Is the Consumption Propensity of Korean Professional Baseball Fans Sustainable?

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Key words: Sustainability of consumption propensity, habitual consumption propensity, Korean professional baseball league, ticket earnings

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Abstract: This study uses data from 1982-2014 for the number of spectators in the Korean professional baseball league and estimates the audience demand function and the admission revenue demand function to determine if fans of the Korean professional baseball league have a habitual consumption tendency. The data is also analyzed to establish the effect of price change on the size of crowds and amount of admission revenue to make recommendations for club's pricing policies.

INTRODUCTION

Korean professional baseball is becoming the most popular sport among the four major sports leagues but it has a disadvantage in that a substantial portion of its sales is generated from transactions with related parties. In other words, it depends on the support of its parent company. In this situation, the prospects for future professional baseball can be perceived as dim if the club does not make efforts to improve revenue from other sources. For example, the Haitai Tigers changed to the Kia Tigers due to the parent company's default and the Ssangbangwool Raiders changed to the SK Wyverns after its twists and turns. In addition, due to the acquisition of the Hyundai Unicorns, the Heroes suffered considerable financial difficulties. Even if there is no weakness in the management of the professional baseball team, if the parent company's financial condition is unstable, the reality is that it can affect the existence of the club[1].

At present, the admission fee for professional baseball in Korea varies according to the seats and days of the week. This is unlike the past where the same admission fee was charged in accordance with the price autonomy policy for each club as implemented in 2002. The LG Twins who use the Jamsil baseball stadium as their home stadium, divided the stadium into seven seating areas including Green, Navy, Blue and Premium seats and differentiated their admission rates. The Kia Tigers have various entrance feesbased on the class of seats such as sky picnic seats, eco-dynamics seats, party seats and sky boxes for premium customers and family fan groups. These changes are an effort to increase profits for club management to secure self-sufficiency.

However, the admission fee strategy is the most fundamental way to raise the income of the club. Ahn and Lee[2] suggest an idea for maximizing revenue in their study on consumer's habitual consumption of major league baseball games. Consumption of major league baseball games was found to be as addictive for Americans as tobacco. This suggests that the current audience is very likely to return to the arena again in the future. The presence or absence of this level of habitual consumption is important for entrance fee strategies. This means that admission fees should be determined based on dynamic analysis because an admission rate change affects not only current consumption but future consumption as well.

Table 1: Summary of 2009 season profits of Korean professional baseball league teams (unit: million won)

Variables	P/L Statement			
	Samsung	LG	Doosan	Heroes
I. Sales revenue	34,098	34,815	24,852	15.922
1. Ticket Earnings	2,237	5,316	6,096	2.291
2. Grant Income		10,950		
3. Ad Revenue	18,713	9,129		1.093
4. Business Income	12,278	8,733	17,378	105
5. Rent Income	870	653	826	
6. Trade Income		35		
7. Other Income			552	12,433
II. Costs	28,330	27,325	19,459	12,423
1. Operating expenses	16,153	21,654	16,093	12,375
2. Application fee	730	1,137	506	
3. Processing fee	72			
4. Ad expense	1,405	354		
5. Cost of business income	9,970	4,180	2,859	48
III. Gross profit	5,768	7,490	5,393	3,499
IV. SG&A expenses	5,753	8,302	6,682	3,887
V. Operating income (loss)	15	(812)	(1,289)	(388)
VI. Non-operating income	598	1,644	1,621	53
VII. Non-operating expenses	585	943	214	298
IX. Net Income(loss)	28	111	586	(633)
P/L Statement (summary)	Lotte	SK	KIA	Hanwha
I. Sales revenue	30,332	29,703	25,492	17,679
II. Operating income (loss)	3,794	202	(428)	(170)
III. Non-operating income (loss)	488	(395)	395	124
IV. Interest Expense		302		
V. Net Income(loss)	3,437	(193)	(33)	(46)

(1) The Samsung Lions have reported grant income combined with advertising revenue since 2005, (2) The cost of business income of the LG Twins is composed of ballpark cost, business expenses, etc., (3) The business income of the Doosan Bears includes rental income from the ballpark and the cost of business income is composed of ballpark operating and rental costs, (4) The business income and cost of business income of the Heroes consist of revenue from merchandise sales and the cost of the merchandise sold, respectively and (5). The Lotte, SK, KIA and Hanwha teams reported only sales, non-operating income, operating income, interest expense and net income in disclosing the status of their affiliates in business groups; Financial supervisory service

This study is based on data from 1982-2014 regarding the number of spectators in the Korean professional baseball league and estimates the audience demand function and admission revenue demand function to evaluate whether fans that attend the Korean professional baseball league games have a habitual consumption tendency. In addition, to help clubs set pricing policies, the study analyzes the effect of price changes on the number of people attending and the amount of admission revenue.

