	Salary for 3 employees	4,200,000	12,600,000
2	Warehouse storage rent	16,667	50,000
3	Cleaning fee	30,000	90,000
4	Stall fee	20,000	60,000
5	Parking fee	60,000	180,000
6	Market levy fee	40,000	120,000
7	Security fee	20,000	60,000
8	Employee meal allowance	400,000	1,200,000
9	Electricity bill	16,667	50,000
10	Transportation costs	120,000	360,000
11	Plastic packaging costs	70,000	210,000
	Total	**4,993,333**	**14,980,000**

Variable costs included only the purchase price of vegetables from suppliers. Table 2 presents the total variable costs per period.

Table 2. Total Variable Costs per Period (IDR)

No.	Variable Cost Component	Time Period		
		Period I (IDR)	Period II (IDR)	Period III (IDR)
1	Red chili purchase	9,380,000	9,727,000	8,946,000
2	Bird's eye chili purchase	3,385,000	4,040,000	5,800,000
3	Green chili purchase	2,370,000	2,460,000	2,190,000
4	Potato purchase	2,943,000	2,806,000	2,310,000
5	Eggplant purchase	900,000	1,040,000	800,000
6	Tomato purchase	1,966,000	1,880,000	1,668,000
7	Cabbage purchase	915,000	1,155,000	966,000
8	Carrot purchase	2,520,000	2,400,000	2,040,000
9	Chinese cabbage purchase	509,000	650,000	660,000
10	Bitter gourd purchase	1,127,000	1,240,000	1,030,000
	Total	**26,015,000**	**27,398,000**	**26,410,000**

Shrinkage costs (product damage) are treated as a reduction in revenue, not as a variable cost. Details of shrinkage costs per period are presented in Table 3.

Table 3. Details of Shrinkage Costs of Toko Mak Reva for November 2025

Period	Shrinkage Cost (IDR)
I	218,000
II	278,970
III	197,000

The shrinkage rate is calculated as the percentage of damaged units against the total units purchased during the research period. The shrinkage rate, along with the average purchase and selling prices per commodity, is presented in Table 4.

Table 4. Shrinkage Rate and Average Prices per Commodity

Commodity	Shrinkage Rate (%)	Period I (IDR/kg)		Period II (IDR/kg)		Period III (IDR/kg)	
		Purchase	Selling	Purchase	Selling	Purchase	Selling
Red chili	2.06	50,703	57,847	45,667	51,972	48,357	55,106
Bird's eye chili	0.73	20,515	25,562	20,200	25,101	32,222	40,000
Green chili	4.00	26,333	31,315	24,600	29,560	25,765	32,400
Potato	4.15	9,403	12,807	8,205	12,294	7,452	11,474
Eggplant	5.93	4,186	7,000	4,000	7,000	4,000	7,000
Tomato	5.73	4,866	8,353	4,476	8,074	4,608	8,565
Cabbage	6.65	3,211	5,634	3,554	5,997	3,687	6,040
Carrot	3.33	14,000	18,679	10,909	15,160	10,200	13,800
Chinese cabbage	11.11	2,781	5,731	3,095	6,000	3,143	6,687
Bitter gourd	10.05	5,316	8,000	5,511	8,000	5,421	8,307

The total revenue and sales volume data per period are presented in Table 5.

Table 5. Revenue and Sales Volume per Period

Period	Normal Revenue (IDR)	Discount Revenue (IDR)	Total Revenue (IDR)	Total Product Units (Kg)	Normal Units Sold (Kg)	Discount Units Sold (Kg)	Total Units Sold (Kg)	Unsellable Units (Kg)
1	32,774,000	394,000	33,168,000	2261	2118	101	2219	42
2	35,890,000	381,970	36,271,970	2573	2427	96	2523	50
3	37,417,400	180,000	37,597,400	2197	2103	50	2153	44

Based on revenue and variable costs data, the contribution margin (CM), contribution margin ratio (CMR), and average CM per kilogram are calculated on an aggregate basis for each period. The results are presented in Table 6.

Table 6. Contribution Margin and Average CM per Kilogram for November 2025

Period	Total Revenue (IDR)	Total Variable Costs (IDR)	CM (IDR)	CMR (%)	Total Units Sold (Kg)	Average CM/kg (IDR)
1	33,168,000	26,015,000	7,153,000	21.6%	2,219	3,224
2	36,271,970	27,398,000	8,873,970	24.5%	2,523	3,517
3	37,597,400	26,410,000	11,187,400	29.8%	2,153	5,196

The average contribution margin per kilogram also increased in each period, in line with rising sales volume. The break-even point in rupiah is calculated by dividing the fixed costs per period (IDR 4,993,333) by the CMR. The result is presented in Table 7.

