The Nonlinear Value Relevance of Advertising Expenditure in Listed Korean Stock Markets

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Abstract

This paper investigates the nonlinear value relevance of advertising expenses in firms listed on Korean stock markets from 2003 to 2011. This study also categorizes the sampled data into several groups to examine the value relevance function of advertising expenses. The empirical findings of this paper show that advertising expenses has an inverted U-shaped relationship with enterprise value in various subgroups belonging to KOSPI markets, big firms, small and medium firms, and low technology firms classified by Himmelberg and Petersen (1994). The empirical results also provide the evidence that advertising expenses is nonlinearly associated with enterprise value with a U-shaped function in total sample firms, KOSDAQ firms, high technology firms classified by Himmelberg and Petersen (1994), and the high and low technology firm groups divided by R&D intensity.

These results support the hypothesis of this study (H: Advertising expenses has nonlinear value relevance in Korean stock markets). The empirical findings of this study reveals that the value relevance shape of advertising expenses differ in accordance with the characteristics of individual firms.

Keywords: advertising expenses, enterprise value, value relevance, nonlinear value relevance

1. Introduction

Advertising is generally defined as the cost that companies bear to promote their products and services or benefits of doing business to an unidentified public. Presently, most companies spend on advertising and public relations campaigns to inform customers about their product or service offering (Moon, 1999; Kloss, 2001). Therefore, most companies have empirical evidence as well as the experience that outlay on advertising increases the sale of products and services and thus increases profits.

Many researchers have studied the relationship between advertising expenses and enterprise value. Contrary to expectations, the empirical results are not conclusive. Some studies show that advertising expenses have a positive influence on enterprise value (Peles, 1971; Abdel-Khalik, 1975; Clarke, 1976; Hirschey, 1982; Ross, 1983; Hirschey & Weygandt, 1985; Lee, 1994; Paek & Jeon, 2004; Chung & Cho, 2004; Lee & Choi, 2007; Huh, Lee, & Kim, 2007; Saha, Zulfiqar, Andrew, & Saeed, 2009; Hossein, Rasool, & Azizolah, 2012), Others report that advertising expenses has no influence on enterprise value, and that in fact, it even has negative value relevance (Picconi, 1977; Bublitz & Ettredge, 1989; Jung & Lee, 1996; Ye & Finn, 1999; Kwon & Lee, 1999; Yook, 2003; Han & Manry, 2004; Kim, Chang, & Ki, 2006; Zhang & Wang, 2011; Kapil, Anirban, & Marnik, 2012).

As in the case of advertising expenses, the empirical findings on the value relevance of donation expenses are open to dispute. Some studies report that donation expenses is positively related to enterprise value (Cochran & Wood, 1984; Posnikoff, 1997; Lev et al., 2006), while others find that donation expenses has no significant relationship with enterprise value, and even that it has negative value relevance (Wright & Ferris, 1997; Welch & Wazzan, 1999).

These contradictory results motivated some researchers to document the value relevance of donation expenses using different valuation concepts. In other words, they assume a nonlinear function of donation expenses in

enterprise value and provide evidence in support (Choi, Lee, & Hong, 2009; Shin, Kim, & Kim, 2011). They document that donation expenses has positive value relevance until it reaches a particular threshold after which it causes enterprise value to decrease rather than increase. They recognize the relevance shape of donation expenses and enterprise value is not linear but nonlinear dynamics (an inverted U-shape).

This study assumes that the previous empirical results on the value relevance of advertising expenses may be the outcome of the nonlinear dynamics of advertising expenses in enterprise value.

Further, this study argues that as in the case of donation expenses, advertising expenses has a nonlinear relationship with enterprise value. In other words, advertising expenses increases (decreases) enterprise value until a particular threshold. When spending on advertising reaches that threshold, it causes a decrease (increases) in enterprise value. Therefore, this paper seeks to examine whether the value relevance shape of advertising expenses is governed by linear or nonlinear dynamics.

To do this, this study adopts Ohlson's (1995) valuation model and the nonlinear analysis method posited by Morck et al. (1988). Sample data sets are divided into several subsample groups in accordance with financial market (KOSPI vs. KOSDAQ), firm size (big vs. small and medium), and technology level (high-tech vs. low-tech). This study thus explores the value relevance function of advertising expenses according to firm characteristics.

