International Review of Business Research Papers
Vol. 8. No.5. July 2012. Pp.16 – 30

FMCG Portfolio Budget Allocation to Price Promotions Using Modern Portfolio Theory (MPT)

Juan Franco-Laverde[1], Andrew Littlewood[2], Craig Ellis[3], Ingrid Schraner[4] and Maria-Estela Varua[5]

Marketing managers seek to maximise the return of their marketing portfolio investment and, as a result, create shareholder value. There has been some application of MPT in marketing as a means to optimize the portfolio. Previous applications have had limitations, namely that marketing lacks a fixed index of comparison and the return of an asset varies with differing levels of marketing spend support. This study focuses on use of MPT in price promotions, which have become a key component in the marketing mix of stimulating sales, particularly in the FMCG environment. The hypothesis of this paper is that previous limitations of MPT in marketing can be overcome through use of brackets of price promotion. This is proven through study of FMCG data and it is shown that price promotions can be optimized to improve return without increased risk.

1. Introduction

Marketers have a clearly defined role in the organisation. They must manage marketing productivity and the marketing mix effectively (Hacioglu, 2010). Key to this is delivering optimal return for their investment and, as a result, they create shareholder value (Doyle, 2000). Managing and executing promotional activities makes up around a third of responsibility (Hacioglu, 2010). As a result, control and understanding of price promotions is a key part of the marketer’s success.

This research paper aims to apply financial techniques to analysing and optimising price promotions, namely Modern Portfolio Theory (MPT). MPT concerns itself with the construction of optimal portfolios to balance risk and return. The application of MPT in marketing is not new, it has previously been applied to portfolios of brands, markets, consumer segments and campaigns to allocate marketing budgets. However all applications have struggled with the lack of an index or fixed return (both common in financial markets). This research studies a completely new area: price promotion and delivers a robust application of MPT in marketing, overcoming the limitations of previous studies, namely the lack of index for comparison and a fixed return.

[1] Juan Franco-Laverde is a PhD student and University of Western Sydney and the Director of marketing analytics company MediaCom Business Science (juan.franco@mediacom.com)
[2] Andrew Littlewood is the Chief Data and ROI Officer of marketing analytics company MediaCom Business Science (andrew.littlewood@mediacom.com)
[3] Craig Ellis is an Associate Professor at University of Western Sydney
[4] Dr. Ingrid Schraner is a Senior Lecturer in Economics and Finance, Coordinator Community Engagement School of Economics and Finance at University of Western Sydney
[5] Dr. Maria-Estela Varua is a Lecturer in Economics and Finance at University of Western Sydney

The paper takes the following structure:

Literature Review: This section firstly classifies the specific price promotions we are analyzing, then moves on to dissect previous marketing applications of MPT.

The Methodology and Model: This section explains how MPT can be applied to price promotion; it also provides an overview of the methods used.

The Findings: This section presents and explains our empirical results utilising the data of a large FMCG dietary supplements provider.

Summary and Conclusions: This section summarises the key theoretical findings.

2. Literature Review

Price promotions at wholesale and retail levels are a ubiquitous phenomenon (Cao, 2011). Although there are numerous definitions of price promotion, they have in common the stimulation of sales in a pre-determined temporary and limited time with the overarching aim of increasing consumer demand, motivating market demand or improving product availability. This definition has led to a segmentation of price promotion into two main kinds; price promotions targeted at retailers and wholesalers known as trade price promotions; and sales promotions targeted at the consumer which are called consumer price promotions.

This research paper focuses on consumer price promotions. Thus, the other consumer sales promotions techniques (Coupons, multi-buys, twin packs, more product for the same price, premiums, games, everyday low prices etc.) are left out for further research. The use of price promotions within the FMCG industry in Australia has become increasingly popular as a key driver of sales for brands fighting for retailers' shelf space and brand managers trying to hit companies' specific targets. In combination with advertising, these activities aim to improve or maintain the position that a specific brand holds in the market place (Franco Laverde, 2008).

The area of consumer price promotion is a contentious one. Many authors have cited the damaging effects of promotion on brand equity (Angel F. Villarejo-Ramos, 2005). It has been proven that promotions can have both positive and negative effects on consumer behaviour in the short and long term (Lichtenstein, 1993). Despite this, there can be many other reasons for executing price promotion, including maintaining shelf space, reducing stock surplus, sales targets and maintenance of relationships with retailers (Ehrenberg, 2001). We can conclude therefore that price promotions will continue to be a fixed part of the retail landscape. They have become a key tool in the marketing arsenal (Raju & Srinivasan, 1990).

Price promotion has inherent risk (a promotion may not be effective or it may be very effective) and as such a concern of the marketer must be to minimise this risk. This analogy draws parallels with financial markets and, in particular, Modern Portfolio Theory (MPT). MPT asserts that investors are risk averse. The hypothesis is that investors would like to earn as much return as possible for any given level of risk. Investors construct portfolios to optimise or maximise the expected return, based on a given level of market risk (Markowitz, 1952). MPT represents one the great advances in finance (Benninga, 2001). According to the theory, it's possible to construct an efficient frontier of optimal portfolios offering the maximum possible expected return for a given level of risk.