Table 7. Break-Even Point and Margin of Safety per Period

Period	Fixed Costs (IDR)	CMR (%)	BEP Rupiah (IDR)	BEP Unit (Kg)	Actual Sales (IDR)	Actual Sales (Kg)	MOS Rupiah (IDR)	MOS (%)
1	4,993,333	21.57	23,149,434	1,549	33,168,000	2,219	10,018,566	30.2
2	4,993,333	24.47	20,405,937	1,419	36,271,970	2,523	15,866,033	43.7
3	4,993,333	29.76	16,778,672	961	37,597,400	2,153	20,818,727	55.4

To enhance readability and illustrate the trends more clearly, the following figures present the visual trends of key CVP metrics across the three observation periods.

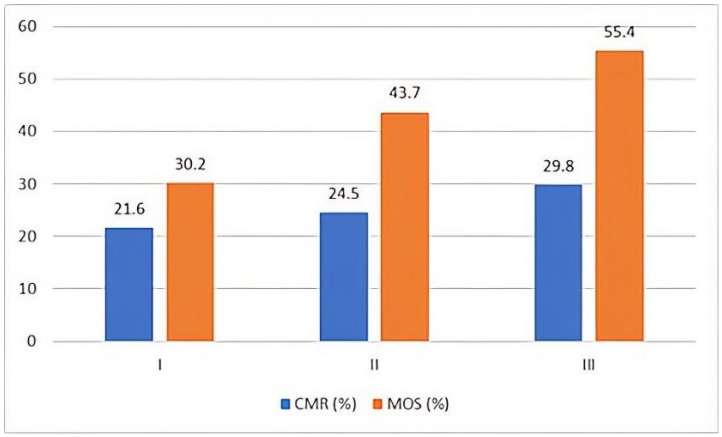

Figure 2. Trends in Contribution Margin Ratio (CMR) and Margin of Safety (MOS)

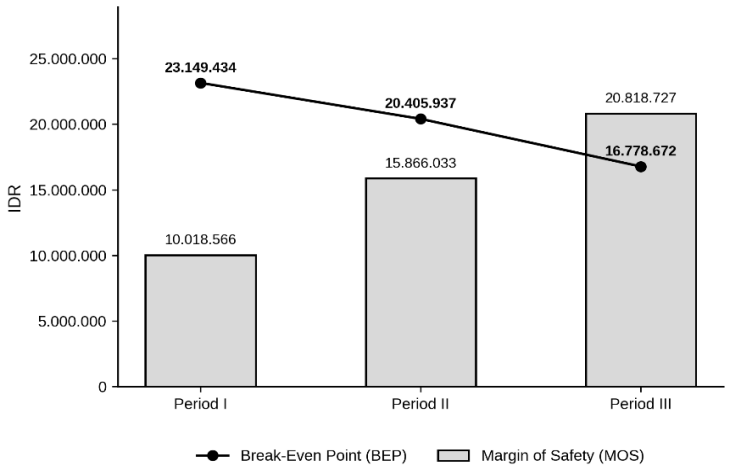

Figure 3. Break-Even Point and Margin of Safety Trend Across Periods

Sensitivity analysis was conducted using data from period I as the basis. The simulation of variable cost increases is presented in Table 8.

Table 8. Simulation of Variable Cost Increases (Period I Basis)

Description	Actual (IDR)	Simulation of increasing variable costs		
		5%	10%	20%
Total sales	33,168,000			

Total fixed costs	4,993,333			
Variable costs	26,015,000	27,315,750	28,616,500	31,218,000
Contribution margin	7,153,000	5,852,250	4,551,500	1,950,000
Contribution margin ratio	21.6%	17.6%	13.7%	5.9%
BEP Rupiah	23,149,434	28,306,876	36,394,555	84,920,629
Profit	2,159,667	858,917	(441,833)	(3,043,333)

Based on the CMR target of 21%, the effective variable cost (EVC) and the ideal selling price are calculated for each commodity using the average purchase price and depreciation rate during November 2025. The results are presented in Table 9.