Research design and model: Table 1 summarizes the 2009 profit and loss statements of the 8 teams of the Korean professional baseball league. Looking at each item of revenue, the team's revenues consist of ticket earnings, grant income, advertising income, business income, rental income, trade income and other income. In 2009 of the eight professional baseball teams, the LG Twins had the highest sales at 34.8 billion won, followed by the Samsung Lions with 34.1 billion won and then the Lotte Giants and SK Wyverns with 30 billion won.

The LG Twins disclosed separate subsidies but the Samsung Lions, Doosan Bears and Heroes reported that the subsidy items were integrated into advertising revenue and business revenue. As shown in Table 1, except for the Heroes, the proportion of subsidy compared to the sales of most clubs is considerably large. Looking at the cost of sales, the items that make up a significant portion of the cost of sales are the operating expenses of the teams. They are composed of participation costs, entrance deposits, special bonuses, training fees, training equipment fees, salaries, down payments and bonus related expenses.

Table 2 shows the related party sales of the 8 Korean professional baseball teams in 2010. The largest related party sales amount was reported by the Samsung Lions at about KRW 28.3 billion, followed by the LG Twins at about 19 billion KRW and SK Wyverns at about KRW 18.7 billion. Heroes has been operated differently from the remaining seven teams in that there are no related party sales because the team name generates the most revenue whereas the other teams are largely funded by transactions with related parties[3].

The sales dependency ratio which is calculated as related party sales divided by total sales revenue, was 70.6% for the Hanwha Eagles, 66.8% for the Samsung Lions and 65.3% for the KIA Tigers. The Doosan Bears had the highest amount at about 7.8 billion, followed by the LG Twins and the Lotte Giants at about 7.7 billion, with the SK Wyverns at about 5.4 billion. The greater the ticket earnings, the lesser the sales dependency ratio.

Table 2: Related party sales of Korean professional Baseball League Teamsin 2010 (unit: million won)

Division/Related parties	Sales	Season sales	Ratio (%)	Ticket income
Doosan				
Doosan E&C, Doosan Heavy Industries and Construction, Doosan infracore, Doosan Engine, etc.	13,170	27,652	47.6	7,802
LG				
Serveone LG Management Development Institute, LG CNS, LG Chem, LG House, LG Life Science, LG Electronics, Jitoual, LG Yuplus, etc.	19,048	35,004	54.4	7,745
Lotte				
Lotte Shopping, Hotel Lotte, Lotte Construction, Lotteria, Busan Lotte Hotel, Daeheung Planning, Lotte.com, Korea Seven, Woori Home Shopping, Lotte JTTV, Lotte Card, Lotte Sonha Insurance, Mybi, Hanaro Card in Busan	17,782	33,128	53.7	7,738
SK				
SK E&C, SK Networks, SK Marketing and Company, SK Broadband, SK Innovation, SK Chemicals, SK Teleces, SK Telecom, SK Telink, TU Media, SK Securities	18,763	30,685	61.1	5,438
KIA				
KIA Motors, Hyundai Mobis, Hyundai Hysco, Hyundai AMCO, Innocence, Hyundai Card, HMC investment and securities	14,343	21,958	65.3	3,697
Heroes		19,029		3,097
Samsung				
Samsung Electronics, Samsung C&T, Samsung Heavy Industries, Samsung Corning, Samsung Electro-Mechanics, Samsung Techwin, Hotel Shilla, Samsung Petroleum, Samsung Life Insurance, Chemical, Samsung Techwin, Samsung SDS, Samsung Networks, Samsung Securities, Samsung Economic Research Institute, Samsung Electronics, etc.	28,332	42,417	66.8	3,027
Hanwha				
Hanwha Chemical, Hanwha Chemical, Hanwha Chemical, Hanwha Construction, Hanwha E&C, Hanwha Time World, Hanwha S&C, Han Cham, Korea Life Insurance, Hanwha Securities	13,646	19,329	70.6	2,670

FSS Electronic Disclosure System, Korean Professional Baseball Yearbook in 2011

Therefore, to improve the financial independence of Korean professional baseball league teams, the most powerful means is increasing entry revenues[4].

