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MERCHANDISING DECISIONS: A NEW VIEW OF PLANNING AND MEASURING PERFORMANCE

A return on investment measure for planning merchandising decisions and for measuring the efficacy of those decisions is developed in this paper. The model is an extension of the familiar gross margin return on investment (GMROI) criterion; however, it corrects the weaknesses inherent in that approach. The use of this new measure is discussed for individual items, vendors, departments, marketing channels and buyers.

The ability to generate target returns on inventory investments has become more critical in recent years. In 1960 the prime interest rate averaged 4.8% and rose to 8% by 1978 (Statistical Abstract of the United States 1978, p. 548). Today generating an adequate return is more difficult since the prime rate is approximately double the 1978 rate. High interest rates have been attributed to new corporate strategies which affect inventory investment. Financial terms of sale in effect can reduce a retailer's real investment in inventory by postponing payment. Recent Business Week (1979) and Wall Street Journal (1980) articles note that firms are foregoing traditional cash discounts to take advantage of extended payment periods. Levy and Grant (1980, 1981) have also recently examined financial terms of sale in light of controlling marketing channel conflict. Credit which is extended to the retailer's customers is another source of new corporate interest. This credit increases the real inventory investment by postponing the customer's payment. Sears Roebuck & Co., J.C. Penney Co., and others are currently experimenting with new strategies for tightening consumer credit (The Wall Street Journal 1980). Similarly, as the costs of retail space continue to increase, retailers should be paying close attention to return on their space investment. For example, the median total charges (including rent) in regional malls for menswear stores was $5.15 per square foot per year in 1972 and $7.59 in 1978, an increase of 47.49% in six years (Dollars and Cents of Shopping Centers 1972 and 1978).

The purpose of this paper is to explore and refine the relationship between return on investment and merchandising decisions. Specifically, a currently employed criterion, gross margin return on investment (GMROI) is reviewed. Improvements are suggested from GMROI which lead to a modified measure called contribution margin return on investment (CMROI). An illustration

which compares two departments within a store using CMROI versus GMROI is presented. The paper concludes with a discussion of the data requirements for CMROI and its use as a method of evaluating the efficacy of items, vendors, marketing channels, and buyers.

GMROI: THE TRADITIONAL VIEW

Return on assets (net profit after taxes/total assets) is a global measure of a firm's return on investment. However, return on assets becomes unwieldy when used for merchandising decisions. A buyer or merchandise manager has little control over operating expenses and taxes, which impact net profit, and investment in fixed and current assets other than inventory. But he or she has direct control over gross margin and inventory investment. Thus, GMROI has been prescribed by many authors in both marketing and accounting as being a superior decision-making return on investment tool (e.g. Sweeney 1973, Robicheaux 1979, and Ahern and Romano 1979). GMROI is currently used, often under a different name, by some of the largest retailers in the country, e.g. Sears and Federated Department Stores. It is also reported in publications of the National Retail Merchants Association.

A target GMROI is set by management based on the overall profitability goals of the firm. This target GMROI is achieved through the planning and control of both gross margin percent and inventory turnover[1] based on the following relationship:

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[1]For GMROI to be used as a return on investment measure, average inventory should be expressed at cost rather than retail. Inventory turnover is easily obtained by multiplying Net Sales/Average Inventory at Cost times (1 - gross margin percent).

$$GMROI = \frac{\text{Gross Margin}}{\text{Net Sales}} \times \frac{\text{Net Sales}}{\text{Average Inventory At Cost}} = \frac{\text{Gross Margin}}{\text{Average Inventory At Cost}} \quad (1)$$

GMROI is particularly useful for comparing the relative performance of merchandise with different gross margin and turnover profiles. For example, if item A has a gross margin of 50% and an inventory turnover of six, GMROI = 150%. Item A's GMROI is equal to item B with an inventory turnover of 8 and a gross margin of 25%. Without a simple tool such as GMROI such comparisons are conceptually difficult.