Table 9. Pricing Based on Target CMR (21%) and Effective Variable Cost (EVC)

Commodity	Purchase Price (IDR/kg)	Shrinkage Rate	EVC (IDR)	Target CMR	Ideal Price (IDR)	Actual Price (IDR)
Red chili	48,242	2.06%	49,257	21.0%	62,351	54,782
Bird's eye chili	24,312	0.73%	24,491	21.0%	31,001	30,223
Green chili	25,566	4.00%	26,631	21.0%	33,710	31,008
Potato	8,353	4.15%	8,716	21.0%	11,033	12,211
Eggplant	4,062	5.93%	4,318	21.0%	5,466	7,000
Tomato	4,650	5.73%	4,933	21.0%	6,244	8,319
Cabbage	3,484	6.65%	3,732	21.0%	4,724	5,890
Carrot	11,703	3.33%	12,105	21.0%	15,323	15,709
Chinese cabbage	3,006	11.11%	3,382	21.0%	4,281	6,167
Bitter gourd	5,416	10.05%	6,021	21.0%	7,622	8,000

2.2 Discussion

This section presents a systematic analysis of the findings reported in the results, covering cost structure, contribution margin behavior, break-even point, margin of safety, sensitivity, and pricing strategy. All of this analysis is based on primary data collected during three ten-day periods in November 2025, with total fixed costs per period of IDR 4,993,333. These fixed costs consist of the nine fixed cost components (employee salaries, warehouse rent, cleaning fees, stall fees, parking fees, market levies, security fees, employee meal allowances, electricity) of IDR 4,803,333, plus daily transportation costs of IDR 12,000 (IDR 120,000 per 10 days) and daily plastic packaging costs of IDR 7,000 (IDR 70,000 per 10 days). The last two costs - which are often misclassified as semi-variable - after direct confirmation from the owner turned out to be fixed daily costs, independent of sales volume. Therefore, there is no need to separate fixed and variable components, making the CVP calculation simpler and more accurate.

Variable cost structure and shrinkage costs - Variable costs in this study only include the purchase price of vegetables from suppliers, because shrinkage costs (product damage) are treated as a reduction in revenue (sales allowance), not as variable costs.

Table 3 shows total variable costs for period I of IDR 26,015,000, period II IDR 27,398,000, and period III IDR 26,410,000. This fluctuation reflects the dynamics of purchase prices, which are strongly influenced by weather conditions, harvests, and supply chains. Meanwhile, Table 3 records shrinkage costs for each period: IDR 218,000, IDR 278,970, and IDR 197,000. The highest shrinkage cost occurred in period II (IDR 278,970), possibly due to bad weather or suboptimal product handling. In contrast, period III had the lowest shrinkage cost (IDR 197,000), contributing to increased net revenue. Table 4 details the shrinkage rate per commodity: Chinese cabbage (11.11%), bitter gourd (10.05%), cabbage (6.65%), eggplant (5.93%), tomato (5.73%), potato (4.15%), green chili (4.00%), carrot (3.33%), red chili (2.06%), and bird's eye chili (0.73%). Chinese cabbage and bitter gourd have the highest shrinkage rates due to their leafy nature, while bird's eye chili is the most durable. This information is very important for determining the ideal selling price because products with high shrinkage rates require greater price compensation.

Purchase price and actual selling price per period - Table 4 presents the average purchase and selling price per kilogram per period for each commodity. The table shows price fluctuations across commodities, with the most notable movements being red chili (IDR 50,703 to IDR 48,357), bird's eye chili (jumping to IDR 32,222 in period III), and potato (declining to IDR 7,452). A comparison between the purchase and selling prices in Table 4 provides an initial picture of the gross margin per commodity. Red chili, for example, has a selling price far above the purchase price (difference of IDR 7,144-IDR 9,439 per kg), while bird's eye chili in period III has a very high difference (IDR 40,000 - IDR 32,222 = IDR 7,778). Potato has a relatively small difference (around IDR 3,000-IDR 4,000). Eggplant has a difference of around IDR 3,000, and tomato around IDR 3,500-IDR 4,000. However, the nominal difference is not sufficient to assess the contribution to fixed costs; a contribution margin calculation is needed.

