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The effects on stock return of consumer electronic industry through marketing communication productivity

Tser-Yieth Chen¹*, Tsai-Lien Yeh² and Ya-Ting Jhang¹

¹Graduate Institute of International Business, National Taipei University, No. 151, University Road, Sanhsia Distrist, 23745, New Taipei City, Taiwan.
²Department of International Business, Ming Chuan University, No.250, Sec.5, Zhong Shan N. Rd, Taipei, 11141, Taiwan.

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This research investigates that whether annual DEA efficiency, firm size, company ages and R&D influence ROA (return on asset) and then further to the stock returns. We use DEA and regression to test the hypothesis and collect the data from the electronic industry of Taiwan from 2006-2009. The empirical results indicate that company ages significantly influence stock return in annual year; firm size significantly influences stock return in the long run. Marketing communication expenditures is really do influence ROA no matter in the short or long run. Consequently, marketing managers in electronic industry of Taiwan can use empirical results to develop their marketing communication strategy and make their performance of firm become more efficiency on their appropriate management treatments.

Key words: Data envelopment analysis, research and development, marketing communication productivity.

INTRODUCTION

It is no doubt that marketing communications plays an even more important role in marketing than ever before due to the serious competition (Palanivelu and Sureshkumar 2010). The accountability of marketing communication expenditures, e.g., advertising and sales promotions have long been concerned about by marketing scholars and practitioners (Luo and Donthu, 2006). But how does the marketing communication works? Are they efficient enough as they cost? What are the influential success factors in the marketing communication? The purpose of this study is then to investigate the performance of stock return on marketing communication productivity.

As a result, consumers will gain their needs and information about the products through marketing communication which firms will gain more profit and improve their market share by marketing communication (Fornell et al., 2010). Superior marketing communication programs can effective build customer equity, which leads to higher future repurchases and margins (Keller, 1998; Keller and Aaker, 1992). Indeed, productive advertising and promotion help promote product awareness, initial product trials, and repeated purchases (Luo and Donthu, 2006; Szymanski et al., 1993). And, that is the reason why authors and researches put their emphasis on the issues of marketing communication expenditures effectiveness.

Compared to the past, when there were fewer media alternatives, less competition, and more homogeneous customers, today’s firms would face a much bigger challenge for understanding, identifying and eliminating the marketing communication inefficiency. Practitioners should know how efficiency in marketing communication exists and how to improve marketing communication efficiency (Soberman, 2009). Productive advertising and sales promotion programs may reduce the vulnerability and volatility of cash flows through reduced brand-switching intentions and decreased customer churn rates (Markey et al., 2009; Vakratsas and Ambler, 1999). From another perspective, investors may regard an improvement in efficient marketing and advertising expenditures as good news in the financial markets.

*Corresponding author. E-mail: chenty@mail.ntpu.edu.tw.
which can have a positive impact on the long-term implications of future cash flows (Hiemstra and Jones, 1994).

Past researchers have concluded that there might be inefficiency in advertising spending (Aaker and Carman, 1982). Bass (1985) observed that much of advertising spending is waste, and the waste could be as high as 40.7% of the net income in some cases. Fornell, Rust and Dekimpe (2010) comprehensively review the literature and pinpoint various researchers' concerns about the productivity of advertising and sales promotion expenditures. Other advertising researches mainly examined the interaction of advertising with other promotional mix elements (Winer and Moore, 1989) and the shape of the response function (Aaker and Carman, 1982). Surprisingly, in Taiwan there has not been much research effort, to date, that empirically provides for marketing communication efficiency and ways to lift marketing communication efficiency. Filling this void would help management to effectively and efficiently budget its marketing communication programs and thus achieve competitive advantage of marketing communication expenditures performances. In this research, DEA and panel data analysis offers a variety of functions, such as benchmarking firms, productivity index, inefficiency, or slack of each input and output, the outcome of this study will provides useful information on how the inputs and outputs make the most cost-efficient media planning with return.