Whilst there is a substantial amount of research to be found on the applications of MPT in financial markets, research on applications in fields other than finance is more limited. Most research outside of finance, specifically in marketing, has focused on brand or product portfolio management and brand or product investment. This research argues that it is possible to create a product portfolio equivalent of an efficient frontier in a similar way to MPT (Cardozo & Smith, 1983).

The paper by Cardozo & Smith (Cardozo & Smith, 1983) did generate criticism (Devinney, et al., 1985) and several problems were identified associated with the extension of financial portfolio theory to product investment of the firm. They cite that Cardoso and Smith’s article showed theoretical misunderstanding in two ways. Firstly, the data was inappropriate for the empirical analysis used. Secondly, there is not a priori reason why the firm should be limited to only its current investment. Cardoso and Smith replied (Cardozo & Smith, 1985) to their criticism on systematic risk or market risk, pointing out that unfortunately there exists no ambiguously defined market or index against which to compare performance of a particular business unit. This suggested that MPT would require modification if applied in marketing.

A further study explores return maximisation and risk minimisation in the marketing portfolio (Ryals, et al., 2007). A model calculating the efficient frontier is developed helping selection of optimal marketing portfolios, specifically in relation to portfolios of brands, markets, consumer segments and campaigns. The study highlights the key issue that varying allocations of marketing spend affect the returns from the portfolio assets, pointing out that returns in marketing (sales) are acutely sensitive to levels of marketing investment. The study addresses this issue by applying sales response curves: curves that take into account the diminishing relationship between increased marketing spend and returns. Whilst this is an elegant solution, it could be argued that an increased level of interpretation (the introduction of the theoretical curves), moves this study away from pure empiricism.

This research paper builds on the previous work on two ways. Firstly despite some of the attention given to the application of MPT in marketing, none of the theory or techniques in MPT have been previously applied to price promotions in the FMCG industry. Secondly this study applies a different technique to tackle the previous problems of a lack of a fixed index and marketing returns sensitivity in varying levels of invested marketing spend

The hypothesis of the study is that assets of the portfolio (price promotions) can be grouped into brackets. By doing this we avoid the need for an index of comparison or the incorporation of response curves, instead using the brackets as the mechanism to reallocate the portfolio.

3. The Methodology and Model

Applying MPT to Price Promotion

The first step of MPT involves the calculation of return and risk of the assets within the given portfolio. Within the price promotions arena this equates to the computation of promotional return (promotional yield) and return volatility (promotional yield changes, at the same discount level). Risk will be measured as the standard deviation of weekly promotional sales at a given promotional discount and the computation of return on investment will follow the Neslin and Van Heerde approach (Neslin & Van Heerde, 2008), where:

π_o = Manufacturer profits without promotion
π_p = Manufacturer profits with promotion
M_o = Normal profit margin for manufacturer
δ = Trade deal discount offered by manufacturer
S_o = Normal (baseline sales) per week
Δ= Increase in sales per week during promotion
$\pi_p - \pi_p$ = Change in profit due to a promotion

Following these definitions, we have:

$$\pi_o = S_o * M_o$$
$$\pi_p = (S_o + \Delta)(M_o - \delta)$$
$$\pi_p - \pi_o = \Delta(M_o - \delta) - S_o\delta$$

The previous equation is broken down in two parts; the first term is the increase in profits due to selling Δ more units during the promotion week, albeit at a reduced margin of $M_o - \delta$. The second term reflects lost contribution from baseline sales during the promotion week (we have sacrificed δ per unit on those sales). Note that we have not worked out any pre or post promotional gain/loss as this topic has been left out for future research.

π_p will always generate a static profit disregarding the variation in Δ and for the purposes of this research paper we need a dynamic metric rather than a static one. Thus, an additional calculation needs to take place in order to account for the increase in sales during the promotion linked to the trade deal discount offered by the manufacturer (δ). Then, the following equation unfolds:

$$\frac{\pi_p - \pi_o}{\delta} = \frac{\Delta(M_o - \delta) - S_o\delta}{\delta} = \frac{\Delta\pi}{\delta}$$

The above equation is simply a dynamic ratio between the change in profit to trade deal discount, which varies with Δ and δ accordingly. It can also be understood as the ratio of incremental profit to promotional spend. In addition, we can also work out a ratio between incremental turnover to promotional spend as follows:

$W_p =$ Wholesale price
$T_o =$ Turnover without promotion = $W_p * S_o$
$T_p =$ Turnover with promotion = $(W_p - \delta)(S_o + \Delta)$

$$\frac{T_p - T_o}{\delta} = \frac{\Delta\left(W_p - \delta\right) - S_o\delta}{\delta} = \frac{\Delta T}{\delta}$$

The former two ratios, change in profit to trade deal discount and change in turnover to trade deal discount allow us to have the variation we are looking for on a set of promotions in order to compute the required risk and return for application of MPT.