Hypothesis: Since, Korean professional baseball is like American major league baseball, the fan's loyalty to baseball is high, so, fans with at least a one-time experience watching professional baseball games are predicted to have a habitual and sustainable consumption tendency. Therefore, we establish two hypothesis as follows:

- H$_1$: Korean professional baseball league fans will have a habitual consumption tendency

In addition, although, demand may decrease when admission fees rise, admission revenue is likely to rise and the following hypothesis is proposed:

- H$_2$: If admission fees rise, the number of spectators will decrease but admission revenue will increase

MATERIALS AND METHODS

The data used in this study are cross-sectional data linked to time variables. The problems of heteroscedasticity in cross-sectional data and autocorrelation of time series data may occur simultaneously. Therefore, fixed and random effects models were estimated by constructing panel data that integrated the data. Finally, the Hausman test was used to select the model suitable for the study's purpose. To solve

the problem of non-stationarity of the panel data, the original data was converted to a natural logarithm form. The regression equation for the number of spectators and admission income is derived using the lifetime consumption model considering habitual consumption propensity as follows:

$$\Delta \ln ATD_{it} = \alpha_i + \gamma_t + \beta_1 \Delta \ln ATD_{it-1} + \beta_2 \Delta \ln PRICE_{it} + \beta_3 \Delta WP_{it} + \beta_4 \Delta CP_{it} + \beta_5 \Delta POST_{it} + \beta_6 \Delta GRDP_{it} + \mu_{it} \quad (1)$$

$$\Delta \ln GATE_{it} = \alpha_i + \gamma_t + \beta_1 \Delta \ln GATE_{it-1} + \beta_2 \Delta \ln PRICE_{it} + \beta_3 \Delta WP_{it} + \beta_4 \Delta CP_{it} + \beta_5 \Delta POST_{it} + \beta_6 \Delta GRDP_{it} + \mu_{it} \quad (2)$$

Where:

$\Delta \ln ATD_t$	=	The change in the number of regular season spectators converted to natural logarithm
$\Delta \ln GATE_t$	=	Change in admission revenue (ticket earnings) of the regular season
α_i	=	Individual effects of 8 teams
γ_t	=	The 33-year time effect
$\Delta \ln ATD_{t-1}$	=	Change in the number of spectators during the previous year
$\Delta \ln GATE_{t-1}$	=	Change in admission revenue for the previous year's regular season
$\Delta \ln PRICE_t$	=	Change in the actual admission fee (nominal admission rate/price index)
ΔWP_t	=	Change in winning percentage
ΔCP_t	=	Change in competing power leveling index

ΔGRDPt = Change in Gross Regional Domestic Product
ΔPOSTt = Change of post season

i = 1, 2, ... ,8, t = 1982, 1983, ..., 2014. ΔlnATD represents the consumption growth rate which subtracts the previous year's number of spectators from the current year's number of spectators and β represents the intensity of the habitual consumption propensity. ΔlnPRICE is the change in admission fee and β2 represents the price sensitivity of Korean professional baseball league fans.

In addition, variables such as winning percentage, competing power leveling index, gross domestic product and a dummy variable for post-season advance were used which were expected to influence the number of spectators and admission revenue. Finally, we added dummy variables for team and year to control for the team's individual and year effects.

In constructing the panel data for this study of eight clubs over 33 years, a team that succeeded a previous baseball club was regarded to have had the same number of spectators and entrance profits as the previous club did in the prior year. The NC Dynos were excluded from the analysis because they joined the Korean professional baseball league in 2013 and changes in the number of spectators and amount of admission revenue was not available. The data used for the analysis were obtained from the Korea Professional Baseball Almanac from 1983-2015, published by the Korea Professional Baseball Commission and the official website of the Korea Professional Baseball Commission. Gross Regional Domestic Product (GRDP) was calculated from the data on the homepage of the Korea National Statistical Office and City Halls[5].