Revenue and sales volume - Table 5 shows normal revenue, discount revenue, and total revenue per period. As shown in Table 5, total revenue increased from IDR 33,168,000 in period I to IDR 37,597,400 in period III, while discount revenue declined from IDR 394,000 to IDR 180,000. Discount revenue was highest in period I (IDR 394,000) and lowest in period III (IDR 180,000), in line with shrinkage costs also being lowest in period III. This indicates improved product quality or better handling. Table 5 also shows unit data. Period II had the highest units sold (2,523 kg) but also higher discount revenue (IDR 381,970), indicating more defective products with deeper discounts. Conversely, period III reduced both the number and severity of product damage, with discount revenue falling to IDR 180,000.

Contribution margin and contribution margin ratio - Table 6 calculates CM and CMR. As shown in Table 6, CM increased consistently from IDR 7,153,000 to IDR 11,187,400 (56.4% increase), while CMR improved from 21.6% to 29.8% (+8.2 percentage points). This indicates enhanced operational profitability, meaning that in period III,

nearly IDR 30 of every IDR 100 in sales remained available to cover fixed costs. Factors driving this improvement include: (1) sales mix shift to higher-margin products (e.g., bird's eye chili), (2) purchasing efficiency (lower prices for potatoes and carrots), and (3) reduced discount revenue (from IDR 394,000 to IDR 180,000). Average CM per kilogram (Table 6) increased from IDR 3,224 to IDR 5,196, nearly doubling contribution per unit.

Break-even point and margin of safety - BEP in rupiah (Table 7) decreased by 27.5% from IDR 23.15 million to IDR 16.78 million, meaning the business now needs lower sales to break even. BEP in units dropped by 38% from 1,549 kg to 961 kg, confirming that higher margins are more effective than chasing volume. Actual sales exceeded BEP in all periods, with MOS rising from 30.2% to 55.4%, indicating that sales could drop by more than half before incurring losses. This high MOS provides substantial room to maneuver in uncertain markets.

The decreasing BEP trend supports Krisdina (2024), who asserted that BEP analysis helps determine the sales level needed to avoid losses. The MOS level is consistent with findings by Medyawati & Jamiah (2025), who reported an MOS of 62.1% for a catering MSME, and Sultoni & Lestari (2024), who reported 93.12% for a chip MSME, all confirming strong financial safety nets when businesses operate significantly above BEP.

Sensitivity analysis: variable cost increase - Table 8 presents a simulation of variable cost increases using period I data as the basis (because period I is the most critical with the lowest volume). The 5% increase scenario: variable costs become IDR 27,315,750, CM drops to IDR 5,852,250, CMR drops to 17.6%, BEP rises to IDR 28,306,876, and profit drops drastically to IDR 858,917 (from actual profit of IDR 2,159,667). A 60% decrease in profit due to a 5% increase in variable costs shows a very high elasticity of profit with respect to variable costs. The 10% scenario: variable costs IDR 28,616,500, CM IDR 4,551,500, CMR 13.7%, BEP IDR 36,394,555, profit negative (-IDR 441,833). This point is the threshold: a 10% increase in purchase price without adjusting the selling price will cause a loss. The BEP that jumps to IDR 36.39 million is already far above actual sales of IDR 33.17 million. The 20% scenario: variable costs IDR 31,218,000, CM IDR 1,950,000, CMR only 5.9%, BEP reaches IDR 84,920,629 (2.56 times actual sales), loss swells to IDR 3,043,333. These results show that the business operates on a thin margin; a small increase in variable costs can wipe out profits. Therefore, controlling purchase prices is an absolute priority. Strategies that can be implemented include: (a) buying in larger quantities when prices are low for durable commodities (e.g., potatoes, carrots, dried chilies); (b) entering into price contracts with suppliers for certain periods; (c) diversifying suppliers to have better bargaining power; (d) proportionally increasing selling prices immediately after a significant increase in purchase prices. The sales volume decrease simulation (explained in the method but not shown in the table) shows that the business can still generate positive profit up to a 30% volume decline. It only starts losing at a 40% decline. Thus, the risk of variable cost increases is far more dangerous than the risk of sales volume decline. This finding has

theoretical implications: in CVP literature, sensitivity is often focused on volume, but for trading businesses with thin margins and dominant variable costs, sensitivity to cost of goods sold can be more critical. This finding corroborates Afriyanto et al. (2025), who showed that CVP analysis is highly sensitive to variable cost changes and that small fluctuations can significantly affect profit. Similarly, Nisa et al. (2023) reported that a 20% increase in variable costs would push a similar MSME into a loss position, reinforcing the paramount importance of purchase price control.