This paper has five sections. The first section explains the necessity for the study; the second section describes previous literature related to the value relevance of advertising expenses. The third section establishes hypothesis and develops empirical model, the forth section analyze empirical model. The last section summarizes the study and suggests implications to future researches.

2. Previous Literature Review

Studies about the relationship between advertising expenses and enterprise value have yielded widely varying results. Some studies document that advertising expenses significantly promote enterprise value (Peles, 1971; Abdel-Khalik, 1975; Clarke, 1976; Hirschey, 1982; Ross, 1983; Hirschey & Weygandt, 1985; Lee, 1994; Paek & Jeon, 2004; Chung & Cho, 2004; Lee & Choi, 2007; Saha, Zulfiqar, Andrew, & Saeed, 2009; Hossein, Rasool, & Azizolah, 2012). Others show that advertising expenses has no significant value relevance, and even it is negatively related to enterprise value (Picconi, 1977; Bublitz & Ettredge, 1989; Jung & Lee, 1996; Ye & Finn, 1999; Kwon & Lee, 1999; Yook, 2003; Han & Manry, 2004; Kim et al., 2006; Zhang & Wang, 2011; Kapil, Anirban, & Marnik, 2012).

Peles (1971) explores the value relevance of advertising expenses by documenting the persistence effect of such expenditure. He shows that advertising expenses has significantly positive effect on enterprise value in food industry, an effect that persists for at least one year. However, he does not find any significant relationship between advertising expenses and enterprise value in the auto industry.

Likewise, Peles (1971), Abdel-Khalik (1975), and Clarke (1976) also demonstrate the persistence effect of advertising activities in promoting sales. For example, Abdel-Khalik (1975) reports that the persistence effect of advertising expenses lasts for more than one year in the pharmaceutical and cosmetics industries, but find no such evidence as regards the necessity industry.

Clarke (1976) investigates the enlarging effect of advertising expenses by targeting consumer goods companies, and shows that this effect persists for just five months. Saha, Zulfiqar, Andrew, and Saeed (2009) investigate the influence of media advertising activities on enterprise value, and document that such activities significantly raise enterprise value. Feng and Li (2010) investigate the value relevance of advertising in the pharmaceutical industry, and report that it has a significantly positive impact on future potential cash flows.

Lee (1994) investigates the relationship between advertising expenses and financial performance in Korea and finds that advertising expenses significantly promote accounting earnings. Kim (1997) and Moon (2001) also document the persistent promotional effect of advertising on enterprise value in the food and beverages industry. Jung et al. (2005) use cumulative abnormal returns as a dependent variable to investigate the value relevance of advertising expenses; they find that advertising influence positive effect on enterprise value. Cho and Ryu (2006) and Huh et al. (2007) also hold advertising expenses is significantly associated with enterprise value.

Seo (2008) reports that treating advertising expenses as an asset is more value relevant than expensing it in financial statements. Piao and Yang (2010) argue that advertising expenses is a more value relevant factor for big companies than for small and medium companies.

In contrast to these studies, others report that advertising expenses is not a value relevant factor, and that it even

has negative value relevance. Picconi (1977) finds that advertising expenses is not significantly related to sales and market share, while Bulitz and Ettredge (1989) show that marketing costs have a negative effect on cumulative abnormal returns. Han and Manry (2004) also report that advertising expenses is not significantly related to stock prices, and that it can even have negative effects on enterprise value.

Choi (1994) explores the value relevance of advertising expenses and R&D cost in Korea by using Tobin's Q as a proxy variable of enterprise value. The results show that advertising expenses has no significant relationship with enterprise value, whereas R&D cost shows significant value relevance.

Jung and Lee (1996) also examines the value relevance of advertising activity by using advertising intensity (calculated as advertising expenses/sales) as an independent variable. They find that no significant relationship exists between advertising intensity and enterprise value. Kwon and Lee (1999) and Yook (2003) investigate the manner in which advertising expenses influences enterprise value by using cumulative abnormal return as a dependent variable; they too find no evidence of the value relevance of advertising expenses. Park (2005) reports that advertising expenses has a positive effect on sales but a negative relationship with operating income. Similarly, Kim et al. (2006) also find that advertising is not significantly related to enterprise value.