Consumer electronics include electronic equipment intended for everyday use. The Taiwanese consumer electronics product enjoyed a higher market share and good reputation all over the world. Electronics Retailers' sales proved the most lucrative for the Taiwanese consumer electronics market in 2008, generating total revenues of $1,191 million, equivalent to 76.7% of the market's overall value. The performance of the market is forecast to decelerate, with an anticipated CAGR of 3.8% for the five-year period 2008 to 2013, which is up to a market value of $1,869 million by the end of 2013. The Taiwanese consumer electronics market has a compound annual growth rate (CAGR) of 5.9% for the period spanning 2004-2008. Electricals and Consumer electronics are most often used in entertainment, communications and office productivity. Some products classed as consumer electronics include personal computers, telephones, MP3 players, audio equipment, televisions, calculators, GPS automotive navigation systems, digital cameras and playback and recording of video media such as DVDs, VHSs or camcorders. Currently, the global consumer electronics industry is mainly dominated by Japanese, South Korean and American companies. Increasingly, these products have become based on digital technologies, and have largely merged with the computer industry in what is increasingly referred to as the customization of information technology (International Funkausstellung Association; IFA, 2010).

LITERATURE REVIEW AND HYPOTHESIS

Practitioners and scholars have questioned marketing communication's credibility because it can be linked to firm shareholder value. Soberman (2009) investigated this issue and suggests approaches that can be employed so that marketers can realize high performance from money spent on communication. Reid et al. (2005) presented a modified version of the Duncan-Moriarty IMC mini-audit (Duncan and Moriarty, 1998) to examine the causal relationship between the IMC process and brand outcomes. They found that IMC is employed more in companies with a market orientation, and in those that encounter a high level of market competition ability. Luo and Donthu (2006) showed that the impact of marketing communication productivity on shareholder value is positive. They also investigated the moderating role of research-and-development (R&D) investment and competitive intensity. Mumel et al. (2007) discovered that the return on equity can be influenced by organizing printed advertisements in newspapers, radio commercials, press conferences, newsletters, sponsorship, and by using leaflets, companies can expect to raise the net sales growth index. Finally, Palanivelu and Sureshkumar (2010) orients to the discussion of the applicability of Integrated Marketing Communication (IMC) in Chinese market, typically in the music mobile phone industry. Based on the analysis of the questionnaire results as well as the concerned theoretical sources, they included that the performance of IMC in its target market is evaluated as the main goal of this study.

Based on the literature review, we propose the nine research hypothesis development as follows:

First, we consider firm size, company ages and R&D factors can influence company on ROA, respectively. We find that large firms have higher profits and lower risk than that of small firms (Conover et al., 1998). These results hold when profits are denominated in either local currency or dollars. There is a relationship between company ages and company performance (Millar et al., 2005). Many studies present a positive causal relationship between research and development (R&D) and ROA (Eberhart et al., 2008; Fan and Case, 2010). Though R&D can increase marketing intensity by providing appropriate product to meet the customer unmet demand, it can also decrease dynamic impact at the expense of sale promotion through an increase in market risk because the blue-sea strategy can be occurred to call option away from the red-sea districts. So, we have the following hypotheses H1, H2, and H3:

H1: Firm size can positively influence on ROA
H2: Company age can positively influence on ROA.
H3: R&D can positively influence on ROA.

Marketing communication productivity can accelerate profits in several ways. Efficient marketing
communication activities offer the extra levels of sales and brand reputation with same advertising and promotion spending. The incremental sales, which represent extra cash flow, then can be invested in other high net present value projects that address long-term performance (Anderson et al., 1997; Mittal and Sethi, 2011). Customers who retain a higher brand identity with the firm tend to be more responsive to future advertising and promotions (Srivastava et al., 1999). Furthermore, because the time for market acceptance may be reduced through learning and the persuasion effects of productive and successful advertising, the product adoption and diffusion rate might be facilitated (Brown and Eisenhardt, 1995; Vakratsas and Ambler, 1999). Over time, this cost saving and higher productivity may accelerate profits (Srivastava et al., 1999). Thus, we propose the following hypothesis H4:

H4: Marketing communication productivity can positively influence on ROA.