RESULTS AND DISCUSSION

Empirical results: The descriptive statistics of the data used in the empirical analysis are summarized in Table 3. Ranking from high to low, the top four teams in terms of

Table 3: Descriptive statistics

Division	ATD	A.GATE	PRICE	WP	CP	POST	GRDP
LG							
AVE	768,327	5,232,859,888	6,550	0.486	1.406	0.303	185,838B*
STD	305,370	3,079,577,667	1,489	0.076	0.830	0.467	77,609B
MIN	239,562	1,542,610,391	3,940	0.365	0.090	0	66,412B
MAX	1,289,297	12,011,790,693	9,537	0.643	3.210	1	295,335B
Lotte							
AVE	706,497	4,105,100,227	5,582	0.471	1.315	0.333	44,231B
STD	368,367	2,600,291,666	960	0.075	1.210	0.479	14,258B
MIN	127,955	709,025,496	4,047	0.265	0.090	0	20,713B
MAX	1,380,018	10,465,584,876	7,645	0.591	5.402	1	64,798B
Doosan							
AVE	621,166	4,244,657,767	6,309	0.510	1.241	0.515	180.182B
STD	327,881	3,137,275,344	1,455	0.073	0.942	0.508	87,789B
MIN	137,385	606,197,713	4,132	0.313	0.090	0	5,189B
MAX	1,291,703	11,879,234,075	9,206	0.700	2.953	1	295,335B
SK							
AVE	445,769	2,483,203,898	5,289	0.483	1.921	00.417	34,317B
STD	339,732	2,533,526,205	1,651	0.108	1.516	0.504	22,571B
MIN	49,956	298,778,821	2,786	0.224	0.091	0	4,863B
MAX	1,069,929	8,306,676,275	8,002	0.659	6.341	1	60,995B
Samsung							
AVE	405,433	2,222,414,338	5,347	0.567	1.622	0.818	26,343B
STD	133,421	996,619,775	1,167	0.060	1.084	0.392	9,491B
MIN	177,774	842,928,623	3,440	0.448	0	0	11.236B
MAX	844,859	4,430,856,662	8,773	0.706	4.321	1	41,263B
KIA							
AVE	332,709	1,879,767,518	5,468	0.527	1.627	0.545	16,274B
STD	141,592	1,093,405,179	976	0.076	0.940	0.506	7,442B
MIN	69,203	442,785,849	4,223	0.392	0.269	0	4,715B
MAX	663,430	5,719,952,857	8,622	0.655	3.480	1	27,738B
Hanwha							
AVE	294,426	1,699,545,063	5,542	0.476	1.669	0.414	19,006B
STD	106,876	986,298,820	1,396	0.089	1.157	0.501	6,832B
MIN	128,337	606,475,401	3,940	0.290	0	0	6,627B
MAX	519,974	4,847,983,886	10,204	0.651	2.923	1	29,231B
Nexen							
AVE	281,526	1,797,331,953	5,735	0.471	2.065	0.333	76,874B
STD	136,943	1,419,388,798	1,997	0.112	1.285	0.479	108,677B
MIN	118,582	403,449,681	3,192	0.188	0.088	0	11,729B
MAX	599,381	5,438,266,036	11,389	0.695	5.581	1	295,335B

(1) ATD = Number of regular season players per team; GATE = Real season revenue per team (nominal ad revenue/price index); WP = Power averaging index; POST = Post season entry; GRDP = Gross real GDP (nominal GRDP/price index), (2) AVE = Average; STD = Standard deviation; MIN = Minimum value; MAX = Maximum value and (3) B = 1 billion won

Table 4: Correlation analysis of regression model variables

Variables	ΔlnATD	ΔlnATD$_{t-1}$	ΔlnPRICE	ΔWP	ΔCP	ΔPOST	ΔlnGRDP
ΔlnATD	1						
ΔlnATD$_{t-1}$	-0.198**	1					
ΔlnPRICE	-0.012	0.100	1				
ΔWP	0.439**	-0.027	-0.022	1			
ΔCP	-0.219**	-0.036	-0.003	-0.099	1		
ΔPOST	0.321**	-0.019	0.016	0.644**	0.075	1	
ΔlnGRDP	0.205**	0.018	0.182**	-0.009	-0.040	-0.007	1