Profit and cost per unit information is considered confidential by manufactures and is not publicly available, so this paper has also developed an additional option: starting from shelf price rather than wholesale price, which does not take into account profit and cost per unit information. This measure is known as promotional yield, where:

$P_o =$ Shelf price without promotion
$V_o =$ Value sales without promotion
$V_p =$ Value sales with promotion

Adding these definitions to the previous ones, we have:

$V_o = P_o * S_o$
$V_p = (S_o + \Delta)(P_o - \delta)$
$V_p - V_o = \Delta(P_o - \delta) - S_o\delta = \Delta V$

Promotional yield ratio is then defined as incremental sales divided by δ as follows:

$$\frac{V_p - V_o}{\delta} = \frac{\Delta(P_o - \delta) - S_o\delta}{\delta} = \frac{\Delta V}{\delta}$$

The average of the historic promotional yield data represents the expected returns from each product while the risk is measured in terms of the standard deviation.

We then utilise this data in construction of an MPT portfolio. From MPT, the definition of expected portfolio return is the weighted average return of the component products. However, the portfolio's variance is not the average of the component products. Thus, the portfolio's expected return and variance are defined as:

$$E\left(r_p\right) = \sum_{i=1}^{n} \omega_i \, \mu_i$$

$$\sigma_p^2 = \sum_{i=1}^{n} \omega_i^2 \, \sigma_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} \omega_i \, \omega_j \sigma_i \sigma_j \rho_{ij}$$

$i \neq j$

Where;

n = Number of products within the portfolio
$E(r_p)$ = Expected portfolio return
ω_i = Proportion invested in each product
μ_i = Expected return of each product
σ_p^2 = Variance of portfolio return
σ_i^2 = Variance of product i return
σ_j^2 = Variance of product j return
ρ_{ij}= Correlation between the returns of products i and j

The expected return of the portfolio $E(r_p)$ is then a function of the proportion of the investment in each product ω_i and the expected return of that product μ_i while the portfolio's variance depends on the variance of product returns for individual products i and j (σ_i^2, σ_i^2), the proportion of investments on products i and j (ω_i, ω_j), and the correlation between the returns of products i and j (ρ_{ij}).

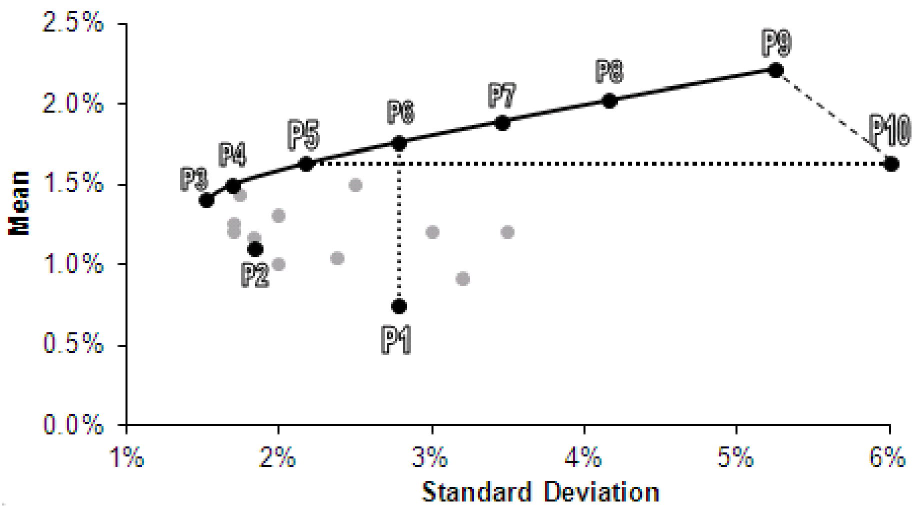
Portfolio theory ranks portfolios according to expected return and risk. The use of these attributes to rank portfolios is known as the mean-variance approach to portfolio analysis and selection. The following rules apply:

1. First, the portfolio with the higher expected return is preferred if both portfolios have the same level of risk (standard deviation). Thus P6 is preferred to P1. See FIGURE 1.

2. Second, the portfolio with the lower risk is preferred if both portfolios have the same level of expected return. This means that P5 is preferred to P10. See FIGURE 1.

3. Third, the portfolio with the lower risk and higher return is preferred. This means that P10 is inferior to P9. See FIGURE 1.