Several scholarly efforts have proposed the importance of ROA about firm return (Brown and Eisenhardt, 1995; Hult et al., 2003). Scholars in strategic management and related fields argued that greater revenue in technology-intensive industries, with increasing industry and long-run stock market performance as principal consequences (Jaskiewicz et al., 2005). Furthermore, an initial increase of marketing communication productivity can positively influence on a firm’s market return (Srivastava et al., 1999). Thus, we have the following hypothesis H5:

H5: ROA is positively causal related to firm stock return.

Furthermore, the relationship between firm size and return is monotonic across portfolio groupings (Conover et al., 1998). There is also a causal relationship between company ages and company return (Millar et al., 2005). Furthermore, some studies document a positive causal relationship between research and development (R&D) and stock return (Fan and Case, 2010). Since R&D can increase equity value by increasing firm value, it can also increase equity value at the expense of bondholder wealth through an increase in firm risk because equity is analogous to a call option on the underlying firm value (Eberhart et al., 2008). Fan and Case (2010) also provides evidence on the effects of R&D expenditures on firms’ subsequent stock returns. So, we list the following hypotheses H6, H7, and H8:

H6: Firm size is positively causal related to firm stock return.
H7: Company age is positively causal related to firm stock return.
H8: R&D can positively influence on stock return.

In short, the complementary effect of marketing and R&D (Dutta et al., 2005) may be expanded in more competitive markets, which would lead to greater cash flows and firm market value. Therefore, it is likely that MCP has the strongest influence on and stock returns when firms have higher R&D intensity. After we specific the one year performance in firms, we start to measure more than one year performance in the same firms. Because MCP results that are too low and employed with inefficient and unproductive marketing communications investments mean overspending in advertising and promotions (Aaker and Carman, 1982; Fornell et al., 2010), the wasted and inefficient resources likely hamper the speed and level of cash inflows to the firm. For practitioners, this finding helps justify advertising and sales promotion budgets and support marketing’s long-term credibility (Eberhart et al., 2008). So, we have this hypothesis H9:

H9: R&D has a moderate effect on the ROA and stock return in firms.

Input and output variables

As to the inputs variables, we focus on two main categories: advertising media spending and sales promotion expenditures. The detail of input variables in advertising is well documented in classic advertising theories (McGuire et al., 1990; Barry and Howard, 1990), as well as in practice (Briggs, 2006; Briggs, Krishnan and Borin, 2005). Actual sales data or revenue, has almost always been considered the single outcome variable to be affected by advertising spending (Coulter, 1998). Advertising media spending includes three dimensions: expenditures in broadcast, print, and outdoor, respectively (Betra et al., 1993). Specifically, a firm’s advertising expenditures in broadcast media equals the sum of television and radio expenditures, and the advertising expenditures in print media equals the sum of newspaper, magazine, and other expenditures. The input of advertising expenditures in outdoor media is the total expenditures in outdoor plant operator markets.

Sales promotion is consuming ever greater proportions of packaged goods total promotional dollars. Sales promotion effectiveness depends more on the particular brand’s market conditions than on the type of product being promoted (Keon and Bayer, 1986).

Outputs include sales level, sales growth and intangible assets. The effectiveness of advertising can enhance sales level and sales growth and marketing communication expenditures influence these outcomes simultaneously, thus, sales level and sales growth are two well-designed outputs (Feltenstein and Rochon, 2009). Note that measuring the sales level requires an approach to control the influence of other relevant variables and carryover effects of advertising and marketing expenditures (Bhargava et al., 2009; Vakratsas and Ambler, 1999).
Intangible assets internally touch employees, management, shareholders, and vendors while intangible assets can externally reach the media, customers, and prospective investors (Gregory et al., 2009). Adding measures of intangible assets into company's performance management standards can set the stage for better corporate strategy execution (Eng and Keh, 2007).