Table 5: Correlation analysis of regression variables for ticket revenue model

Variables	ΔlnGATE	ΔlnGATEt-1	ΔlnPRICE	ΔWP	ΔDR	ΔPOST	ΔlnGRDP
ΔlnGATE	1						
ΔlnGATEt-1	-.114*	1					
ΔlnPRICE	.331**	.110	1				
ΔWP	.420**	-.028	-.022	1			
ΔCP	-.194**	-.040	-.003	-.099	1		
ΔPOST	.319**	-.056	.016	.644**	.076	1	
ΔlnGRDP	.260**	-.011	.182**	.009	-.040	-.007	1

(1) ΔlnATD = Changes in the number of regular season spectators converted to natural logarithms ΔlnATD$_{t-1}$ = Number of regular season spectators in the previous year; ΔlnGATE = Natural logarithm of change of real season entry (nominal entry profit/price index); ΔlnGATE$_{t-1}$ = Change; ΔWP = Change in winning percentage; ΔDR = Change in competing power leveling; ΔPOST = Post-season advance dummy; ΔGRDP = Change in real GDP (nominal GRDP/price index) and (2) * $p<0.05$; ** $p<0.01$

regular season spectators (ATD) and admission revenue GATE) were the LG Twins, the Lotte Giants, the Doosan Bears and the SK Wyverns. On average, the top four teams use a stadium with relatively greater capacity than the bottom four teams.

The average entrance fee (PRICE) was highest for the LG and Doosan teams who use the Jamsil ballpark while the other 6 teams were not markedly different. A competing power leveling index (CP) with a lower value means that the team's performance level is equalized and a higher value means a more unbalanced competing power level. The average competing power index was lowest for Doosan at 1.241 with 1.315 for Lotte and 1.406 for LG. For these three teams, it appears that competing power leveling has a significant impact on the number of spectators and admission revenue.

The Pearson correlation of the variables used in the spectators and admission revenue regression model is summarized in Table 4 and 5. First, the correlations of the variables used in the spectator's regression model are as follows: ATDt-1, WP, competing power leveling index (CP), post season advancement (POST) and Gross Regional Domestic Product (GRDP) were shown to have correlation with the number of spectators at a significance level of 1%.

The correlations between the variables used in the regression model of admission income show that all independent variables have a significant effect on admission income at significance levels of 1 and 5%. However, the increases in the number of spectators (ATD$_{t-1}$) and admission revenue in the previous year (GATE$_{t-1}$) negatively affect the increases in number of spectators and admission revenue of the current season. It seems that additional analysis is needed. In the 2 regression models, the Gross Regional Domestic Product

(GRDP) in the affiliated city has a statistically significant correlation of 0.182 with the entrance fee (PRICE) but this is not too high. Post-season advancement (POST) was highly correlated with the Winning Percentage (WP) at 0.644 and statistically significant. This is because a team with a high winning percentage advances to the post season. The Variance Inflation Factor (VIF) showed that the collinearity between independent variables was 1.016-1.77.

In this study, the empirical models of Eq. 1 and 2 were analyzed using unbalanced panel data of eight teams of Korean professional baseball during the 1982-2014 period. The NC Dynos were founded and joined the Korean professional baseball league in 2013, so, it was not possible to measure the most recent increase in the number of spectators and amount of admission revenue. We conducted an F-Test to determine the most appropriate model among the one-way fixed-group effect model, one-way fixed time effect model and two-way fixed group and time effect model. As a result, the two-way fixed group and time effect model was proved to be the best model.

In the random effects model, the null hypothesis H: $\sigma\alpha2 = \sigma\gamma2 = 0$ of the Breusch-Pagan test was not rejected, therefore, the group effect and time effect are 0 at the same time. However, the null hypothesis was rejected by the Hausman test and by the two models. Therefore, in this study, we present the analysis results using only the two-way fixed group and time effect model.