3. Hypothesis and Empirical Model

3.1 Hypothesis

As mentioned earlier, studies investigating the value relevance of advertising expenses show conflicting results. Some studies report that advertising expenses has a positive influence on enterprise value (Peles, 1971; Abdel-Khalik, 1975; Clarke, 1976; Hirschey, 1982; Ross, 1983; Hirschey & Weygandt, 1985; Lee, 1994; Paek & Jeon, 2004; Chung & Cho, 2004; Lee & Choi, 2007; Saha, Zulfiqar, Andrew, & Saeed, 2009; Hossein, Rasool, & Azizolah, 2012). Others show that advertising has no significant value relevance (Picconi, 1977; Bublitz & Ettredge, 1989; Jung & Lee, 1996; Ye & Finn, 1999; Kwon & Lee, 1999; Yook, 2003; Han & Manry, 2004; Kim et al., 2006; Zhang & Wang, 2011; Kapil, Anirban, & Marnik, 2012).

The present study considers the possibility that the conflicting results in respect of the value relevance of advertising expenses may be caused by the assumption of linear dynamics in the valuation model. Therefore, this study tests whether the value relevance shape of advertising expenses is governed by linear or nonlinear dynamics by developing the following hypothesis:

H: Advertising expenses has nonlinear value relevance in Korean stock markets

3.2 Empirical Model

To investigate this hypothesis, the study uses the valuation model proposed by Ohlson (1995) and the empirical analysis method for testing nonlinearity developed by Morck et al. (1988). Ohlson (1995) developed a new valuation model by adding the linear information dynamics of value relevant factors to the residual income model (RIM). The Ohlson model assumes that enterprise value is a function of net income and book value of equity; the unidentified value relevant factor is defined as the error term (Equation 1).

$$MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NI_{i,t} + \varepsilon_{i,t} \tag{1}$$

This study develops equation (2) by adding advertising expenses ($AD_{i,t}$) to the Ohlson (1995) valuation model (Equation 1).

$$MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + \varepsilon_{i,t} \tag{2}$$

This study also develops equation (3) by adopting the empirical method of Morck et al. (1988), McConnell and Servaes (1990), Choi et al. (2009), and Shin et al. (2011) for testing the nonlinear value relevance of advertising expenses.

$$MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + a_4 AD_{i,t}^2 + \varepsilon_{i,t} \tag{3}$$

By using these empirical models, the study examines the nonlinear value relevance of advertising expenses. To ensure the robustness of the test, this study divides the total samples into several subsamples in accordance with firm characteristics such as financial markets (KOSPI (Korea Composite Stock Price Index) vs. KOSDAQ (Korea Securities Dealers Automated Quotations)), firm size (big vs. small and medium), and technology level (high vs. low). All variables are deflated by total number of shares outstanding in year t. The variables used in this study are as follows:

$MV_{i,t}$: Stock prices three months after fiscal year t, $BV_{i,t-1}$: Book value of equity per share at the end of year t-1, $NI_{i,t}$: Accounting earnings per share in period t, $NIA_{i,t}$: Accounting earnings before deducting advertising

expenses per share in period t, $AD_{i,t}$: Advertising expenses per share in period t, $AD_{i,t}^2$: The square of advertising expenses per share in period t, $\varepsilon_{i,t}$: error term

4. Empirical Analysis

4.1 Sample Selection Procedure

To examine the nonlinear value relevance of advertising expenses, this paper obtains sample data from the KIS-VALUE LIBRARY. The number of sample data is 10,505 (firm-year) and they cover 9 years from 2003 to 2011 in the listed Korean share markets. In the process of sample selection, this study excludes companies that do not reveal information on all the main variables used in the empirical test, such as stock prices, accounting earnings, book value of equity, and advertising expenses. Companies in the finance and insurance business, those in a condition of encroachment of capital or legal management, and those that do not settle their accounts in the end of December are also excluded.

Table 1 shows the number of sample data in accordance with financial markets, firm size, and industries. This study trims outliers by removing samples that have Cook's Distance greater than 0.5 and absolute value of studentized residuals greater than 1.