Please note that we need to employ sales level that has controlled the carryover effects of advertising (Chauvin and Hirschey, 1993; Vakratsas and Ambler, 1999) and the impact of other relevant factors, such as R&D, firm size, and competition. Thus, we use the following functions:

\[
SALE_t = SALE_t - \text{SALES}_{t_{predicted}}
\]

Where \( \text{SALES}_{t_{predicted}} = a + b_0 \text{SALE}_{t-1} + b_1 \text{AD}_{t-1} + b_2 \text{PR}_{t-1} + b_3 \text{RD}_{t} + b_4 \text{RD}_{t-1} + b_5 \text{FS}_{t} + b_6 \text{FS}_{t-1} + b_7 \text{CAGE}_{t} + b_8 \text{CAGE}_{t-1} + e \)

Where \( t \) is the \((n)\)-th year.

If we want to estimate the \((n)\)-th annual year sales level, we have to estimate the \((n)\)-th annual year sales revenue that only influencing by \((n-1)\)-th advertising expenditure, \((n-1)\)-th promotion expenditure, \((n-1)\)-th R&D, \((n-1)\)-th firm size, \((n)\)-th firm size, \((n-1)\)-th company ages and \((n)\)-th company ages. Next, we run a zero intercept regression and we obtain the coefficient of regression and \( \text{SALES}_{t_{predicted}} \) as below (Table 1).

### Empirical analysis

The technical efficiency model includes the 2 input variables, that is, advertising and sale promotion expenditures; and 3 output variables, that is, sales level, sales growth and intangible assets. We then first conduct the multi-collinearity diagnosis and find that the correlation coefficient between input variables themselves and output variables themselves are smaller than 0.8 (Charnes et al., 1985). Next, we employ isotonicity diagnosis and find that the correlation coefficients between input and output variables are all positive (Bowlin, 1987). Our case also meets rule of thumb to define suitable number of DMUs issued by Golany and Roll (1989). Finally, we conduct sensitive analysis (Donthu and Yoo, 1998). Obviously, advertising media expenditure is the key factor that influences much on technical efficiency. When we delete this variable from the input, the efficiency units decline from 8 to 6 s, sales promotion expenditure also have some influences on technical efficiency but not as strong as advertising media expenditure. Thus, we can say that according to sensitive analysis, these 2 input variables are suitable for evaluating efficiency because they all have influence on technical efficiency.

The data used for this analysis were gathered from Taiwan Economic Journal (TEJ), and in this study have a representative sample in 2009 of 30 public traded companies in Taiwan electronic industry. Electronics industry is mainly dominated by Japanese, South Korean and American TEJ provided data for the company name, sales revenue, advertising, R&D, firm size, the company age, and other such variables. Firm size is the log of the number of employees, (Rao et al., 2004). In line with prior literature in marketing and management (that is, Anderson et al., 2004; Fischer and Pollock, 2004), we measure R&D with each firm-year spending (Anderson et al., 2004), which we also collected from the TEJ database.

The second output variable is sales growth, which we also derived from the TEJ data set and calculated as a company annual growth rate, such as sales level \( t \) versus sales level \( t-1 \) then divide sale \( t-1 \), the result will be our sales growth rate (Rao et al., 2004).

We obtained data for the final output variable, intangible assets, from the annual reputation survey of
Table 2. The efficiency score of annual year from 2006 to 2009.