CONTRIBUTION MARGIN RETURN ON INVENTORY INVESTMENT: AN IMPROVEMENT OVER GMROI

GMROI, as it is commonly used, fails to accurately portray the average investment in inventory and neglects certain expenses which directly affect merchandising decisions. Mullins (1972) has previously treated some of these issues, but they have been generally ignored in the marketing literature. Additional considerations are also integrated into the following discussion.

The (CMROI) model presented herein is general in nature. It is designed to be applicable to as wide a range of situations as possible and to apply to as many retailers as possible. As a practical matter, not all retailers can employ every element of CMROI in every situation. CMROI can be defined at the merchandise item level, as well as the vendor, department or store levels.

To rectify the errors associated with the traditional GMROI, the formula for contribution margin return on investment is presented.

$$CMROI = \frac{(GM-IE-SE-OAE)}{\text{Net Sales}} \times \frac{\text{Net Sales}}{\{\$INV\}} \quad (2)$$

where: GM = gross margin dollars (as usually defined)

IE = interest expense of maintaining inventory

SE = spatial expense of storing and displaying inventory

OAE = other allocable expenses associated with the merchandise

{$INV} = average dollars invested in inventory.

The term (GM-IE-SE-OAE) is referred to as the contribution margin. (GM-IE-SE-OAE)/(Net Sales) is the contribution margin percent, while (Net Sales/{$INV}) is the rate of (financially measured) inventory turnover. The average dollars invested in inventory, {$INV} is discussed prior to an exploration of the components of contribution margin.

Average Dollar Investment in Inventory, {$INV}

The traditional accounting definition of average inventory includes only the physical inventory in the store. However, it does not reflect the true investment. The dollar investment in inventory begins when merchandise is paid for by the store. The investment terminates when the store collects for the merchandise. An accurate measure of inventory investment then includes a reduction in inventory investment by the amount of accounts payable for merchandise received and an increase in inventory investment by the amount of accounts receivable for merchandise sold on credit. This relationship is expressed on a daily basis as:

$$I_i = (DVI_i - AP_i + AR_i) \qquad (3)$$

where: DVI_i = dollar value of inventory (at cost) on day i

AP_i = accounts payable on day i for this merchandise

AR_i = accounts receivable on day i for this merchandise.

and average inventory would be expressed as:

$$\sum_{i=1}^{n} I_i \div n \qquad (4)$$

where: n = number of days in the time period under consideration.

Terms of Purchase (AP_i). It is typical for retailers to pay after delivery. Financial terms of sale such as 2/10/net 30 are common.[2] However, any combination of discount and payment dates is possible. The cash discount is included in retailers' gross margin calculation[3] but the discount period is neglected. The effect on financial performance can be profound since a longer period reduces inventory investment; in fact, its effect is equivalent to a loan. The inclusion of accounts payable into CMROI improves the accuracy of the return on investment measure and therefore the accuracy of management decisions. In essence, buyers can be directly rewarded for their ability to obtain longer discount periods if CMROI is used to evaluate their performance.

Consumer Credit (AR_i). Retailers' investment in inventory ceases when collection is made for items sold. Since most retailers grant consumer credit of some kind, this is not always coterminous with the date of sale. Indeed, only for cash payment does financial investment and physical relinquishment occur simultaneously. If payment is made by bank credit card, by check, or if the retailer sells his accounts receivable to a factor, the lag between sale and collection is small. If the retailer maintains his own credit system, the time lag between sale and collection and therefore the inventory investment will be greater.

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[2] 2/10/net 30 means that a 2% discount is offered if paid within 10 days of invoice date; otherwise, the full invoice amount is due on the 30th day.

[3] Gross margin dollars equals net sales plus cash discounts minus workroom expenses minus cost of goods sold.

The effect of consumer credit on merchandising decisions may appear somewhat elusive on the surface. The credit cost to the retailer is identical across product categories and departments. However, certain products are more apt to be bought on credit than others, e.g., furniture, men's suits and other large expenditures. These "credit-prone" products adversely affect dollar inventory investment. Thus, the degree to which consumer credit is used to purchase specific products is incorporated into CMROI.

