AI AND ML

# Minimum-Bill Thresholds in Promotional Milk Coupon Subscriptions: A Review of Consumer Redemption, Basket Value, and Association Rule Mining

Pratima S. Joshi, Vinay Kulkarni, Veena Raju

CDVL, Hyderabad, Telangana, India

Published November 2026

**Abstract**

A minimum-bill coupon requires a shopper to reach a specified transaction value before receiving the offer. This paper examines a milk coupon subscription in which the qualifying minimum bill is raised from Rs 99 to Rs 149, an increase of about 50.5%. Through a focused narrative review of studies on coupon redemption, sales promotions, conditional (minimum-spend) promotions and association rule mining in retail, it argues that the higher threshold may encourage some customers to add products to qualify while discouraging redemption among those whose usual baskets fall below the new threshold, so that the net effect on sales and profitability cannot be inferred from the threshold alone. The paper proposes a conceptual framework, five research questions and four hypotheses, and a methodology for future empirical work combining pre-post or comparison-group analysis of redemption and transaction value with Apriori-based market basket analysis, together with a set of evaluation metrics.

**Keywords:** Milk coupon subscription; minimum-bill threshold; coupon redemption; sales promotion; market basket analysis; Apriori algorithm; association rules; retail analytics

## 1 Introduction

Retailers use coupons and conditional promotions to influence purchasing decisions, encourage larger baskets, and support customer retention. A minimum-bill coupon requires a shopper to reach a specified transaction value before receiving the offer. In the case considered here, the qualifying minimum bill changes from Rs 99 to Rs 149, an increase of 50 (approximately 50.5%). The practical question is whether the higher threshold changes coupon redemption, basket value, add-on purchases, and retailer outcomes. The change may produce opposing responses. Some customers whose usual eligible basket is below Rs 149 may add products to qualify; others may decide not to redeem the coupon. Consequently, a higher average bill among redeemed coupons would not, by itself, show that the programme improved total sales or profitability. The number of redemptions, discount cost, customer visits, and purchases by non-redeemers also matter. This paper is a focused narrative review and proposed analytical framework, rather than a report of completed field research. It connects literature on coupon redemption and conditional promotions with market basket analysis and specifies how a future empirical study could examine the threshold change.

## 2 Review approach and scope

This manuscript uses a focused narrative review of selected scholarly sources on digital coupon redemption, sales-promotion effects, minimum-threshold coupons, conditional promotions, and association rule mining in retail. The sources were located through web-based scholarly search and publisher pages. This is not a systematic review: no exhaustive database search, preregistered protocol, formal screening process, or quantitative synthesis was performed. The selected literature is used to establish concepts and inform a testable evaluation plan.

## 3 Literature review

### 3.1 Coupon redemption and customer response

Nayal and Pandey (2020) present a meta-analytical review of digital coupon redemption intention. Their review identifies customer-related factors, including attitudes and coupon proneness, as important influences on redemption, alongside perceived value and convenience. This suggests that a threshold change should not be evaluated solely by the face value of the offer: customer response and the perceived effort required to qualify may also matter. Santini et al. (2016) conducted a meta-analysis of sales-promotion research and reported relationships between sales promotions, purchase intentions, and sales volume. The broader implication is that promotional effects should be assessed using clearly defined outcomes and an appropriate comparison, rather than assuming every promotion produces the same result for every customer.

### 3.2 Minimum-spend and conditional promotions

Conditional promotions require a customer to meet a spending or quantity condition to receive a benefit. Amornpetchkul et al. (2018) examine conditional promotions and consumer overspending, showing why minimum-spend requirements are relevant to customer purchasing and seller-profit decisions. More directly, a study of constrained mobile coupons (The effects of constrained mobile coupons, 2023) reports that minimum-threshold coupons increased purchase probability and purchase quantity during the redemption period in the studied setting, with effects on the customer-firm relationship beyond redemption also examined. These findings provide a rationale for testing whether a 149 threshold encourages basket top-ups. They do not establish that raising a specific threshold from 99 to 149 will increase spending in every retail context. The result may depend on the distribution of customers' usual basket values, perceived coupon savings, product availability, and how far the threshold is from a customer's normal spend. The direction and magnitude of the effect therefore remain empirical questions.