Figure 1: The efficient frontier and portfolio selection

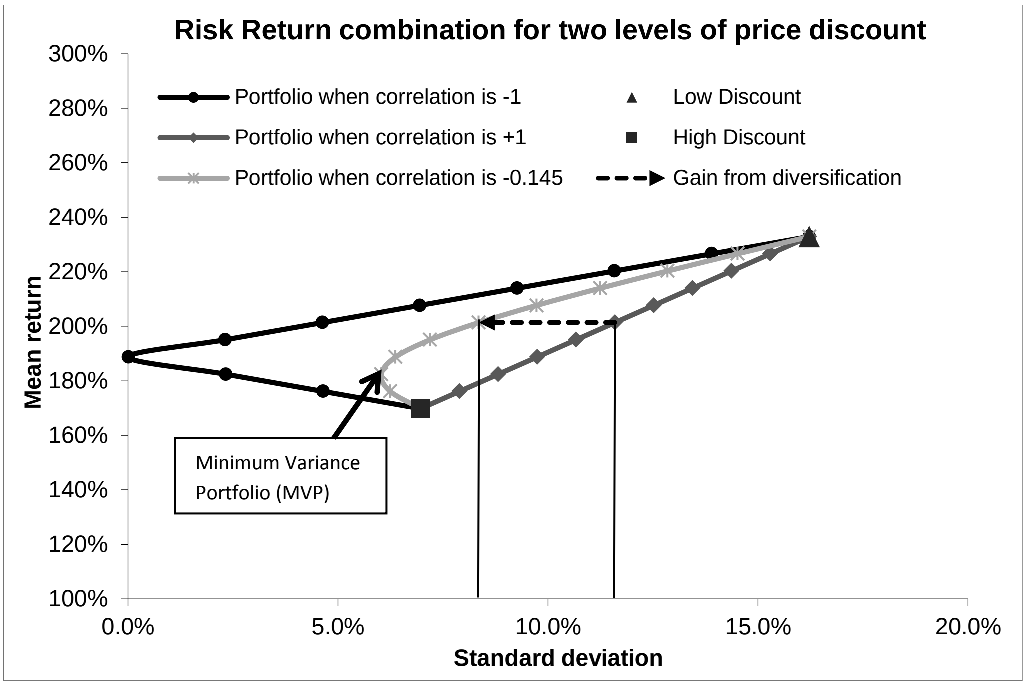


Among all attainable portfolios, the first ranking rule alone filters out a set of portfolios known as efficient portfolios (P3 to P9). The dash curve that joins the risk return combinations of all the efficient portfolios is known as efficient frontier. These ranking rules allow investors to remove the inferior portfolios with risk return combinations that lie below the efficient frontier.

Diversification in a Simple Two Levels of Price Discount Portfolio

Let's assume that we invest 50% of promotional spend in high promotional discount and 50% in low discounts. By diversifying promotional spend across different discount levels; overall portfolio risk can be reduced for a given level of returns. This principle is demonstrated in FIGURE 2.

Figure 2: Risk Return combination for two levels of discount, high and low.



From FIGURE 2 we can see that when the correlation is equal to +1, the portfolio expected return is 200% and its standard deviation is greater than 10%. This standard deviation is then the benchmark against which any benefit of diversification is gauged. In general terms, product returns are less than perfectly correlated. Thus, -1< ρ_{ij} <+1. When ρ_{ij}=-1, the risk/return combinations plot within the triangle of FIGURE 2. The measured correlation between high and low returns for 12 hypothetical price promotions is -14.5, which generates a standard deviation less than 10% on the curve. The benefit of diversification is much less than the extreme case when ρ_{ij}=-1. However, it is still substantial because the portfolio return standard deviation has been reduced from 11.6% to 8.3%.

Extension to Multiple Levels of Price Discount Portfolio

The covariance between return i and return j is defined as $\sigma_{ij} = \sigma_i\sigma_j\rho_{ij}$. Thus, the portfolio variance can be re-written as follows:

$$\sigma_p^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} \omega_i \, \omega_j \sigma_{ij}$$

The efficient frontier is the portfolio of products that give the lowest variance of return of all portfolios with the same expected return or simply an efficient portfolio has the highest expected return of all portfolios having the same variance.

The objective is to minimise σ_p^2 subject to constrains:

$\sum_{i=1}^{n} \omega_i \, \mu_i = E(r_p)$ at a desired value, k

$$\sum_{i=1}^{n} \omega_i = 1$$

σ_p^2 and $E(r_p)$in matrix notation are written as

$\sigma_p^2 = w^{'}\Omega \, w$,
$E(r_p) = w'R$; where

W': (1*n) row vector of weights
R: (n*1) column vector of expected returns
Ω: (n*n) covariance matrix

The matrix representation of these constrains is:

B * w = b

$$\begin{bmatrix} 1 & ... & 1 \\ R_1 & ... & R_n \end{bmatrix} \begin{bmatrix} w_1 \\ ... \\ w_n \end{bmatrix} = \begin{bmatrix} 1 \\ k \end{bmatrix} ,$$

where

B is a (2 * n) matrix of 1's and asset returns, R.
b is a (2 * 1) column vector with elements 1 and the desired minimum variance return, k.

Minimising σ_p^2 subject to B*w = b has the solution

$$w_k = \Omega^{-1} B^{'} \left(B \Omega^{-1} B^{'} \right)^{-1} b$$

The global minimum variance portfolio (MVP) has the solution

$w^* = (\Omega^{-1} i)/(i^{'\Omega^{-1}} i)$, *i* is a (n * 1) column vector of probabilities = 1.