The regression results for the number of spectators and admission income are summarized in Table 6. First, regression analysis was performed using the increase rate (ΔlnATD) of the regular season as the dependent variable. The coefficient of increase in the number of spectators (ΔnATDt-1) of the previous year which indicates the habit of consumption was estimated to be -0.085 and not

Table 6: Regression analysis results

Variables	Dep. Var.: No.of Spectators (ΔlnATD)		Dep. Var.: Ticket Revenues (ΔlnGATE)	
	Coefficient	t-values	Coefficient	t-values
Constant	0.110	1.21	0.119	1.32
ΔlnATD$_{t-1}$	-0.085	-1.59		
ΔlnGATE$_{t-1}$			-0.086	-1.65
ΔlnPRICE	-0.475	-2.78**	0.504	2.98**
ΔWP	1.241	6.04**	1.250	6.08**
ΔDR	-0.043	-3.87**	-0.043	-3.84**
ΔPOST	0.081	2.55**	0.079	2.48*
ΔlnGRDP	0.299	4.43**	0.298	4.52**
N	251			
R^2	0.666		0.702	

(1) ΔlnATD = Changes in the number of regular season spectators converted to natural logarithms; ΔlnATD$_{t-1}$ = Number of regular season spectators in the previous year; ΔlnGATE = Natural logarithm of change of real season entry (nominal entry profit/price index); ΔlnGATE$_{t-1}$ = Change; ΔWP = Change in winning percentage; ΔDR = Change in competing power leveling; ΔPOST = Post-season advance dummy; ΔGRDP = Change in real GDP (nominal GRDP/price index) and (2) *$p<0.05$, **$p<0.01$

significant. The coefficient estimate has a negative sign which does not seem to indicate habitual consumption propensity. In other words, if the number of spectators in the previous year expands, the growth rate of the current season's spectators will decrease but the change is not significant. Therefore, hypothesis 1 that Korean professional baseball fans have habitual consumption propensity was rejected.

It is expected that the Winning Percentage (ΔWP) has a positive sign, since, Korean professional baseball fans are sensitive to the team's winning rate. The coefficient was estimated to be 1.241 with a t-value of 6.04, indicating a significant effect at the 1% significance level. According to the estimation results, the number of spectators increases by 12.4% when the team's winning rate is increases by 10%.

The competing power leveling index (CP) was estimated to be -0.49 with a t-value of -3.87 indicating a statistically significant relationship with the number of spectators at a 1% significance level. This means that as competing power is leveled, the number of spectators increases.

In addition, post-season advance (ΔPOST) and gross regional domestic product (ΔlnGRDP) of affiliated city have positive signs as expected. Second, regression analysis using the growth rate of admission revenue (ΔlnGATE) as a dependent variable yields similar results to the original regression model, except for the admission fees coefficient. Although, the rate of increase in admission fees is shown to have a negative relationship with the number of spectators, it has a significantly positive impact on admission revenue. As admission fees increase, the number of spectators will decrease while admission revenue will increase. Thus, hypothesis 2 is supported and has important implications for determining pricing policy.

CONCLUSION

This study examined the influence of fan's habitual consumption propensity and price sensitivity on the Korean professional baseball league by regarding professional baseball games as a commodity. Regression analysis using data from 8 team data for the period 1982-2014 showed that there was no sustainable and habitual consumption propensity of Korean professional baseball league fans. However, Korean professional baseball league fans seem to be price-sensitive because as admission fees rise, the number of spectators decreases. Nevertheless, the higher the admission fee, the higher the team's profits[6, 7].

This result suggests that, to secure financial independenceand enhance the addictive propensity of consumers, Korean professional baseball league clubs should implement a pricing policythat will increase admission revenue and further strengthen the strategy of price differentiation. This means that it is necessary to increase entrance revenue through specialty seating, such as family seats and premium seats which will lead to an increase in audience and relatively higher prices.

The winning percentage showed a positive effect on the number of spectators and the amount of admission revenue while the imbalance in competing power leveling seemed to havea negative effect. Therefore, a club must maintain high scores in its baseball leagueto increase the number of spectators and admission income. The League Secretariat will have to implement a policy to level the competing power between clubs.

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