### 3.3 Association rule mining and market basket analysis

Market basket analysis identifies items that appear together in transactions. The Apriori algorithm finds frequent itemsets and derives association rules, commonly summarized using support, confidence, and lift. Yoshimura et al. (2018) demonstrate the use of Apriori-based association rules to investigate linked shopping trips. Hashad et al. (2024) compare Apriori and FP-Growth for retail market basket analysis and discuss the use of frequent patterns for retail decision support. These studies support the use of association mining as a descriptive tool for identifying product combinations. For the milk coupon case, rules such as (Milk) $\rightarrow$ (Bread) or (Milk) $\rightarrow$ (Butter) could be compared between promotional and regular transactions. Support measures how often the itemset appears in the selected transaction group; confidence measures the proportion of transac-

tions containing the antecedent that also contain the consequent; and lift compares that confidence with the overall prevalence of the consequent. Rules are descriptive associations, not evidence of causation. Results can also be unstable in small datasets, so thresholds and minimum transaction counts should be chosen and reported transparently.

### 3.4 Research gap and contribution

The selected literature separately addresses coupon redemption, conditional promotion effects, and retail association mining. The proposed contribution of this paper is a practical framework that combines these perspectives for a milk coupon subscription scenario in which the minimum qualifying bill changes from 99 to 149. The framework links redemption and financial measures with product-level association analysis.

## 4 Proposed conceptual framework and research questions

The proposed framework treats the qualifying threshold (99 versus 149) as the policy change of interest. Potential intermediate responses include whether customers qualify, whether they redeem the coupon, and whether they add items to their basket. Outcomes include redemption rate, average transaction value, add-on spend, total sales, discount cost, and if cost data are available gross margin. The following research questions are proposed:

- **RQ1:** Is the coupon redemption rate different after the minimum-bill threshold changes from 99 to 149?
- **RQ2:** Does average transaction value among coupon redemptions change after the threshold change?
- **RQ3:** Does the distribution of transaction values and the frequency of basket top-ups change around the 149 threshold?
- **RQ4:** Do product association rules differ between coupon-redemption transactions and comparable regular transactions?
- **RQ5:** Does the change improve net commercial outcomes after accounting for redemption volume, discounts, and relevant operating costs?

## 5 Proposed methodology for future empirical work

### 5.1 Data requirements

A future study should use anonymized, transaction-level data from a retailer or coupon programme for comparable periods before and after the policy change. At minimum, the dataset should contain transaction ID, transaction date, item or SKU, quantity, selling price, transaction total, coupon eligibility, coupon redemption status, threshold version, and a reliable indicator of promotional versus non-promotional transactions. If feasible, include customer pseudonymous ID, product category, stock availability, discount value, and cost or margin. Personal identifiers should not be included in the analysis dataset. The currently prepared illustrative CSV is a small simulated learning dataset. It does not record the 99/149 threshold change, real coupon redemptions, transaction totals, or actual customer behaviour. It must not be used to claim empirical results in a journal paper.

### 5.2 Study design and analysis

The primary design should be a pre-post observational analysis with comparable time windows and, where possible, a comparison group not affected by the threshold change. A simple pre-post comparison is vulnerable to confounding from seasonality, price changes, holidays, stock-outs, store traffic, and other campaigns. If an unaffected comparison group is available and assumptions are defensible, a difference-in-differences design may help separate the threshold change from common time trends. The design, inclusion criteria, and analysis plan should be specified before examining final results. Calculate redemption rate as redeemed coupons divided by eligible coupons issued, multiplied by 100. Calculate average transaction value as total transaction sales divided by the number of transactions. Define add-on spend consistently—for example, the value of items beyond a prespecified baseline and distinguish sales from profit. Compare transaction-value distributions, particularly the 99-148 band and the 149-and-above band, while recognizing that observed changes in these bands do not by themselves establish causation.

### 5.3 Apriori analysis

For basket analysis, encode each transaction as a set of purchased items and apply Apriori to obtain frequent itemsets and association rules. Analyse groups separately, such as (a) transactions with a redeemed coupon, (b) eligible transactions with no redemption, and (c) comparable regular transactions. Do not label a transaction "promotional" merely because it contains milk; the label should come from actual programme records. For a rule A → B, support is the proportion of transactions containing both A and B; confidence is the proportion of transactions containing A that also contain B; and lift is confidence divided by the support of B. Report the minimum support and confidence thresholds, number of transactions in each group, and number of rules produced. Compare rules only when the groups have adequate data, and avoid interpreting differences in lift as causal effects of the coupon. Use confidence intervals or resampling where suitable, and consider multiple-testing and small-sample issues.

### 5.4 Suggested evaluation metrics

The suggested evaluation metrics are listed in Table 1.