The return and risk of the global minimum variance portfolio (MVP) are:

$$E\left(r_p^* = w'^* R\right)$$

$$\sigma_p^{2*} = \left(i'\Omega^{-1} i'\right)^{-1}$$

In MPT returns are set by the market and are not affected by the level of investment. Returns for price promotions differ as they are affected by the level of discount (promotional spend). To overcome this issue we propose to split promotions into brackets: Low, Medium, High and Deep promotions. The specific levels for each (Low and High) are defined by the distribution for a specific product through intra category study. This classification avoids the need to calculate the portfolio return as a function of the varying spends as highlighted by Ryals, Dias and Berger (Ryals, et al., 2007).

Applying the previous methodology starting with two levels of price promotions; high and low, and then moving on to a four price promotional setting in the findings section we can show that random portfolios are inferior that optimised portfolios.

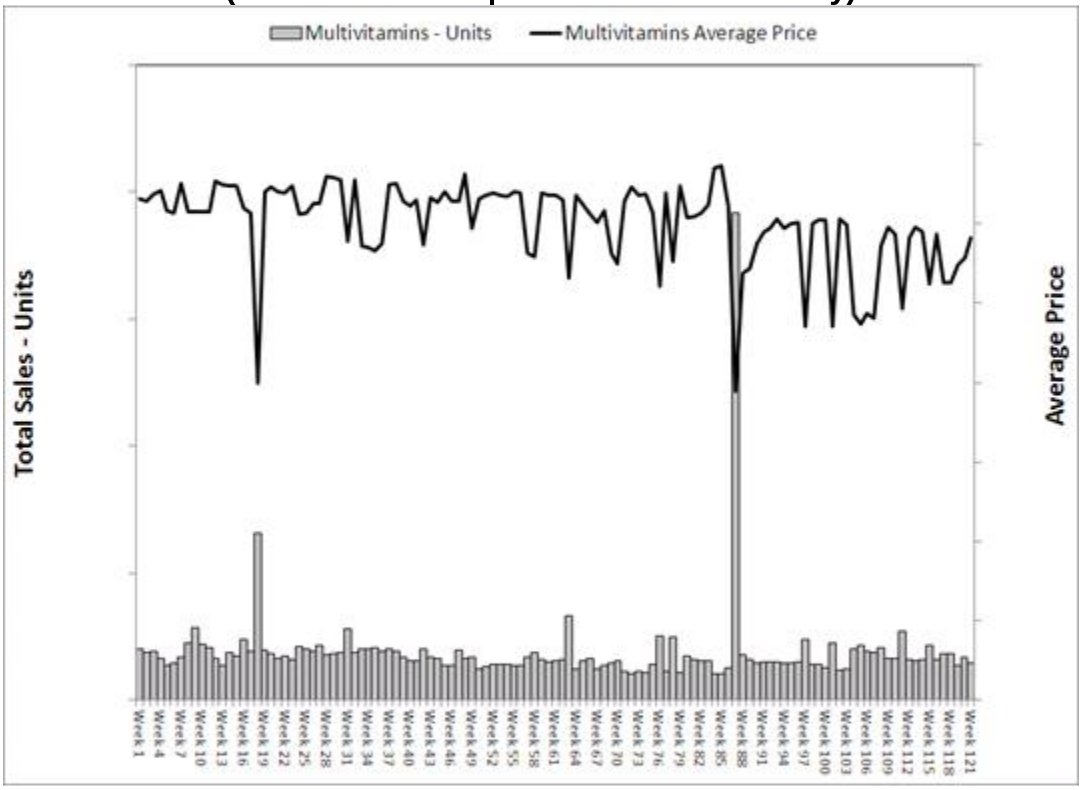
4. The Findings

Empirical Testing: Australian Dietary Supplements Category

Weekly sales from January 2009 to May 2011 (121 observations) are used to identify weeks on and off promotion. In the FMCG industry two years of data usually suffices as comparisons are mostly done from previous year to current in order to plan for the year ahead. For the purpose of this research it is important that the data at hand depicts sufficient variation during the study sample so that MPT can be then applied.

Taking data for one product we initially classify two levels of price promotion; Low and High. FIGURE 3 shows weekly unit sales and price data for a major retailer in the Australian supermarket industry.

Figure 3: Price and unit sales trends for sales in a major supermarket (axis removed to preserve confidentiality)



We can observe that different price discounts have been used by the manufacturer. A total of 36 price promotions during the period of study were identified, of which 18 are categorised as low price discounts and 18 as high price discounts. TABLE 1 shows the promotional yield ratio previously explained in the methodology section for Low and High price discounts and the required statistical information to work out price volatility (risk) and promotional return. For the purposes of this paper we avoid the use of profit and cost per unit as they are confidential to the manufacturer. Formulas to apply these measures have been provided in the methodology section.