<table>
<thead>
<tr>
<th>Firm</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>3.25E-02</td>
<td>7.76E-02</td>
<td>7.22E-02</td>
<td>0.2655</td>
</tr>
<tr>
<td>F2</td>
<td>0.6536</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F3</td>
<td>2.87E-02</td>
<td>5.44E-02</td>
<td>9.19E-02</td>
<td>0.1218</td>
</tr>
<tr>
<td>F4</td>
<td>0.8281</td>
<td>0.2960</td>
<td>0.6642</td>
<td>0.1920</td>
</tr>
<tr>
<td>F5</td>
<td>6.53E-02</td>
<td>0.1121</td>
<td>0.1655</td>
<td>0.2094</td>
</tr>
<tr>
<td>F6</td>
<td>0.1745</td>
<td>0.1739</td>
<td>0.1596</td>
<td>0.2744</td>
</tr>
<tr>
<td>F7</td>
<td>0.6969</td>
<td>0.4617</td>
<td>0.3748</td>
<td>0.6871</td>
</tr>
<tr>
<td>F8</td>
<td>0.4015</td>
<td>0.3789</td>
<td>0.1671</td>
<td>0.4953</td>
</tr>
<tr>
<td>F9</td>
<td>0.6275</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F10</td>
<td>0.4738</td>
<td>1</td>
<td>0.3224</td>
<td>1</td>
</tr>
<tr>
<td>F11</td>
<td>0.2956</td>
<td>0.4530</td>
<td>0.1133</td>
<td>1</td>
</tr>
<tr>
<td>F12</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F13</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F14</td>
<td>0.3079</td>
<td>0.3652</td>
<td>7.05E-02</td>
<td>0.5361</td>
</tr>
<tr>
<td>F15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F16</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F17</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F18</td>
<td>1</td>
<td>1</td>
<td>0.7482</td>
<td>0.5183</td>
</tr>
<tr>
<td>F19</td>
<td>0.6635</td>
<td>0.8059</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>F20</td>
<td>0.8069</td>
<td>1</td>
<td>0.3425</td>
<td>0.9080</td>
</tr>
<tr>
<td>F21</td>
<td>0.3324</td>
<td>0.6080</td>
<td>0.5897</td>
<td>1</td>
</tr>
<tr>
<td>F22</td>
<td>0.7087</td>
<td>0.3517</td>
<td>0.2540</td>
<td>0.2415</td>
</tr>
<tr>
<td>F23</td>
<td>1</td>
<td>0.9616</td>
<td>0.6772</td>
<td>1</td>
</tr>
<tr>
<td>F24</td>
<td>1</td>
<td>1</td>
<td>5.55E-02</td>
<td>1</td>
</tr>
<tr>
<td>F25</td>
<td>0.1322</td>
<td>0.1167</td>
<td>9.87E-02</td>
<td>0.4008</td>
</tr>
<tr>
<td>F26</td>
<td>0.2400</td>
<td>0.4148</td>
<td>0.5183</td>
<td>0.7128</td>
</tr>
<tr>
<td>F27</td>
<td>8.31E-02</td>
<td>0.2425</td>
<td>0.1286</td>
<td>0.2274</td>
</tr>
<tr>
<td>F28</td>
<td>0.1554</td>
<td>0.3826</td>
<td>0.4328</td>
<td>0.6574</td>
</tr>
<tr>
<td>F29</td>
<td>0.1316</td>
<td>0.2395</td>
<td>0.4259</td>
<td>0.5192</td>
</tr>
<tr>
<td>F30</td>
<td>0.4342</td>
<td>0.7065</td>
<td>0.6332</td>
<td>0.6126</td>
</tr>
<tr>
<td>AVE</td>
<td>0.5412</td>
<td>0.6086</td>
<td>0.5035</td>
<td>0.6860</td>
</tr>
</tbody>
</table>

Note. Source from this study.

