

Determinants of a College Basketball Team's Revenue

Nils Weddig* and Joseph Redding*

ABSTRACT

This paper shows empirical evidence of how a men's college basketball program's revenue is affected by several determinants, with results based on data from the past eight seasons. Important factors to consider when analyzing a college basketball team's revenue include; advertising, ticket pricing, performance during the previous season and the past three games, performance of a local rival's program in the previous season, quality of opponents faced, time of the event, and the Gross State Product. This article evaluates these determinants on the basis of a regression analysis to provide information about how significantly they affect a college program's revenue.

INTRODUCTION

College athletics today have a huge impact on campuses across the nation. Thousands of students, alumni and parents tune in and or attend college sporting events which can generate large revenues for institutions. The focus of this research is on a four year private, catholic college located in North Eastern New York. The college is a non-profit organization which focuses on improving the college as a whole and its community by reinvesting the revenue generated by the basketball program into the college and its athletic programs. Over the past decade college sports have helped create an atmosphere that is very competitive and passionate. College basketball is one of the most popular college sports to attend and to watch. The evaluated college is compared to other Division 1 programs a smaller college. However, their basketball team is still very competitive and has appeared in eleven national tournaments, six of which have been at the NCAA tournament. Over the past decade the program has seen a lot of success, but they have also battled many hardships.

Even though the success of the team has changed throughout the years the one thing that has never changed is the support from the students, alumni, faculty, and the community. At every home game the arena is filled with students, alumni, faculty, as well as the local community that attend to watch great basketball and support their favorite team. In this research article the effect of different determinants on a college basketball program's revenue is being analyzed. Collecting data of past ticket sales, the price of the tickets, as well as the attendance for each game will enable the determination of the amount of revenue generated from this program. Some determinants being considered are the advertisement expenses for each game, the opponent's team quality, the performance of the crosstown rival's basketball program,

* Siena College, Loudonville, NY 12211

whether the games are being held during the week or on weekends as well as the time of the game, and finally a demographic factor being the Gross State Product of New York. Past research has shown that a college basketball program has an essential branding aspect whose impact is greater than the profitability of the institution because it leads to an increase of the college's national profile (Smith, 2008).

Starting out with a literature survey whose purpose is to outline hypothesis of various authors regarding relating topics and pointing out their most significant determinants of revenue will draw a connection between previous done research and this research article. The following section exhibits the data used for the research, as well as the data analysis describing the regression model applied to find significant determinants for future forecasts of the team's revenue. The final part of this article will summarize the results of the research ending in a conclusion.

LITERARY SURVEY

Many articles have done similar research. Most of the authors focused on how college athletic program's profitability is affected by different determinants. Research by Gerdy (2000) has shown that a successful college athletic program positively affects the institution's revenue due to a greater national profile and especially a greater attention from the local community which increases funding. Other authors see demographic factors as a more significant determinant of college basketball revenue. Brown (1995) claims in his article about revenue of college basketball programs that the income of the fan base has a significant impact on revenues generated throughout a college basketball season. In his research he looked at the per capita income of the city in which a college basketball program is located which is one of many ways to determine the income of the fan base. Some authors have looked at this topic from a different point of view. Another significant determinant of college basketball revenue is according to Nemhauser and Trick (1997) the scheduling process of the home and away games. The authors claim that it is very important not to have too many or too few home games. Finding the optimum balance in the number of home and away games is substantial to generate the highest possible revenue. In addition research has proven that having the last game of the season at home can give revenue numbers a significant boost. Another crucial factor in scheduling games is looking at the strength of the opponent. You can increase the game attendance and consequently the revenue by facing a lot of strong opponents. However, this could lead to a worse winning record or even a losing record which could eventually lead to a drop in the overall game attendance numbers.

Similar research has been done by Lane, Nagel and Netz (2012). To predict revenues generated during a college basketball season, the authors used a number of determinants. Among others, they used the team's performance during previous seasons by looking at the team's ranking index. In addition, the home game arena's capacity was used as a determinant since a greater capacity will enable more fans to come to the college's games and therefore, higher ticket sales and revenues can be generated. Another

interesting revenue determinant used by these authors was a Nike dummy which measured if the team was sponsored by Nike. If this was the case, they assumed that a college sponsored by Nike will have access to the country's greatest high school recruits. Having the best recruits will increase the performance of the team and consequently increase the ticket demand and interest in the team by the fans. This will lead to greater ticket sales and an increase in revenues.