**Table 1.** Suggested evaluation metrics.

| Metric | Calculation/measure | Purpose |
|---|---|---|
| **Coupon redemption rate** | (Redeemed coupons / eligible coupons issued) $\times$ 100 [cite: 3] | Measures use of the offer [cite: 3]. |
| **Average transaction value** | Total sales value / number of transactions [cite: 3] | Measures average bill size [cite: 3]. |
| **Average spend per redemptions** | Sales from redeemed-coupon transactions / number of redemptions [cite: 3] | Describes spend associated with redemptions [cite: 3]. |
| **Incremental sales/ margin** | Requires a valid comparison design and cost data [cite: 3] | Helps distinguish association from incremental impact [cite: 3]. |
| **Association-rule metrics** | Support, confidence, lift, and transaction count [cite: 3] | Describes item co-occurrence within each group [cite: 3]. |

## 6 Expected implications and hypotheses

The threshold increase is 50.5%, but this arithmetic change does not predict a 50.5% change in customer spending or redemption. The following are hypotheses to test, not findings:

- **H1:** The redemption rate may decline if a larger share of customers' usual eligible baskets falls below 149.
- **H2:** Average bill value among successful redemptions may rise if customers add products to meet the higher threshold.
- **H3:** Total coupon-linked sales and profit may increase or decrease depending on changes in redemption volume, basket size, discount cost, and margin.
- **H4:** Product association rules may differ across redeemed-coupon and regular transactions, but such differences may reflect customer mix or other factors rather than the threshold itself.

For illustration, a 120 basket would satisfy a 99 minimum but not a 149 minimum. The customer would need at least 29 of additional eligible spending to reach 149, assuming the programme defines qualification as a bill of at least 149 and all added items count toward the threshold. A 160 basket would meet both thresholds. The actual rules, exclusions, and coupon benefit must be confirmed with the retailer.

## 7 Limitations and ethical considerations

This is a narrative review and proposed framework based on selected sources, not a systematic review or empirical evaluation. No retailer-level pre-change and post-change data were provided, so the paper cannot report measured changes in redemption, sales, profit, or product associations. The illustrative dataset is too small and lacks key variables required for such conclusions. Findings from other retail settings may not generalize to a particular milk subscription programme. Future work should protect customer privacy, use anonymized data, comply with applicable institutional and legal requirements, and disclose funding, conflicts of interest, and data access restrictions. Any causal claim should be supported by a suitable design and stated assumptions.

## 8 Conclusion

Changing the minimum bill for a milk coupon from 99 to 149 raises the spending threshold by 50, or approximately 50.5%. The change may encourage some customers to add products while discouraging redemption among customers whose usual baskets fall below the new threshold. The net effect on sales and profitability cannot be inferred from the threshold alone. Existing research on coupon redemption, conditional promotions, and market basket analysis motivates a structured evaluation using redemption, transaction-value, cost, and product-association metrics. A future study using real, sufficiently large transaction and coupon data could combine pre-post or comparison-group analysis with Apriori-based basket analysis. Until such data are analysed, all expected effects should be presented as hypotheses rather than results.

## References

[1] Nayal P, Pandey N (2020). Redemption intention of coupons: A meta-analytical review and future directions. *Journal of Promotion Management*, 26(3), 372–395. https://doi.org/10.1080/10496491.2019.1699628

[2] Santini FDO, Vieira VA, Sampaio CH, Perin MG (2016). Meta-analysis of the long- and short-term effects of sales promotions on consumer behavior. *Journal of Promotion Management*, 22(3), 425–442. https://doi.org/10.1080/10496491.2016.1154921

[3] Amornpetchkul T (2018). Conditional promotions and consumer overspending. *Production and Operations Management*, 27(8), 1455–1475. https://doi.org/10.1111/poms.12877

[4] The effects of constrained mobile coupons in the mobile channel (2023). Journal of Retailing and Consumer Services, 75, 103542. https://doi.org/10.1016/j.jretconser.2023.103542

[5] Yoshimura Y, Sobolevsky S, Bautista Hobin JN, Ratti C, Blat J (2018). Urban association rules: Uncovering linked trips for shopping behavior. *Environment and Planning B: Urban Analytics and City Science*, 45(2). https://doi.org/10.1177/0265813516676487

[6] Hashad AA, Wah KK, Alnoor A, Chew XY (2024). Exploratory analysis with association rule mining algorithms in the retail industry. *Malaysian Journal of Computing*, 9(1). https://doi.org/10.24191/mjoc.v9i1.21433