Each company (Roberts and Dowling, 2002). This measure of perceived innovativeness, employee talent, social responsibility, long-term investment value, financial soundness, use of corporate assets, quality of management, and quality of products and services. Many prior studies have successfully used this corporate reputation score in both marketing and strategy (Johnson et al., 2009; Roberts and Dowling, 2002). In particular, McGuire et al. (1990: 170) note that the “Fortune reputation is one of the most comprehensive and widely circulated surveys of attributes available (for measuring reputation). Both the quality and number of respondents are comparable or superior to the ‘expert panels’ usually gathered such purposes.” Thus, research across disciplines seems to accept this best-available measure of corporate reputation. However, because it has been noted that the Fortune reputation measure depends on financial performance (Aaker and Jacobson, 2001), we also address this reverse-causality issue in our analyses, as we discuss subsequently, using the approach that Roberts and Dowling (2002) recommend.

From Table 2, we observe that the calculated mean technical efficiency between 2006 and 2009 was ranged from 0.541 to 0.686 and average technical efficiency is 0.584. Relative to their production frontier, firms operated efficiently with actual production ranging from 32 to 46% under the maximum production levels. In 2006, the technical efficiency was 0.541, with a gentle uplift to 0.607 in 2007, followed by a steep decline to 0.504 in 2008, and then an obvious uplift to 0.686 in 2009. Average technical efficiency increases in 2009 relative to 2006. The mean technical efficiency score of 0.574 for the period from 2006 to 2007 was lower than it was (0.595) for the period from 2008 to 2009. The
Table 3. The empirical result of hypothesis: annual data model.

<table>
<thead>
<tr>
<th>Hypothesized path</th>
<th>Coefficient</th>
<th>T-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Size → ROA Size</td>
<td>β₁ = 0.326</td>
<td>3.465**</td>
</tr>
<tr>
<td>Company ages → ROA</td>
<td>β₂ = 0.605</td>
<td>4.189**</td>
</tr>
<tr>
<td>Marketing communication expenditures → ROA</td>
<td>β₄ = 0.412</td>
<td>2.892**</td>
</tr>
<tr>
<td>R&amp;D → ROA</td>
<td>β₃ = 0.200</td>
<td>2.194*</td>
</tr>
<tr>
<td>Firms Size → Stock return</td>
<td>β₅ = 0.005</td>
<td>-</td>
</tr>
<tr>
<td>Company ages → Stock return</td>
<td>β₆ = 0.042</td>
<td>-</td>
</tr>
<tr>
<td>R&amp;D → Stock return</td>
<td>β₇ = 0.413</td>
<td>2.072*</td>
</tr>
<tr>
<td>ROA → Stock return</td>
<td>β₈ = 0.821</td>
<td>3.974*</td>
</tr>
<tr>
<td>Marketing communication marketing expenditures and R&amp;D have a moderate effect on stock return</td>
<td>β₉ = 0.491</td>
<td>2.520**</td>
</tr>
</tbody>
</table>

Adj-R² = 0.3214; F = 7.541

Note: Based on one-tailed tests: for t-values greater than 1.65(*); for t-values greater than 2.33(**).

improvement of world financial tsunami is not obvious in 2008 to 2009 since the Taiwan government proposed an electrons logistics modification strategy. The Taiwan government conducted a flexible electrons logistics mechanism to promote resource utilization efficiency, resulting in an increase in overall electrons technical efficiency. The mean technical efficiency score in Taiwan for 2006 to 2009 was 0.584 (Table 1). This implies that DMUs in Taiwan could have produced the same level of outputs by using 58.4% of the inputs actually used.

