Trade Discount, Cash Discount, Markup, and Markdown

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Trade Discount: Merchandising Chain

$\boxed{\text{Manufacturer}} \longrightarrow \boxed{\text{Wholesaler}} \longrightarrow \boxed{\text{Retailer}} \longrightarrow \boxed{\text{Consumer}}$

- The manufacturer gives a *list price* or *MSRP (Manufacturer's Suggested Retail Price* to the marchandise.

- *Trade discounts* are used at each stage of the merchandising chain to set different price differentials.

- At each stage of the mechandising chain a trade discount is given to the marchandise. The trade discount is lower down the chain to allow for a markup.

- The trade discount from $\boxed{\text{Retailer}}$ to the $\boxed{\text{Consumer}}$ is more appropriatly called a *markdown*.

Trade Discount:

- The *rate of discount* is applied on the list price and the amount of discount is given by

$$\text{Amount of Discount} = \text{Rate of Discount} \times \text{List Price}$$

- The *net price* is the price given to the following marchendiser in the chain, determined by

$$\text{Net Price} = \text{List Price} - \text{Amount of Discount}$$

- The net price can can be calculated directly from the list price and rate of discount by

$$\text{Net Price} = (1 - \text{Rate of Discount}) \times \text{List Price}$$

Trade Discount:

- The ususal notation is obtained by letting N be the net price, L the list price and d the rate of discount. We obtain

  $$N = (1-d)L$$

  where $(1-d)$ is called the *net price factor (NPF)* or *net factor*

Trade Discount: Examples

1. Find the amount of discount, if the rate of discount is 11% and the list price is $\$213.99$.

$$\begin{aligned} \text{Amount of Discount} &= \text{Rate of Discount} \times \text{List Price} \\ &= 0.11(213.99) \\ &= \$23.54 \end{aligned}$$

2. Find the list price, if the rate of discount is 7% and the amount of discount is $\$29.99$.

$$\begin{aligned} \text{Amount of Discount} &= \text{Rate of Discount} \times \text{List Price} \\ \text{List Price} &= \frac{\text{Amount of Discount}}{\text{Rate of Discount}} \\ &= \frac{29.99}{0.07} \\ &= \$428.43 \end{aligned}$$

Trade Discount: Examples

1. Find the rate of discount, if the discount is $\$39.98$ and the list price is $\$429.99$.

$$\begin{aligned}
\text{Amount of Discount} &= \text{Rate of Discount} \times \text{List Price} \\
\text{Rate of Discount} &= \frac{\text{Amount of Discount}}{\text{List Price}} \\
&= \frac{39.98}{429.99} \\
&= 9.3\%
\end{aligned}$$

2. The Agrarian Bike Shop buys a bike for $\$139.99$ less a trade discount of 13%. What amount of discount does the bike shop obtain? What is the NPF? What is the net price?

$$\begin{aligned}
\text{Amount of Discount} &= \text{Rate of Discount} \times \text{List Price} \\
&= (0.13)(139.99) = \$18.20
\end{aligned}$$

$$NPF = (1-d) = 1-0.13 = 0.87$$

$$N = (1-d)L = (0.87)(139.99) = \$121.79$$

Trade Discount: Discount Series

- It is possible at a certain level in the marchandising chain to have multiple trade discount.

- Let $d_1, d_2, d_3, \ldots, d_n$ be a series of trade discounts then *NPF for a Discount Series* is given by

$$(1-d_1)(1-d_2)(1-d_3)\ldots(1-d_n)$$

and it follows that the net price is given by

$$\mathrm{N} = (1-d_1)(1-d_2)(1-d_3)\ldots(1-d_n)L$$

- It is possible to convert a series of trade discounts to a *single equivalent rate of discount* by the following formula

$$\begin{aligned} & 1 - \text{NPF for a Discount Series} \\ = \quad & 1 - [(1-d_1)(1-d_2)(1-d_3)\ldots(1-d_n)] \end{aligned}$$

Trade Discount: Discount Series: Example

- The Agrarian Bike Shop buys a bike helmet for $\$49.99$ less a trade discount of 11%, 5%, 3%. What is the net price of the bike helmet? What is the single equivalent rate of discount?

$$\begin{aligned} N &= (1-d_1)(1-d_2)(1-d_3)L \\ &= (1-0.11)(1-0.05)(1-0.03)49.99 \\ &= \$41.00 \end{aligned}$$

Single Equivalent Rate of Discount

$$\begin{aligned} &= 1-[(1-d_1)(1-d_2)(1-d_3)] \\ &= 1-[(1-0.11)(1-0.05)(1-0.03)] \\ &= 1-0.82 \\ &= 18\% \end{aligned}$$

Payment Terms and Cash Discounts:

- Merchandisers usually sell to each other on credit. An invoice is usually given to the buyer with the *payment terms*. Sometimes the merchandisers that sell the goods offer a *cash discount* to obtain a quick payment.

