



# Market Basket Analysis of a Health Food Store in Thailand: A Case Study

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## ABSTRACT

This article presents a market basket analysis of a health food store in Thailand. The analysis identifies data attributes that frequently occur together in the dataset. Frequent occurrences of data attributes representing customer purchasing behaviors are extracted as association rules using the frequent pattern growth algorithm. The generated associations are evaluated using standard measures based on occurrence counts and an additional financial measure. Marketing strategies in the form of cross-selling pairs of specific products are then designed based on the data attributes appearing in the significant associations. The cross-selling products are offered at discounted prices and promoted in marketing campaigns. A break-even analysis is performed to estimate the required number of additional sales volumes from each marketing campaign to compensate for the discounted prices. The presented use case demonstrates the effectiveness of extending the market basket analysis to include a financial measure that can lead to practical marketing campaigns.

## KEYWORDS

Association rule, Frequent pattern growth, Health food, Market basket analysis, Marketing strategy, Retail

## MARKET BASKET ANALYSIS OF A HEALTH FOOD STORE IN THAILAND

### A Case Study

Today, businesses must compete within and across industries in a competitive consumer market environment. It has become increasingly crucial for a business to maintain its competitive edge. One key competitive advantage involves insights into customers' purchasing behaviors, which helps the company develop new marketing strategies to increase customers' purchases and revenue. Notably, in

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the retail industry, where direct contact with consumers occurs, having more insights and knowledge of customer purchasing behavior enables the company to strengthen its competitive advantage.

One widely used technique to study retail customer behavior is market basket analysis. This analysis can uncover the patterns of the association behind customers' purchasing behavior (Annie & Kumar, 2012). It can be applied to the retail industry and many other industries, including bioinformatics and education, as discussed in Kaur and Kang (2016). Marketing practitioners have accepted market basket analysis for its usefulness in helping businesses understand their customers' behaviors and thus operate more profitably. Specifically, an analysis output in the form of association rules containing frequent itemsets provides sales and marketing departments with valuable information for designing effective strategies.

The market basket analysis framework has been developed specifically to serve retail and marketing purposes by uncovering sets of items that customers frequently purchase together. The co-occurrence of items or products in a single shopping receipt can be found in transactional data. The analysis outcome is a set of association rules in the form of  $A \rightarrow B$ . These rules describe the relation between two items: "If a customer purchases item  $A$ , then he or she also purchases item  $B$ ." Upon discovering these relationships, retailers can use this knowledge to offer sales promotions to enhance customer purchases.

Data mining is a technique for discovering traits and patterns to find associations among the items in a sizeable transactional dataset. Regarding mining algorithms, many alternatives exist, including Apriori (Agrawal & Srikant, 1994), frequent pattern growth or FP-growth (Han et al., 2000), Eclat (Han et al., 2001), K-Apriori (Annie & Kumar, 2011), and the two-way cooperative collaborative filtering (CF) approach (Hwang & Lee, 2021). Along with the output, specific measures are used to restrict the number of association rules found. Two common measures include support and confidence. Support is defined as the number of transactions containing both items over the total number of transactions, i.e., the relative frequency of item occurrence. Confidence is the likelihood of purchasing another item when one item is purchased. It is equivalent to the conditional probability of one product purchase given another product purchase (Raorane et al., 2012). Because of its effectiveness, association rule mining is widely used in various applications. Zhang and Guo (2011) developed a novel approach that evaluates the quality of association rules using TOPSIS, a well-known multiple-criteria decision-making technique. Herawan et al. (2012) proposed an SLP-Growth algorithm to identify meaningful association rules for engineering students who suffer from examination anxieties. Tanantong and Ramjan (2021) used the Apriori algorithm to extract valuable insights related to demand and supply patterns from social media data in Thailand. The study aimed to leverage social media's rich and diverse content to gain insights into consumer preferences and market trends to improve social media marketing.

Two main approaches used in the assessment of the market basket analysis are classical and temporal. The classical method does not consider the order in which the products are selected for purchase. It only produces rules based on the principle "If a transaction contains an item  $A$ , then it also contains item  $B$ ." By contrast, the second approach is based on temporal association, meaning that it considers the time aspect. This association type is divided into sequential pattern analysis, where the former is based on a short sequence of transactions and the latter on one long event sequence (Weiß, 2014). Using either type, one can choose based on the desired outcome or computational efficiency. Kamakura (2012) proposed using RFID tags mounted to the shopping cart to study the sequential pattern. The shopping trip's route could then be illustrated using computer software. This analysis allows the researcher to identify the sequence in which products are purchased and determine the sequential patterns accordingly.

The benefits of the market basket analysis for local and transnational retailers depend on which aspects of shopping transactions are selected for leverage. Discovery of the set of items frequently purchased together through the obtained association rules can lead to a more

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