Annual year model

We first show that the annual year model with 2009 data in Table 3. We first find that firm size (FS) is not outstanding enough, because it’s too high correlation with company ages (CAGE). These results provide us the reasonably evidence for the model. Susceptibility to firm size and company ages have significantly effect on ROA (H1: β₁ = 0.326; H2: β₂ = 0.605), R&D has significantly effect on ROA (H3: β₃ = 0.200) and marketing communication marketing expenditures (H4: β₄ = 0.412). Firm size and company not significantly influence to stock return. (H6: β₆ = 0.005; H7: β₇ = 0.042) but R&D (H8: β₈ = 0.413) and ROA (H5: β₅ = 0.821) has significantly influence to stock return. Furthermore, marketing communication marketing expenditures and R&D have a significantly moderate effect on stock return (H9: β₉ = 0.491). Since that H6 does not has a significantly result. So we conduct regression again only include firm size factor and/or only include company ages factor. The result show, only including company age factor is significant then only including firm size factor (H61: β61 = 0.231 > β62 = 0.085).

Panel data model

We further show that the panel data from 2006 to 2009 data in Table 4. These results provide us the reasonably evidence for the model. Susceptibility to firm size and company ages have significantly effect on ROA (H1a: β₁a = 0.148; H2a: β₂a = 0.695), R&D (H3a: β₃a = 0.156) and marketing communication marketing expenditures (H4a: β₄a = 0.220) has significantly effect on ROA. Here Firm size and company age are not significantly influence to stock return (H6a: β₆a = 0.005; H7a: β₇a = 0.041), but R&D (H8a: β₈a = 0.412) and ROA (H5a: β₅a = 0.819) has significantly influence to stock return. Furthermore, marketing communication marketing expenditures and R&D have a significantly moderate effect on stock return (H9a: β₉a = 0.489). Again, we run regression twice only include firm size factor and only include company ages factor. The result show that only including company age factor is significant and then only including firm size factor (H63: β63 = 0.092 < β64 = 0.185).

Conclusions

The contribution of this study is to provide discussion platform in the field of marketing communication expenditure management and/or marketing management. This study proposes a framework how to get the sale revenue that only influence by advertising expenditure...
Table 4. The empirical result of hypothesis: panel data model.

<table>
<thead>
<tr>
<th>Hypothesized path</th>
<th>Coefficient</th>
<th>T-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm size → ROA</td>
<td>$\beta_{1a} = 0.148$</td>
<td>2.500**</td>
</tr>
<tr>
<td>Company ages → ROA</td>
<td>$\beta_{2a} = 0.695$</td>
<td>9.522**</td>
</tr>
<tr>
<td>Marketing communication marketing expenditures → ROA</td>
<td>$\beta_{4a} = 0.220$</td>
<td>3.688**</td>
</tr>
<tr>
<td>R&amp;D → ROA</td>
<td>$\beta_{3a} = 0.156$</td>
<td>2.518**</td>
</tr>
<tr>
<td>Firm size → Stock return</td>
<td>$\beta_{6a} = 0.005$</td>
<td>1.259</td>
</tr>
<tr>
<td>Company ages → Stock return</td>
<td>$\beta_{7a} = 0.041$</td>
<td>0.724</td>
</tr>
<tr>
<td>R&amp;D → Stock return</td>
<td>$\beta_{8a} = 0.412$</td>
<td>3.110**</td>
</tr>
<tr>
<td>ROA → Stock return</td>
<td>$\beta_{5a} = 0.819$</td>
<td>5.559**</td>
</tr>
<tr>
<td>Marketing communication marketing expenditures and</td>
<td>$\beta_{9a} = 0.489$</td>
<td>1.833*</td>
</tr>
<tr>
<td>R&amp;D have a moderate effect on stock return</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj-R² = 0.2918; F = 6.446</td>
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Note: Based on one-tailed tests: for t-values greater than 1.65(*); for t-values greater than 2.33(**).

and the marketing communication expenditure toward electronic industry. This frame work is mainly based on Luo and Donthu (2006). The unique characteristics of this research are that the sales level predicted is rarely used in marketing research study, this method appearance in finance research study most. By using this method in Taiwan electronic industry, we can find that marketing communication expenditures (DEA efficiency) really owns a positive influence on ROA no matter in annual year model or panel data model. Thus, marketing communication expenditures (DEA efficiency) play an important role in communicating with their costumers (Joshi and Hanssens, 2010). Accordingly, companies should consider how to spend the marketing communication expenditures in the right way first, not cost down it first (Luo and Donthu, 2006).