Pricing strategy based on CVP and effective variable cost - Table 9 is the core of the novelty of this research. The ideal selling price is calculated using a recovery pricing approach that integrates the shrinkage rate. First, effective variable cost (EVC) is calculated as: EVC = purchase price per kg / (1 - shrinkage rate). This formula acknowledges that from each kilogram purchased, only a portion is fit for sale; the purchase cost must be covered by the units that are actually sold. The higher the shrinkage rate, the higher the EVC. For example, red chili with a purchase price of IDR 48,242 and a shrinkage rate of 2.06% has EVC = 48,242 / (1 - 0.0206) = 48,242 / 0.9794 = IDR 49,257. Chinese cabbage with an 11.11% shrinkage rate: EVC = 3,006 / 0.8889 = IDR 3,382. The target CMR of 21% was chosen based on the actual CMR observed in Period I (21.57%), which represents the minimum operating margin required for the business to cover all fixed costs and generate a positive profit. This threshold aligns with the minimum viable contribution margin concept, ensuring that the business maintains a safety buffer. Additionally, industry benchmarks for fresh commodity retail typically require a minimum margin of 20-25% to absorb both price volatility and shrinkage risks. The choice of 21% represents a conservative yet achievable target for Toko Mak Reva. Moreover, Yang et al. (2022) demonstrated that smaller retailers with limited self-funding typically have a stronger preference for financing sources that offer lower costs, as their marginal revenue from additional capital diminishes with increasing financing rates. This insight supports adopting a conservative target CMR of 21% for Toko Mak Reva, as the business operates with thin margins and high sensitivity to variable cost fluctuations, consistent with the characteristics of perishable goods retailers in developing markets. Second, with a target CMR of 21% (0.21), the ideal selling price = EVC / (1 - 0.21) = EVC / 0.79. Red chili ideal = 49,257 / 0.79 = IDR 62,351; Chinese cabbage ideal = 3,382 / 0.79 = IDR 4,281. A comparison with the average actual selling price (from Table 4) shows whether a commodity currently provides a margin below or above the target.

Difference analysis per commodity - Based on the comparison between actual and ideal prices, commodities are classified into three categories. First, underpriced commodities requiring gradual increases include red chili (12.1% below ideal), bird's eye chili (2.5% below ideal), and green chili (8% below ideal). Second, over-priced commodities requiring competitive evaluation include eggplant (28% above ideal), tomato (33% above ideal), cabbage (24.7% above ideal), and Chinese cabbage (44% above ideal).

Tomato and Chinese cabbage show the largest gaps and need careful market review. Third, optimally priced commodities requiring no adjustment include potato (10.7% above ideal, but competitive), carrot (2.5% above ideal), and bitter gourd (4.9% above ideal). Gradual price adjustments with volume monitoring are recommended for under-priced commodities to improve overall CMR, while over-priced commodities should be evaluated to ensure competitiveness without sacrificing margins.

Discount policy for defective products - EVC can be used as the floor price for defective products. For example, red chili has an EVC of IDR 49,257; normal ideal selling price IDR 62,351; the maximum discount allowed so that the price does not fall below EVC is (62,351 - 49,257)/62,351 = 21.0% - exactly equal to the target CMR. Therefore, the maximum safe discount is the target CMR (21%). For minor damage, a 5% discount → price IDR 59,233; moderate damage 10% → IDR 56,116; fairly serious damage 15% → IDR 52,998; severe damage 21% → IDR 49,257 (equal to EVC). In this way, defective products still contribute to fixed costs (because the price is above EVC) except in the case of severe damage, which only reaches break-even for the variable component. Implementing tiered discounts is also fairer for consumers and can increase sales of defective products without harming the business.

Managerial and theoretical implications - Managerially, the above findings provide concrete guidance for Toko Mak Reva. First, evaluate prices every 10 days or whenever there is a significant change in purchase prices. Use the EVC formula and the 21% target CMR to calculate the ideal price. Second, prioritize gradual price increases for red chili, bird's eye chili, and green chili. Third, monitor eggplant, tomato, cabbage, and Chinese cabbage prices that are too far above the ideal; consider gradual reductions if volume declines. Fourth, implement tiered discounts with an EVC floor. Fifth, monitor shrinkage costs and shrinkage rates per commodity; high shrinkage rates (Chinese cabbage, bitter gourd) require special attention in handling and storage. Sixth, because sensitivity to variable cost increases is very high, build an early warning system: if purchase prices rise by >3%, immediately recalculate BEP and consider adjusting selling prices.