A Negative Inventory Investment. Examination of (3) reveals that I_i can be negative on any given day! Suppose a shipment of merchandise is received with terms of net thirty. If the merchandise is sold for cash, and is sold out by the twentieth day, then the retailer has, in effect, received an interest free loan from the vendor. This "loan" is equal to the total dollar value of the shipment for days 21 to 30, and is equal to a lesser amount on the preceding days. For illustrative purposes, suppose the shipment were 20 units with a cost of \$10 each. Further assume that the daily selling rate is one unit per day. The "loan" would then be \$10 on day 2, \$20 on day 3, ... and \$200 on days 21 to 30.

A negative CMROI has meaning when contribution margin is negative: the product is a money loser! When contribution margin is positive and average inventory (4) is negative, however, a negative CMROI is grossly misleading. This latter situation is ideal, for it represents the instance of a retailer making money while actually investing none of his own funds. The following convention is suggested to guarantee a positive turnover:

$$\{\$INV_i\} = \text{maximum of } \{\$1, \sum_{i=1}^{n} I_i \div n\} \qquad (5)$$

When (4) is negative or zero, $\{\$INV\} = \$1$. The magnitude (negative or zero) of (4) is then irrelevant for computing CMROI. In any such situation the

retailer has no funds invested in inventory. Setting the denominator at $1.00 is virtually equivalent to "no funds invested," yet it enables the retailer to obtain a positive value for CMROI. The negative magnitude of (4) is captured in the contribution margin.

Contribution Margin

As noted previously, gross margin is the earnings ratio in the traditional GMROI formula. Gross margin does not capture all the important components necessary for merchandising decisions. The necessary adjustments to gross margin which are reflected in contribution margin are now considered.

IE: Interest Expense of Maintaining Inventory. In today's economy, the interest expense of maintaining inventory is much more significant than in the past. Therefore, proper consideration of interest expense becomes more critical. The cost of maintaining an inventory investment is the product of the daily interest rate (r), the magnitude of the investment, and the duration of the investment. Thus, the period of time associated with the terms of sale and the terms of purchase in conjunction with the daily interest rate, impact the interest expense. Mathematically, interest expense is:

$$IE = r \sum_{i=1}^{n} I_i \qquad (6)$$

for whatever duration of time is chosen for investigation. Note that IE is not expressed in terms of $\{INV_i\}$, the convention used to define a negative inventory investment. When $\sum I_i$ is less than zero, a negative IE has meaning. The retailer can invest these "negative" dollars to collect interest. That is contribution margin is enhanced when IE is negative. Further, it is not generally necessary that these dollars be invested. Provided the retailer borrows from a lending institution a negative $\sum I_i$ decreases needed borrowings.

SE: Spatial Expenses of Storing and Displaying Inventory. The cost of displaying and storing merchandise is rarely inconsequential. There is a direct rental expense for the space occupied. A maintenance expense may also be incurred. Even when space is owned there is an opportunity cost in foregone revenues from renting the space to others. It must be emphasized that it is not always advantageous to trace spatial expenses. They should be collected only when the value of the knowledge gained exceeds the gathering cost. In particular, spatial expenses are probably useful for evaluating buyers, departments, or stores. However, it would probably be too difficult and expensive to determine spatial expenses for items and vendors.

The spatial expense for a particular time period is determined by the product of: COST, the value of a square foot of space per day; and SPACE, the average square footage.

The value of a square foot of space per day, COST, is determined by a number of factors. In general, the location of a store determines the average value of space. The value of space in a prime location in a major shopping center is greater than in an average strip shopping location. Within the store, the locations of some departments are more desirable than others. In one major retail department store chain, for example, the value of space is based upon the amount of traffic through the store.[4] The average square footage, SPACE, includes all the space occupied by the merchandise and the display and common areas. By including SE in CMROI, retailers are able to explicitly evaluate the productivity of merchandise with different space requirements.

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[4]Personal communication, Gary Milleson, Vice President of Finance, Sanger Harris Department Stores, a division of Federated Department Stores.

OAE: Other Allocable Expenses. Finally, expenses which are directly associated with merchandise should be incorporated into CMROI. However, overhead or common expenses should not be considered. Workroom expenses are currently included in calculating gross margin. Sales commissions and some direct promotional costs effect return on investment in a similar manner and should therefore be treated in the same fashion.