Table 1: Promotional yield ratio

	Promotional Yield Ratio	
Observations	Low	High
1	338.5%	101.9%
2	641.7%	-43.2%
3	519.2%	-41.3%
4	339.7%	-81.4%
5	270.4%	129.8%
6	185.4%	230.1%
7	155.0%	199.6%
8	74.9%	307.5%
9	-34.9%	123.6%
10	9.6%	106.3%
11	518.1%	85.4%
12	429.7%	71.7%
13	484.2%	95.2%
14	140.7%	109.6%
15	768.9%	110.3%
16	117.1%	93.8%
17	32.6%	76.4%
18	27.6%	139.2%

	Low	High
Variance	536.0%	82.3%
Standard Deviation	231.5%	90.7%
Mean	278.8%	100.8%
Covariance	-1.0060	
Correlation	-0.4790	
Share of spend	14%	86%

The principal of diversification can be clearly explained in TABLE 2 where we make use of the Sharpe ratio (Sharpe, 1966) to rank portfolios. The Sharpe ratio is simply the ratio of portfolio's expected return minus risk free divided by portfolio's standard deviation: $\left(S = \frac{E(r_p)-Rf}{\sigma_p}\right)$.

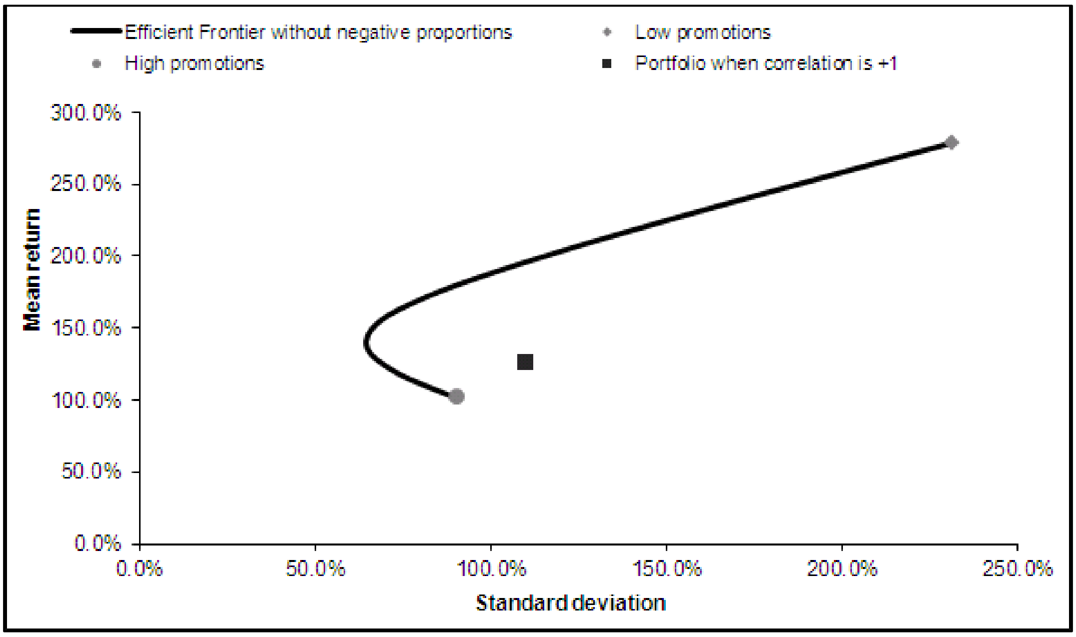
Table 2: Sharpe ratio at different proportions of portfolio

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
Spend on Promotion		Portfolio ρ = 1			Portfolio ρ = -0.48		
Low	High	Risk	Return	Sharpe Ratio	Risk	Return	Sharpe Ratio
100%	0%	231.5%	278.8%	1.20	231.5%	278.8%	1.20
90%	10%	217.4%	261.0%	1.20	204.2%	261.0%	1.28
80%	20%	203.3%	243.2%	1.20	177.2%	243.2%	1.37
70%	30%	189.3%	225.4%	1.19	150.9%	225.4%	1.49
60%	40%	175.2%	207.6%	1.18	125.6%	207.6%	1.65
50%	50%	161.1%	189.8%	1.18	102.1%	189.8%	1.86
40%	60%	147.0%	172.0%	1.17	81.9%	172.0%	2.10
30%	70%	132.9%	154.2%	1.16	68.0%	154.2%	2.27
20%	80%	118.9%	136.4%	1.15	64.7%	136.4%	2.11
10%	90%	104.8%	118.6%	1.13	73.4%	118.6%	1.62
0%	100%	90.7%	100.8%	1.11	90.7%	100.8%	1.11

When correlation is equal to 1 the results are given in columns 3 to 5. The actual situation for our low and high promotions is described in columns 6 to 9. As expected, the price volatility for the portfolios when correlation is equal to 1 is higher than those with an actual correlation of -0.48.

In the case of correlation equal to 1 the Sharpe ratio is at its highest when the proportion of low promotions is about 80% to 100%. However, with an actual correlation of -0.48 the Sharpe ratio is at its highest when spending 30% on low promotions and 70% on high promotions, which differs from the current 14% spend on low promotions and 86% on high. FIGURE 4 illustrates the concept of diversification.