Theoretically, this research enriches the CVP literature in three ways. First, it introduces the effective variable cost (EVC) concept, which integrates shrinkage rates directly into pricing decisions and addresses the gap identified by Yan et al. (2020) and Yang et al. (2022) regarding practical perishability management for MSMEs. Second, it empirically demonstrates that in vegetable trading, sensitivity to increases in variable costs can exceed sensitivity to decreases in volume, challenging the traditional volume-centric focus of CVP analysis. Third, it provides a replicable tiered discount framework that ensures defective products still contribute to fixed costs, offering a novel solution to the perennial challenge of managing perishability while maintaining profitability. These contributions can serve as references for similar research in other fresh commodity sectors.

Research limitations - This research has several limitations that need to be acknowledged. First, the observation period was only one month (November 2025). Vegetable market conditions are strongly influenced by seasons, weather, and holidays. These results may not apply to months with different characteristics, such as during Ramadan or the lean season. Further research with a minimum period of 3-6 months is needed. Second, the classification of shrinkage rates was carried out subjectively by the owner based on physical condition; there is no standard measurable rubric. This can introduce bias. Future research can develop a standard rubric (e.g., based on the percentage of spoiled area, firmness, or color change). Third, CVP analysis assumes a linear relationship and constant fixed costs; in reality, fixed costs can change in the long term, and variable costs per unit can differ at extreme volumes. However, for short-term MSME analysis, these assumptions are still adequate. Fourth, the results of this research are contextual to Toko Mak Reva; generalization to other vegetable stores requires further verification. Nevertheless, the methodology and framework developed can be adapted.

Thus, the entire discussion above shows that applying CVP analysis adapted to perishability characteristics provides a more accurate understanding of business performance and serves as a strong basis for strategic decision-making, especially in setting adaptive selling prices and non-harmful discounts. Toko Mak Reva has a healthy foundation (increasing CMR, decreasing BEP, high MOS), but must be wary of the risk of variable cost increases. Implementation of the price and discount recommendations will further strengthen the business's profitability and competitiveness in the dynamic vegetable market.

5. Conclusions

Based on the analysis of cost-volume-profit (CVP) at Toko Mak Reva over three ten-day periods in November 2025, the business consistently operated above the break-even point with improving financial performance. Contribution margin and its ratio increased consistently across periods. At the same time, the break-even point decreased, and margin of safety strengthened significantly, indicating improved operational efficiency and strong financial security. Sensitivity analysis reveals that the business is highly vulnerable to increases in variable costs: a 5% rise reduces profit substantially, while a 10% rise leads to a loss. In contrast, the business can tolerate a significant decline in sales volume without suffering a loss. This finding emphasizes that controlling purchase prices and negotiating with suppliers is more critical than managing sales volume fluctuations, consistent with Afriyanto et al. (2025) and Nisa et al. (2023).

The proposed pricing strategy, based on a target CMR of 21% and effective variable cost (EVC) that incorporates shrinkage rates, identifies price gaps across commodities. Red chili, bird's eye chili, and green chili are underpriced and should be gradually increased. Conversely, eggplant, tomato, cabbage, and Chinese cabbage are overpriced and need

careful evaluation to maintain competitiveness. A tiered discount policy with EVC as the floor price ensures that discounted defective products still contribute to fixed costs.

This research offers three theoretical contributions: (1) introducing the effective variable cost (EVC) concept, which incorporates shrinkage rates into pricing decisions and extends the traditional CVP model to perishable commodity trading; (2) empirically demonstrating that in fresh commodity retail, sensitivity to variable cost increases can exceed sensitivity to sales volume decreases, challenging the volume-centric focus of conventional CVP analysis; and (3) providing a tiered discount framework with EVC as the floor price, offering a practical solution for managing perishability while maintaining profitability. This novelty addresses the gap identified by Yan et al. (2020) and Yang et al. (2022) regarding limited attention to perishability in MSME CVP studies.

Future research should extend the observation period to 3-6 months to capture seasonal variations in purchase prices and shrinkage rates. Objective shrinkage measurement rubrics need to be developed to enhance data reliability. Comparative studies across multiple retail businesses would improve the generalizability of findings. Additionally, future studies could incorporate consumer behavior analysis to examine how pricing adjustments affect demand elasticity for individual commodities. The integration of digital technologies for real-time shrinkage monitoring represents another promising research direction, and future research should also include financial statement analysis in the CVP calculation, as the current model primarily relies on cost data provided by the business owner.

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