AN ILLUSTRATION

To illustrate how CMROI can lead to a very different return on investment than GMROI, two typical departments in a department store are examined. Operating characteristics for furniture and Missy sportswear were estimated from median values summarized in the Merchandising and Operating Results of Department and Specialty Stores (1979), and from personal interviews with executives of three major department store chains. The operating characteristics are found in Table 1. The comparative performance measures are summarized in Table 2. The traditional measure for GMROI yields 346% for Missy sportswear and 136% for furniture due to the higher turnover of sportswear. The example is now extended to CMROI.

Average Dollar Investment in Inventory {$INV}

Missy Sportswear. With an inventory turnover of 4.2, the approximate days of supply is 86 (360/4.2). However, since the typical manufacturer's terms of sale are 8%/10/net 30, the manufacturer is financing the inventory 11.6% of the time (10/86). Therefore the revised average inventory investment is reduced to $187,080.

Furniture. Days of supply are approximately 200 (360/1.8). However, the manufacturer provides financing for an average of 75 out of the 200 days, or

37.5% of the time.[5] Therefore, average inventory investment is reduced to $269,375.

Consumer credit by department was unavailable and therefore ignored in this illustration.

Contribution Margin

Assuming an interest rate of 20% compounded annually, the annual inventory interest expense would be $34,610 for sportswear and $49,834 for furniture.[6] The space expense for sportswear is $38,216, and $33,043 for furniture. Note that although the sportswear department utilizes significantly less space than furniture, the cost per square foot is significantly more, since it is located in a higher foot traffic area. No sales commission is paid in sportswear. However a 5% of sales commission is applied to furniture on sales over the salesperson's draw. This commission increases selling expense approximately 1 1/2% above what it would have been without the commission. Therefore, other allocable expenses for furniture is $20,400 ($1,360,000 x .015).

Contribution Margin Return on Investment

CMROI for Missy sportswear is virtually no different than the original GMROI, 352% vs. 346%, respectively. However, the CMROI for furniture imporved by 31% over GMROI, from 136% to 179%. This increase in return on investment

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[5]Interviews indicated that terms for furniture were often 2%/10 days/net 30, but were sometimes extended to 2%/10 days/net 60 E.O.M. It is assumed that the discount is not taken, and the purchase is made in the middle of the month. Therefore, the retailer's inventory is financed for an average of 75 days.

[6]An interest rate that is 20% compounded annually is equivalent to a daily rate of .05% $\left[(1.20)^{1/365}\right]$, or an annual rate of 18.25% compounded daily.

in furniture is significant, especially when one considers that over $20,000 in additonal selling expenses are included in CMROI. Examination of CMROI components indicate that extended financial terms of sale for furniture had the largest impact on CMROI by reducing inventory investment and interest expense relative to Missy sportswear. In addition, although the furniture department utilizes approximately 65% more space than does Missy sportswear, this space is assigned a charge which is almost half the Missy sportswear charge due to the relatively less desirable location. Although the furniture department is clearly a relatively unprofitable department using both GMROI and CMROI, its position is certainly strengthened when the more complete CMROI measure is applied.

DISCUSSION

The preceding illustration indicated the use of CMROI in the evaluation of departments. CMROI can also be utilized as an evaluative aid in judging the relative profitability of specific merchandise items, vendors, channels and buyers. Following is a discussion describing these specific uses and the acquisiton of data for CMROI.

Item Evaluation

CMROI can be used as the citerion for distribution by value reports in which every item is ranked according to CMROI. Such a report would be superior to those currently in use since return on investment is a better measure of productivity than the more commonly used reports based on sales or gross margin.

It is also possible to determine why some items did or did not achieve the target CMROI. Suppose an item yielded a substantially higher CMROI than

anticipated. By investigating the components of CMROI, a merchandise manager may determine that inventory interest expense was less than expected. Then the manager could determine whether the deviation resulted from an unforeseeably low interest rate or a better terms of purchase policy negotiated by the buyer. An understanding of the causes of deviations from the target CMROI leads to insights useful to merchandise managers and buyers for evaluating and rewarding past performance and planning strategy for the future.