Figure 4: Portfolio mean and standard deviation at varying proportions of high and low promotions



Empirical testing: Australian Dietary Supplements Category – Extension to Four Levels of Discount

Price promotions are now split in four brackets; Low, Medium, High, and Deep. TABLE 3 describes the actual data in the multivitamins category for one retailer.

Table 3: Four levels of promotional discount

	Promotional Yield Ratio			
Observations	***Low***	***Medium***	***High***	***Deep***
1	338.5%	185.4%	-43.2%	101.9%
2	641.7%	155.0%	-41.3%	123.6%
3	519.2%	74.9%	-81.4%	106.3%
4	339.7%	-34.9%	129.8%	85.4%
5	270.4%	9.6%	230.1%	71.7%
6	518.1%	140.7%	199.6%	95.2%
7	429.7%	117.1%	307.5%	109.6%
8	484.2%	32.6%	93.8%	110.3%
9	768.9%	27.6%	139.2%	115.6%

Variance-Covariance matrix				**Mean Returns**
2.2089	0.1442	-0.4050	0.1744	4.7893
0.1442	0.4994	-0.2813	0.0488	0.7866
-0.4050	-0.2813	1.6177	-0.0765	1.0377
0.1744	0.0488	-0.0765	0.0230	1.0050

Making use of matrix algebra we can easily discern the variance-covariance matrix needed to the calculation of portfolio's risk and return.

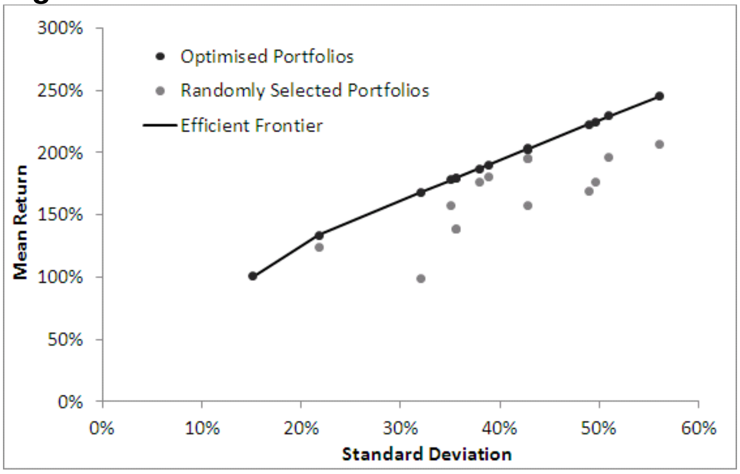
Our final step involves the optimisation process, described previously, to improve promotional return given a certain level of risk. To this end, we select 14 random portfolios and then we optimise one by one subject to fixing the price volatility (risk) as per the random ones in order to improve promotional return. TABLE 4 describes this situation.

Table 4: Random porfolio returns at four discount levels

Random Portfolios	Low	Medium	High	Deep	E(Rp)	S.D.p	Optimised Portfolios	Low	Medium	High	Deep	E(Rp)	S.D.p
P1	6%	8%	16%	70%	123%	22%	Eff-P1	9%	12%	9%	70%	134%	22%
P2	10%	20%	30%	40%	139%	36%	Eff-P2	21%	24%	13%	42%	180%	36%
P3	20%	30%	40%	10%	177%	50%	Eff-P3	33%	35%	18%	14%	225%	50%
P4	21%	25%	25%	29%	180%	39%	Eff-P4	24%	27%	14%	35%	190%	39%
P5	25%	10%	35%	30%	196%	51%	Eff-P5	34%	37%	18%	11%	229%	51%
P6	25%	25%	25%	25%	195%	43%	Eff-P6	27%	30%	16%	27%	203%	43%
P7	15%	20%	35%	30%	158%	43%	Eff-P7	27%	30%	16%	27%	203%	43%
P8	28%	18%	40%	14%	207%	56%	Eff-P8	38%	41%	20%	1%	245%	56%
P9	15%	10%	25%	50%	158%	35%	Eff-P9	21%	24%	13%	43%	178%	35%
P10	20%	30%	25%	25%	176%	38%	Eff-P10	23%	26%	14%	37%	187%	38%
P11	10%	20%	30%	40%	139%	36%	Eff-P11	21%	24%	13%	42%	180%	36%
P12	18%	25%	40%	17%	169%	49%	Eff-P12	32%	35%	17%	15%	223%	49%
P13	0%	50%	0%	50%	99%	32%	Eff-P13	18%	21%	12%	49%	168%	32%
P14	25%	25%	25%	25%	195%	43%	Eff-P14	27%	30%	16%	27%	203%	43%

The efficient frontier can be plotted from the optimised portfolios. In addition to the efficient frontier we add the random portfolios on to a graph to illustrate the meaning of attainable portfolios and how the ranking rules are used to filter out the efficient portfolios. FIGURE 5 depicts this situation.