Table 1. Sample selection

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
KOSPI	485	488	502	521	532	539	552	555	472	4,646
KOSDAQ	488	518	574	626	676	706	749	805	715	5,857
External auditing	0	0	0	0	0	0	0	0	2	2
Total	973	1,006	1,076	1,147	1,208	1,245	1,301	1,360	1,189	10,505
Big firm	418	425	434	456	461	466	474	488	417	4,039
Small & Medium firm	555	581	642	691	747	779	827	872	772	6,466
Total	973	1,006	1,076	1,147	1,208	1,245	1,301	1,360	1,189	10,505
Manufacturing	666	690	750	795	847	872	912	948	845	7,325
Nonmanufacturing	307	316	326	352	361	373	389	412	344	3,180
Total	973	1,006	1,076	1,147	1,208	1,245	1,301	1,360	1,189	10,505

4.2 Empirical Results

4.2.1 Descriptive Statistics

Table 2 shows descriptive statistics on the core variables. The dependent variable, $MV_{i,t}$, which represents stock price 3 months after a fiscal year t, has a minimum value of 45, a maximum value of 1,707,000, and mean value of 19,561. The independent variable $BV_{i,t-1}$, which represents the book value of equity per share at the end of fiscal year t-1, shows a minimum value of 1.10813, a maximum value of 1,821,292, and mean value of 18,322. The minimum value of $NI_{i,t}$, which represents accounting earnings per share in period t, is -56,641, the mean value is 1,533, and the maximum value is 307,667. The main independent variable, $AD_{i,t}$, shows mean value of 388.96598, maximum value of 133,165, and median value of 9.12679.

Table 2. Descriptive statistics

Variable	Number	Mean	Standard deviation	Minimum	Maximum	Medium
MVit	10,505	19,561	76,298	45.00000	1,707,000	4,395
BVit-1	10,505	18,322	73,643	1.10813	1,821,292	4056.87
NIit	10,505	1,533	7,687	-56,641	307,667	307.412
ADit	10,505	388.96598	3,484	0	133,165	9.12679

Variable definitions: Variable definition: $MV_{i,t}$: Stock prices three months after fiscal year t, $BV_{i,t-1}$: Book value of equity per share at the end of year t-1, $NI_{i,t}$: Accounting earnings per share in period t, $AD_{i,t}$: Advertising expenses per share in period t.

4.2.2 Results of Correlation Analysis

Table 3 shows the Pearson correlations between independent and dependent variables. The results show that all correlation coefficients are significant, with a 1% level of significance between dependent and independent variables. The correlation of $MV_{i,t}$ and $BV_{i,t-1}$ shows the highest coefficient (0.84830), while the next in order is $MV_{i,t}$ and $NI_{i,t}$ (0.73815), and the last is that of $MV_{i,t}$ and $AD_{i,t}$ (0.57138). The coefficients among independent variables also show significantly positive correlations at 1%. The coefficient of $BV_{i,t-1}$ and $NI_{i,t}$ is 0.69301, that of $BV_{i,t-1}$ and $AD_{i,t}$ is 0.54703, and that of $NI_{i,t}$ and $AD_{i,t}$ is 0.46746. Because of the high correlations between the main variables, this study also tests whether there is any multicollinearity. It is confirmed that the possibility of multicollinearity is very low, with the computing result of all Variance Inflation Factors (VIF) at < 8.0.

Table 3. Pearson correlations

Variables	MV_{it}	BV_{it-1}	NI_{it}	AD_{it}
MV_{it}	1	0.84830***	0.73815***	0.57138***
BV_{it-1}	0.84830***	1	0.69301***	0.54703***
NI_{it}	0.73815***	0.69301***	1	0.46746***
AD_{it}	0.57138***	0.54703***	0.46746***	1

1) Pearson's coefficient of correlation, two-sided test,

2) Variable definitions: refer to Table 2

3) * p < 0.1, ** p < 0.05, *** p < 0.01

4.2.3 Test Results on the Nonlinear Value Relevance of Advertising Expenses

Table 4 shows the effect of advertising expenses on enterprise value of listed companies in Korean share markets over the 2003-2011 periods. For this purpose, the study uses the Ohlson (1995) valuation model and the empirical analysis method for testing nonlinearity developed by Morck et al. (1988). Model 1 is used to test the value relevance of advertising expenses, while model 2 is used to investigate whether advertising expenses is nonlinearly related to enterprise value.