Research and development (R&D) is important to Taiwan electronic industry and our result show that R&D has a strong influence on company performance which we use is ROA. Innovation is carried out by various value chain participants, including brand-name manufacturers (sometimes called lead firms), contract manufacturers and component suppliers, they all benefits from innovation in such networks. This research examines empirically the relationship of R&D spending in firm performance in the Taiwan electronics industry by using the TEJ data set for 2006 to 2009.

Main paths in the research model

From the empirical results, there are four main paths in our model, and they are susceptibility to company age to stock return in annual year, firm size to stock return for long run and marketing communication expenditures to stock return through ROA within annual year and long run (Figure 1a).

Firstly, from empirical results, susceptibility to marketing communication expenditures (DEA efficiency) is important variables to influence ROA, because the coefficient ($\beta_2 = 0.412$)
21.542) is greater than other ones. Based on the result, we agree on the study of Luo and Donthu (2006) that susceptibility to marketing communication expenditures is a critical factor to affect ROA under the environment in Taiwan electronic industry (Figure 1b).

Secondly, from the empirical results, we find the effect of path from company ages to stock return (0.018). We accept Millar et al. (2005) that there is a positive relationship between company ages and stock return in Taiwan electronic industry (Figure 2a).

Thirdly, from the results, we know the effect of path from marketing communication expenditures to ROA (17.793) and ROA to stock return (0.028). From the result, we agree on the study of Luo and Donthu (2006) that susceptibility to marketing communication expenditures is a critical factor to affect ROA under the environment in Taiwan electronic industry for long run (Figure 2b).

The last, from the results, we know the effect of path from firm size to stock return (0.012). From the result, we agree on the study of Conover, Friday and Howton (1998) that susceptibility to firm size is a factor to affect stock return under the environment in Taiwan electronic industry for long run.

Therefore, we got an interesting finding that no matter in annual year or long run, marketing communication expenditures (DEA efficiency) is a critical factor to affect ROA under the environment in Taiwan electronic industry. Company age is more obvious than firm size which has an effect on stock return in annual year. But in long run, firm size is more obvious than company age which has an effect on stock return.

It is important for Taiwan electronic companies to adopt marketing communication activities so that it could help them to build up better company performance and product association of consumers. Marketing managers could use the ways that understand the degree of susceptibility to company ROA, increase marketing communication expenditures efficiency and investment this cost to make their company more credible and
awareness in the highly competitive Taiwan electronic market. Therefore, it also can let consumer more understand each company products advantage. Companies should pay more attention to utilize the most useful marketing communication management alternatives depend on the characteristic of their advertising and sale promotion such that keep or increase their competitive advantage in the electronic market. The empirical results of this study indicate that susceptibility to research and development (R&D) is also important factor to affect company ROA and stock return. It means electronic companies invest a lot in this part, according, company R&D office and marketing office should work more close than before. Marketing should report the needs of market to R&D office and R&D should provide several solutions for market office to compare which it the most perfect solution that fit the needs in Taiwan electronic market.

The principle industry of this research is the Taiwan electronic industry. Our study only focuses on this industry to discuss the cause-effect relationship between marketing communication, R&D, ROA and stock return. In the future, it can be extended to other industries or more global for research. By literature overview, we could know that there are many reasons which affect ROA and stock return. Therefore, this study suggests that further researchers can discuss the moderating effect of other variables such as the competition of company between ROA and stock return. The number of samples in this research is 30 through 4 years and the majority of samples were selected in Taiwan, which is a bustling country. Therefore, future researchers can consider companies from different countries as representative sample to generalize the research results.

**REFERENCES**