- The invoice will have the following information:

  - *Rate of discount:* The rate at which the invoice can be discounted if the discounted amount is paid in the discount period.

  - *Discount period:* The time period in which the discount can be applied to the invoice.

  - *Credit period:* The time period in which the invoice must be paid before interest is applied.

- There are three different payment terms commonly used: Ordinnary dating, End-of-the-month dating, Receipt-of-goods dating.

Payment Terms and Cash Discounts: Ordinary Dating

- The most common type of payment terms. The invoice will have the following

  $$\boxed{\text{3/15, n/30}}$$

  where 3% is the rate of discount if paid within 15 days of the date of the invoice. The 15 days is the discount period. The credit period is 30 days, which means the payment must be made within 30 days of the date on the invoice.

- **Example:** An invoice with the net amount of $\$829.12$ is dated June 3 with terms $\boxed{\text{3/10, n/30}}$. If the invoice is paid on June 12 what payment is needed to settle the invoice? If the invoice is paid on June 14 what payment is needed to settle the invoice?

  - Since June 12 is within the 10 days of the invoice the amount to be paid is $(1-0.03)829.12 = \$804.25$.

The payment needed if the invoice is paid on June 13 is the full net amount of $\$829.12$ since June 14 is not within 10 days of the date of the invoice.

Payment Terms and Cash Discounts: E.O.M. Dating

- The invoice will have the following

  2/10, n/30 E.O.M. or 2/10 E.O.M.

  where the discount period is within 10 days following the end of the month which the invoice is dated. The credit period ends 30 days after the end of the month which the invoice is dated.

- **Example:** An invoice with the the net amount of $\$3\,212.23$ has payment terms 2/10 E.O.M. and dated April 27. If the invoice is paid on May 8, what amount needs to be paid? If the invoice is paid on May 13, what amount needs to be paid?

  - Since May 8 is within the discount period the amount to be paid is $(1-0.02)3\,212.23 = \$3\,147.99$.
    The payment needed if the invoice is paid on May 13 is the full net amount of $\$3\,212.23$ since May 13 is not within 10 days of the beginning of the new month.

Payment Terms and Cash Discounts: R.O.G. Dating

- The invoice will have the following

  3/10, n/30 R.O.G.

  where the discount period and credit period start when the goods are received. Therefore the date on the invoice can be ignored.

- **Example:** An invoice with the net amount of $\$879.32$ has payment terms 3/10, n/30 R.O.G. and dated April 27, the goods are received on September 12. If the invoice is paid on September 20, what amount needs to be paid? If the invoice is paid on October 1, what amount needs to be paid?

  - Since September 20 is within the discount period which started when the goods where received the amount to be paid is $(1-0.03)878.32 = \$851.97$.

The payment needed if the invoice is paid on October 1 is the full net amount of $\$878.32$ since October 1 is not within 10 days of the date the goods where received.

Payment Terms and Cash Discounts: Partial Payments

- It is possible for a business to pay part of an invoice during the discount period. Then a discount is applied to the proportion of the amount being paid.

- **Example:** An invoice with the the net amount of $\$567.12$ has payment terms 3/10, n/30 E.O.M.. If the business wants to reduce the debt to $\$300.00$ within 10 days of the following month, how much do they need to pay? If the business pays $\$200.00$ within 10 days of the following month, what is the new balance of the invoice?

  - The business needs to pay $567.12 - 300.00 = \$267.12$ but since they pay within 10 days of the following month they can apply the 3% discount. Therefore they simply need to pay $0.97(267.12) = \$259.11$.

– If the business pays $\$200.00$ it amounts to paying more credit on the invoice since it is within the discount period. It amounts to paying

$$\begin{aligned} \$200.00 &= 0.97(\text{credit}) && (1)\\ \text{credit} &= \frac{200.00}{0.97} && (2)\\ \text{credit} &= \$206.19 && (3) \end{aligned}$$

Therefore the new balance of the invoice is $567.12 - 206.19 = \$360.93$.

Markup

- A business generally seeks to generate a profit. This is done through the business buying and selling activities.