Table 4. Test of nonlinear dynamics between advertising expenses and enterprise value: All firms

Variables & Expected Sign		Model 1	Model 2
Variables	Expected Sign		
Intercept	?	4015.50761***	3753.11095***
BV	+	0.54891***	0.52371***
NI	+	2.74807***	2.80262***
AD	+	0.603539***	3.53119***
AD^2	-	-	0.00008327***
ΣYD		Included	Included
ΣIND		Included	Included
F-Value		3412.54	4558.92
Adj R^2		0.8404	0.8822
Number of samples		10,505	10,505

1) Variable definitions: refer to Table 2

2) Model 1: $MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + \varepsilon_{i,t}$,

3) Model 2: $MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + a_4 AD_{i,t}^2 + \varepsilon_{i,t}$,

4) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The empirical results using model 1 show that F value is 3412.54 at the 1 % level of significance, and Adj R^2 is

0.8404. The results also reveal that all independent variables, such as BV (0.54891), NI (2.74807), and AD (0.603539), are positively related to enterprise value at the 1% level of significance.

The results using model 2 show that F value (4558.92) is significant at the 1% level, and Adj R^2 is 0.8822. Similar to model 1, all coefficients of variables, such as BV (0.52371), NI (2.80262), AD (3.53119), and AD^2 (0.00008327) are positively related to enterprise value at the 1 % level of significance. The plus sign of AD^2 indicates that the value relevance shape of advertising is governed not by linear but by nonlinear dynamics (U-shape).

These findings are consistent with the hypothesis of the paper. In other words, these results suggest that advertising expenses decreases enterprise value until a particular threshold, but once the expenditure reaches that threshold, it causes an increase in enterprise value.

Table 5 shows the results of the test conducted to ascertain whether nonlinear value relevance of advertising expenses exists in Korean stock markets. The test is conducted by dividing the sample data into subsamples in accordance with financial markets (KOSPI vs. KOSDAQ).

Korea has several financial markets. Generally, they are divided into KOSPI and KOSDAQ segments; "KOSPI" stands for "Korea Composite Stock Price Index," and "KOSDAQ," for "Korea Securities Dealers Automated Quotation." The listed examination standard level of KOSPI is higher than that of KOSDAQ, and the company size of KOSPI is usually larger than that of KOSDAQ.

The results show that all F values are significant at the 1 % level, and Adj R^2 of KOSPI (0.8874) is higher than KOSDAQ (0.6275). The results also show that all variables are significantly associated with enterprise value at the 1% level of significance. In particular, the coefficients of AD^2, which indicate whether advertising expenses has nonlinear value relevance, show negative sign at the 1% level of significance in the KOSPI, and positive in the KOSDAQ.

This result suggests that advertising expenses has a nonlinear relationship with enterprise value in KOSPI (inverted U-shape) and KOSDAQ (U-shape) groups. In other words, advertising expenses in KOSPI sample group, increases enterprise value until a threshold, but once it reaches that thresholds, it causes a decrease in enterprise value. However, in KOSDAQ sample group advertising decreases enterprise value until a threshold, but it arrives at that thresholds, it increases enterprise value.

Table 5. Test of nonlinear dynamics between advertising expenses and enterprise value: KOSPI vs. KOSDAQ

Variables and Expected sign		Financial markets	
Variables	Expected sign	KOSPI	KOSDAQ
Intercept	?	4022.49745***	3373.71109***
BV	+	0.52908***	0.36543***
NI	+	2.91047***	2.59865***
AD	+	7.64555***	-1.74860***
AD^2	-	-0.00007552***	0.00015987***
ΣYD		Included	Included
ΣIND		Included	Included
F-Value		2113.73	571.52
Adj R^2		0.8874	0.6275
Number of samples		4,646	5,857

1) Variable definitions: refer to Table 2

2) Model 2: $MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + a_4 AD_{i,t}^2 + \varepsilon_{i,t}$,

3) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6 shows the results of the next test for determining the existence of nonlinear value relevance of advertising expenses in Korean stock markets. This test is conducted by splitting sample data into several subsamples in accordance with firm size (big vs. small and medium).