Figure 5: The efficient frontier at four discount levels



The random portfolios are not efficient as none of them lie on the efficient frontier. Thus, managers would prefer portfolios that fall on the efficient frontier rather than the ones below it. In practice, the preferred portfolio will depend on manager's risk preferences. The actual situation for the multivitamin product is given in P1 in TABLE 4 where the spend allocation equaled 6%, 8%, 16%, and 70% for each promotional brackets respectively (Low, Medium, High, and Deep). P1 has generated a standard deviation of 22% and a return of 123%. The optimisation procedure given in Eff-P1 has improved the promotional return to 134% with a split spend of 9%, 12%, 9% and 70% respectively. Note that while low and medium spend have increased their share, high did decrease it and deep remained steady.

This demonstrates that the use of MPT technique can be employed by managers to improve returns given the same level of risk when planning ahead for price promotions based on historical performance. Although this study has been limited to one product, the application of MPT would be extended to two or more products, segments or categories; something that the authors are currently working on as FMCG multi-brand manufacturers will be interested on to better allocate promotional spend across brands.

5. Summary and Conclusions

Marketing managers seek to maximise the return of their marketing investment and as a result create shareholder value. Price promotions have become a key component in the mix of stimulating sales, particularly in the FMCG environment. Whilst the merit of price promotions is debated, they service nefarious needs of marketers making them a fixed component of the marketing mix. The need is therefore to optimise these to the greatest effect.

This research provides an elegantly simple solution to an area that concerns marketing managers' time. Specifically FMCG marketing managers can now identify the associated risk in deployment of different discount levels in price promotion. They can then optimise the mix of these activities to minimise risk and maximise return. The study shows that by classifying price promotions into brackets, and then utilising MPT to re-allocate across these brackets return can be improved with no further risk.

The key limitations in this research are that external factors (advertising and in store) and competitive pricing (relative price) cannot be accounted for. Whilst, some of these factors are encompassed in the return calculation ($E(r_p)$, we recommend further research to include these factors.

References

Angel F Villarejo-Ramos, M J S-F 2005, 'The impact of marketing communication and price promotion on brand equity' *Brand Management,* Vol. 12, No. 6, pp. 431-444.

Bell, D R, Chiang, J & Padmanabhan, V, 1999 'The Decompositionof promotional response: An empirical generalization', *Marketing Science,* Vol. 18, Issue 4, pp. 504-526.

Benninga, S, 2001, *Financial Modeling,* 2nd edition, MIT Press, London.

Blattberg, R & Neslin, S, 1990, *Sales Promotion: Concepts, Methods,and Strategies,* Englewood Cliffs, Prentice Hall, New Jersey.

Cao, W, 2011, 'Another Look at Price Promotion', *The Journal of Industrial Economics,* Vol. LIX, pp. 282-295.

Cardozo, R N & Smith, D K, 1983, 'Applying Financial Portfolio Theory to Product Portfolio Decisions: An Empirical Study', *Journal of Marketing,* Vol. 47, Issue 2, pp.110-119.

Cardozo, R N & Smith, D K, 1985, 'On the Use of Financial Portfolio Theory in Marketing Decisions: A Reply to Devinney', Stewart, and Shocker *Journal of Marketing ,* Vol. 49, Issue 4, pp. 113-115.

Devinney, T M, Stewart, D W & Shocker, A D, 1985, 'A Note on the Application of Portfolio Theory: A Comment on Cardozo and Smith', *Journal of Marketing,* Vol. 49, Issue 4, pp. 107-112.

Doyle, P, 2000, *Value-Based Marketing: Marketing Strategies for Corporate Growth and Shareholder Value,* John Wiley & Sons, West Sussex.

Ehrenberg, A, 2001, 'The Case Against Price-related Promotions' *Admap,* Issue 418.

Franco Laverde, J C, 2008, *Confirmation of Candidature - PhD thesis degree,* Universitiy of Western Sydney, Sydney.

Hacioglu, O G a G, 2010, 'The organizational roles of marketing and marketing managers', *Marketing Intelligence & Planning,* Vol. 28, No. 3, pp. 291-309.

Lichtenstein, D R, 1993, 'Price Perceptions and Consumer Shopping Behavior: A Field Study', *Journal of Marketing Research,* Vol. 30, pp. 234-245.

Markowitz, H M, 1952, 'Portfolio Selection', *Journal of Finance,* Vol. 7, No. 1, pp. 77-91.

Neslin, S A & Van Heerde, H J, 2008, 'Promotion Dynamics', *Foundations and Trends in Marketing,* Vol. 3, No. 4, pp. 177–268.
Raju, J S & Srinivasan, V a L R, 1990, 'The Effects of Brand Loyalty on Competitive Price Promotional Strategies' *Management Science,* Vol, 36, Issue 3, pp. 276 - 304.
Ryals, L, Dias, S & Berger, M, 2007, 'Optimising marketing spend: return maximisation and risk minimisation in the marketing portfolio', *Journal of Marketing Management,* Vol. 23, Issue 9-10, pp 991-1011.
Sharpe, W F, 1966, 'Mutual Fund Performance', *Journal of Business,* pp. 119–138.