- The following equation governs the profit of a business

$$\begin{aligned} \text{Selling Price} &= \text{Cost of Buying} + \text{Expenses} + \text{Profit} \\ S &= C + E + P \end{aligned}$$

and the *markup* of a business is defined as

$$\begin{aligned} \text{Markup} &= \text{Expenses} + \text{Profit} \\ M &= E + P \end{aligned}$$

Therefore the first equation can be rewritten as

$$\begin{aligned} \text{Selling Price} &= \text{Cost of Buying} + \text{Markup} \\ S &= C + M \end{aligned}$$

Markup: Example

1. The Agrarian Bike Shop buys biking shoes for $\$150.12$ per pair. If the operating cost of the bike shop is 15% of the cost and the owner wants a profit of 5% of the cost. What should be the selling price of the shoes? What is the markup of the shoe pair?

$$\begin{aligned} S &= C+E+P \\ &= 150.12+15\% \text{ of } \$150.12+5\% \text{ of } \$150.12 \\ &= 150.12+0.15(150.12)+0.05(150.12) \\ &= \$180.14 \end{aligned}$$

$$\begin{aligned} S &= C+M \\ M &= S-C \\ &= 180.14-150.12 \\ &= \$30.02 \end{aligned}$$

Markup: Rate of Markup

- There are two different ways to calculate the the rate of markup: based on cost, or based on the selling price.

- Rate of markup based on cost:

$$\begin{aligned} \text{Rate of Markup Based on Cost} &= \frac{\text{Markup}}{\text{Cost}} \\ &= \frac{M}{C} \end{aligned}$$

- Rate of markup based on selling price:

$$\begin{aligned} \text{Rate of Markup Based on Selling Price} &= \frac{\text{Markup}}{\text{Selling Price}} \\ &= \frac{M}{S} \end{aligned}$$

Markup: Example

- The Agrarian Bike Shop buys bicycle bells for $\$4.99$ and the markup is 25% of the selling price. What is the selling price? What is the rate of markup based on the cost?

$$\begin{aligned} S &= C + M \\ S &= 4.99 + 25\% \text{ of } S \\ S &= 4.99 + 0.25S \\ 0.75S &= 4.99 \\ S &= \$6.65 \end{aligned}$$

$$\begin{aligned} S &= C + M \\ M &= S - C \\ M &= 6.65 - 4.99 \\ M &= \$1.66 \end{aligned}$$

$$\begin{aligned} \text{Rate of Markup Based on Cost} &= \frac{M}{C} \\ &= \frac{1.66}{4.99} \\ &= 33\% \end{aligned}$$

Total Cost

- The *total cost* is the cost of buying an item plus the expenses associated to selling the item. This can be represented as follows

$$\begin{aligned} \text{Total Cost} &= \text{Cost of Buying} + \text{Expenses} \\ \text{Total Cost} &= C + E \end{aligned}$$

- If the selling price is equal to the total cost of an item, then the item is sold at the *break-even* point. If the selling price is more than the cost of buying but less than the total cost then the item is sold at an *operating loss*. If the item is sold at a selling price less than the cost of buying the item is sold and a *total loss*.

- Profit can be determined by the the following formula involving the total cost,

$$\text{Profit} = \text{Selling Price} - \text{Total Cost}$$

Markdown

- A *markdown* is a reduction in the price of an item sold to the consumer. It is applied to the *regular selling price* and becomes the *sale price*.

$$\text{Sale Price} = \text{Regular Selling Price} - \text{Markdown}$$

- The markdown is usually given as a percent and is applied to the selling price like a trade discount. If $d\%$ is the markdown then

$$\text{Sale Price} = (\text{1-d})\text{Regular Selling Price}$$

Total Cost and Markdown: Example

- The Agrarian Bike Shop sells bike gloves for $\$19.99$. The store's expenses are 20% of the cost and the shop requires a profit of 25% of the cost. What is the cost of the bike gloves for the bike shop? What is the maximum rate of markdown for the store to break-even? What is the maximum rate of markdown for the store before suffering an abosolute loss?

  - First the cost of the bike gloves is determined

$$\begin{aligned} S &= C + E + P \\ 19.99 &= C + 20\% \text{ of } C + 25\% \text{ of } C \\ 19.99 &= 1.45C \\ \$13.79 &= C \end{aligned}$$

  - Secondly the total cost is determined and then the rate of markdown with the total price as the sale

price.

$$\begin{aligned}\text{Total Cost} &= C+E \\ &= C+20\% \text{ of } C \\ &= 1.2C \\ &= \$16.54\end{aligned}$$

$$\begin{aligned}\text{Rate of Markdown} &= \frac{\text{Markdown}}{\text{Regular Selling Price}} \\ &= \frac{19.99-16.54}{19.99} \\ &= 17\%\end{aligned}$$

Therefore the store can offer a discount of 17% and break-even.

– The maximum rate of markdown for the store before suffering an absolute loss is a markdown resulting in the selling price being the cost paid for the gloves.

$$\begin{aligned}\text{Rate of Markdown} &= \frac{\text{Markdown}}{\text{Regular Selling Price}} \\ &= \frac{19.99-13.79}{19.99} \\ &= 31\%\end{aligned}$$