The results show that all F values are significant at the 1 % level, and the Adj R^2 of big firms (0.8817) is higher

than the corresponding figure for small and medium firms (0.6576). Similar to the results in Table 5, these findings show all variables are significantly associated with enterprise value at the 1% significance level. The coefficients of AD^2, indicating nonlinearity of advertising expenses, are negative at the 1% level of significance both for big firms and small and medium firm groups.

These results suggest that advertising expenses has a nonlinear relationship (an inverted U-shaped function) with enterprise value both in big firms and in small and medium firm groups. In other words, advertising expenses increases enterprise value until a particular threshold, but once it reaches that threshold, it causes a decrease in enterprise value.

Table 6. Test of nonlinear dynamics between advertising expenses and enterprise value: Big vs. Small and Medium

Variables and Expected sign		Firm size	
Variables	Expected sign	Big firms	Small & medium firms
Intercept	?	6909.92453***	2878.30332***
BV	+	0.53918***	0.36550***
NI	+	3.41717***	1.80413***
AD	+	4.19541***	6.05188***
AD^2	-	-0.00005613***	-0.00195***
ΣYD		Included	Included
ΣIND		Included	Included
F-Value		1737.73	718.78
Adj R^2		0.8817	0.6576
Number of samples		4,039	6,466

1) Variable definitions: refer to Table 2

2) Model 2: $MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + a_4 AD_{i,t}^2 + \varepsilon_{i,t}$,

3) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7 shows the results of the test for nonlinear value relevance of advertising expenses in which data samples have been split into subsamples according to industry classification, as defined by Himmelberg and Petersen (1994).

Himmelberg and Petersen (1994) classifies the electronic component, chemical, metal, pharmaceutical, medical, precision & optical instruments, and electrical equipment industries in the high technology group, and else industries in the low technology group.

Table 7 shows that all F values are significant at the 1 % level and the Adj R^2 of the high technology group (0.9261) is higher than the corresponding figure for the low technology group (0.9168). Table 8 also presents that all variables are significantly related to enterprise value at the 1% level of significance.

The coefficients of AD^2, indicating nonlinearity of advertising expenses, are negative at the 1% level of significance in low technology groups. These findings suggest that advertising expenses is nonlinearly related to enterprise value with an inverted U-shaped curve in low technology firms. In other words, advertising expenses increases enterprise value for this group until a particular threshold, but once it reaches that threshold, it causes enterprise value to decrease in low technology companies.

In contrast to the low technology firm group, the value relevance of advertising expenses shows nonlinear dynamics with a U-shaped curve in the high technology group. These suggest that an increase in spending on advertising leads to a decrease in enterprise value until a particular threshold, it reaches that thresholds and it increases enterprise value.

Table 7. Test for nonlinear dynamics between advertising expenses and enterprise value: Industry classification by Himmelberg and Petersen (1994)

Variables and Expected sign		Industry Classification by Himmelberg and Petersen (1994)	
Variables	Expected sign	High technology	Low technology
Intercept	?	4186.52994***	3843.65520***
BV	+	0.45255***	0.59431***
NI	+	2.43477***	3.00769***
AD	+	9.16663***	2.91517***
AD^2	-	0.00029694***	-0.00004823***
ΣYD		Included	Included
ΣIND		Included	Included
F-Value		4043.86	3549.53
Adj R^2		0.9261	0.9168
Number of samples		4,930	5,575

1) Variable definitions: refer to Table 2

2) Model 2: $MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + a_4 AD_{i,t}^2 + \varepsilon_{i,t}$,

3) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The study classifies sample firms into two groups according to the size of R&D intensity (R&D investment/total sales) that is, into high technology and low technology groups at 50% of R&D intensity.

Table 8 shows that all F values are significant at the 1 % level and the Adj R^2 of the high technology group (0.9024) is higher than that of the low technology group (0.8789). Table 8 also shows that all variables are significantly associated with enterprise value at the 1% level of significance.

The coefficients of AD^2, indicating nonlinearity of advertising expenses is positive at the 1% level of significance both in the case of the high and low technology firm groups. This result suggests that advertising expenses is nonlinearly associated with enterprise value with a U-shaped function in both high and low technology firms. This means that an increase in advertising expenses leads to an decreases in enterprise value until a threshold, but it reaches that threshold, and it increases enterprise value both for high and low technology firm groups.