Vendor Evaluation

The procedure for evaluating vendors is similar to the procedure for items. That is, low CMROI vendors are candidates for deletion. CMROI is particularly useful for evaluating vendors who pressure retailers into purchasing an entire line when only part of that line is profitable. Only a comparison of vendor CMROIs allows the retailer to evaluate the relative return on investments across vendors and thus determine which vendors should be used.

CMROI is also a useful negotiating tool. Merchandise managers can bargain for better prices, better terms, faster delivery, etc., using the target CMROI as their rationale. They can argue that they will not buy the item or line or will not allocate the amount of space desired by the vendor unless the target CMROI can be reached.

Marketing Channel Evaluation

Retailers are often confronted with the decision of either buying direct from a manufacturer or buying from a wholesaler. Assuming the manufacturer and wholesaler both have adequate supply and can perform the expected services, the decision rests on which source can provide the retailer with the higher CMROI. Gross margin is usually lower when buying from a wholesaler.

However, spatial expense, inventory interest expense and inventory investment are also normally lower since the wholesaler delivers smaller shipments with greater frequency. Without an evaluative tool like CMROI, the interrelationships between these earnings and turnover components may be difficult.

Buyer Evaluation

Buyers should be evaluated on the basis of their overall contribution to corporate profitability, within the constraint imposed by the investment budget available to them. Therefore, CMROI should be an important basis for buyer compensation. The multidimensional nature of CMROI allows buyers flexibility in achieving corporate objectives which are not available using GMROI or other productivity measures. For example, in contrast to the traditional GMROI formula, compensation tied to CMROI encourages buyers to pay attention to space allocation.

Gathering Data for CMROI

Critical to the utilization of CMROI as a managerial tool is the acquisition of timely information on its components. Modern cash registers can act as point-of-sale (P.O.S.) data entry terminals. Combined with their optical character recognition (O.C.R.) capabilities or their ability to read universal product codes (U.P.C.) the data base needed for modern computer based merchandise management is at hand. This equipment along with appropriate software enables managers to manipulate their merchandise mix with control and understanding never possible in the past. Mason and Mayer (1980) have lucidly discussed the potential of this "electronic revolution."

CONCLUSION

Gross margin return on investment (GMROI), a standard merchandise assessment tool, possesses a set of shortcomings. These shortcomings -- exclusion of the spatial expense of storing and displaying merchandise, of the interest expense of maintaining an inventory, and the other allocable expenses associated with selling inventory -- lead to a distorted view of gross margin percentage. Further, the method used for computing average inventory in the GMROI formula ignores the terms of purchase by the retailer as well as the terms of sales to the customer. These factors lead to a bias in inventory turnover. A new, related merchandise assessment tool, contribution margin return on investment (CMROI), has been described. CMROI rectifies the weaknesses inherent in GMROI. Importantly, in times of high interest rates, rising construction costs and rental rates, rapid inflation, and macroeconomic volatility the strengths of CMROI over GMROI become greater.

An illustration was presented to show how two departments could achieve quite different returns on investment using CMROI rather than GMROI. The usage of CMROI was discussed for individual items, vendors, marketing channels and buyers. Finally data requirements for CMROI were reviewed.

TABLE 1

Example Operating Characteristics for Two Departments

Operating Characteristic	Sportswear	Furniture
Net Sales	$1,620,000	$1,360,000
Gross Margin	45.2%	43.1%
Inventory Turnover	4.2	1.8
Average Cost Inventory	$211,630	$431,000
Financial Terms of Sale (AP)	2%/10 days/net 30	2%/10 days/net 60 E.O.M
Annual Interest Rate	20%	20%
Value of Space (COST)	$3.64/sq. ft./yr.	$1.91/sq. ft./yr.
SPACE	10,500 sq. ft.	17,300 sq. ft.
Sales Commission	none	5% of sales over salesperson's draw

TABLE 2

Summary Performance Measures for Two Departments

Performance Measure	Sportswear	Furniture
GMROI	346%	136%
Average Dollar Investment	$187,080	$269,375
Contribution Margin	$659,414	$482,883
CMROI	352%	179%

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