Table 8. Test of nonlinear dynamics between advertising expenses and enterprise value: Classification by the size of R&D intensity (at median)

Variables and Expected sign		Classification by the size of R&D intensity (at median)	
Variables	Expected sign	High technology	Low technology
Intercept	?	4833.77250***	2520.06353***
BV	+	0.51458***	0.56559***
NI	+	5.16663***	2.22487***
AD	+	-2.68509***	1.26026***
AD^2	-	0.00047873***	0.00009692***
ΣYD		Included	Included
ΣIND		Included	Included
F-Value		2177.02	2845.41
Adj R^2		0.8789	0.9024
Number of samples		5,192	5,313

1) Variable definitions: refer to Table 2

2) Model 2: $MV_{i,t} = a_0 + a_1 BV_{i,t-1} + a_2 NIA_{i,t} + a_3 AD_{i,t} + a_4 AD_{i,t}^2 + \varepsilon_{i,t}$,

3) * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9 shows the summary of empirical tests. As shown in Table 9, advertising expenses has nonlinear value relevance with an inverted U-shaped function in KOSPI firms, big firms, small and medium firms, and low technology groups classified by Himmelberg and Petersen (1994).

Table 9 also indicates that advertising expenses has nonlinear value relevance with a U-shaped function in total sample firms, KOSDAQ firms, high technology firms classified by Himmelberg and Petersen (1994), and the high and low technology groups divided by the size of R&D intensity. Therefore, these empirical test results support the hypothesis of this study (H: Advertising expenses has nonlinear value relevance in Korean stock markets). The findings document the existence of nonlinear dynamics between advertising expenses and enterprise value according to the characteristics of individual firms.

Table 9. Summary of test results

Subgroups	All Sample	KOSPI	KOSDAQ	Big firms	Small & medium firms	Industry Classification by Himmelberg and Petersen (1994)		Classification by the size of R&D intensity (50%)	
						High technology	Low technology	High technology	Low technology
Nonlinearity	∪ U-Shaped Curve	∩ Inverted U-Shaped Curve	∪ U-Shaped Curve	∩ Inverted U-Shaped Curve	∩ Inverted U-Shaped Curve	∪ U-Shaped Curve	∩ Inverted U-Shaped Curve	∪ U-Shaped Curve	∪ U-Shaped Curve

5. Conclusions

This study hypothesizes that advertising expenses is nonlinearly associated with enterprise value. This means that advertising expenses increases (decreases) enterprise value until a particular threshold, but once it reaches that threshold, it has a negative (positive) influence on enterprise value. Therefore, this study investigates whether the value relevance shape of advertising expenses shows linear or nonlinear dynamics on listed companies in Korean stock markets over the 2003-2011 periods.

For more robustness of empirical tests, the study divided sample firms into several subsamples in accordance with financial markets, firm size, and technology levels. The empirical results show the existence of nonlinear value relevance of advertising expenses with an inverted U-shaped function in several subgroups such as the KOSPI, big firms, small and medium firms, and low technology groups classified by Himmelberg and Petersen (1994). This suggests that the value relevance function may show nonlinear dynamics (an inverted U-shape) according to the characteristics of individual firms. Advertising expenses increases enterprise value until a particular threshold, but once it reaches that threshold, it causes a decrease in enterprise value in those firm groups.

The result also documents that advertising expenses is nonlinearly associated with enterprise value with a U-shaped function in total sample firms, KOSDAQ firms, high technology firms classified by Himmelberg and Petersen(1994), and the high and low technology firm groups divided by R&D intensity. This means that the value relevance of advertising expenses show nonlinear dynamics with a U-shaped function in accordance with the characteristics of individual firms. This suggests that advertising expenses decreases enterprise value until a particular threshold, but once it arrives at that threshold, it increases enterprise value in those firm groups.

These results support the hypothesis of this study (H: Advertising expenses has nonlinear value relevance in Korean stock markets). The findings of this paper document the existence of nonlinear dynamics between advertising expenses and enterprise value according to the characteristics of individual firms. The empirical findings also reveals that the value relevance shape of advertising expenses differ in accordance with the characteristics of individual firms.

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