McEvoy (2005) did not examine determinants of the athletic program's revenues but used the performance of the athletic program as an indicator of student enrollment at the associated college. After previous research in the same area by McCormick and Tinsley (1987) and Murphy and Trandel (1994) McEvoy focused on the four main college sports, men's basketball and football as well as women's basketball and volleyball. The result of his research demonstrated that there was a positive relationship between undergraduate admissions and the athletic program's performance. However, not all sports indicated the same impact on admissions. The most significant determinant of undergraduate admissions was the performance of the football program. Other authors like Toma and Cross (1998) also claim that the performance of the men's basketball program can have a significant impact on undergraduate admissions at a college. Their research highlights that after a successful season and winning a championship the number of applications at the institution increases.

DATA AND MODEL

The model underlying this research article has been established from data collected throughout the team's past eight seasons during the years 2006 until 2014. Each game's revenue as well as ticket prices and advertisement expenses have been recorded and are being taken into consideration for the analysis. The following regression equation will be the basis of the analysis:

$$REV_i = \alpha_0 + \alpha_1 COMPDAY_i + \alpha_2 COMPTIME_i + \alpha_3 OPPQUAL_i + \alpha_4 Total_Adv_i + \alpha_5 We_Tk_Pr_i + \alpha_6 GAMEREC_i + \alpha_7 PREPERFORM_i + \alpha_8 RIVPERFORM_i + \alpha_9 GSP_i$$

The college team plays all their home games in an arena located off campus. The capacity of more than 17,000 seats is a big positive of the arena. However, the arena is being used for many different events and is not available at all times. Like previously mentioned, the game scheduling process can have a great impact on the revenue generated throughout a season. In this model, revenue is the dependent y variable because the model is supposed to predict the future revenue amount per season. The various x variables listed above determine the amount of revenue generated each season and will be looked at closer in the following paragraphs.

COMPDAY refers to the day of the competition. The games are either being held during the week or on the weekend. After examining the game attendance numbers of the past eight seasons, it clarifies that in general more people attend games on the weekend instead of games being held during the week. Since this is the case it can be used as a revenue determinant because the day on which a season game is being

held affects the attendance numbers and consequently the ticket sales which determine the corresponding revenue. In the same way, the second variable, the time of the competition, has an important role for the ticket revenue.

COMPTIME takes into consideration whether the game takes place during the day or at night. Night games are generally more popular and lead to a greater attendance and higher ticket sales. During a regular season, on average 14 games are being scheduled. The quality of the opposing teams, OPPQUAL, differs throughout the whole season. Research has shown that more people attend games against a team with a high quality. High quality can either refer to the strength of the opponent or whether the opposing team is a rival. In order to use the opponent's quality in the regression model, the quality of the teams has to be expressed numerically. A survey completed by current players provided a ranking index for each opponent faced throughout the past eight seasons. A quality of one refers to a weak opponent and a quality of five refers to a very strong opponent. Historically, the highest game attendance has been reached each year during games against the crosstown rival university.

In recent years, the college's athletic department has focused more on advertising their men's basketball program. Expenses for various advertisement campaigns have been increased with the goal of increasing the attendance numbers throughout the basketball season. The different parts are television, radio, printed and outdoor advertisement. Recently, small amounts per season have also been invested into internet advertisement to adapt to the societal changes and the increasing involvement with social media. The amount of advertisement spent for each game has been allocated providing a total amount of advertisement spent for each game (Total_Adv) to include the effect it has on each dollar of revenue generated.

Ticket prices are the best measurable determinant of revenue. The effect of a price change can instantly be seen in the amount of revenue generated. Therefore, this variable is very significant to reach the optimum revenue. However, determining the optimum ticket price has difficulties. The demand for the team's tickets is relatively elastic. Generally, the higher the ticket price, the lower the demand. The reason for the elasticity is the existence of a substitute product, the basketball games of the crosstown rival university. The college basketball team focused on in this research does not have to fear to lose their loyal fans but it is in competition with their crosstown rival for neutral spectators who just want to see a good basketball game. If the ticket prices of the rival are significantly lower, the neutral spectators will attend their games because they will be able to see a qualitative equal game for a lower price. This example clarifies the importance of ticket prices. This research focuses on the prices of season, regular, group and discounted children/student tickets leading to a weighted average ticket price (We_Tk_Pr) per game.

In every field nowadays performance is one of the most important measurements of quality. It is also an important determinant of revenue. The better the performance of your product, the higher is the demand for it. Thus, the higher is the revenue. In this research three variables have been used to measure the

performance. GAMEREC refers to basketball team's record in the previous three games. The team's performance can either increase or decrease the revenue. In case of a winning record in the previous three games a greater attendance than in the previous games can be expected which increases revenue. Similar, a losing record decreases the interest of the fans but even more the interest of the neutral spectators who have the possibility of attending other Division I Men's Basketball games at the rival university.

The variable PREPERFORM indicates whether the previous season was a successful or an unsuccessful season. A season can be seen as successful if the team either had a winning record or if the team won a championship. A good performance during the previous year will lead to a greater interest by the community and fans and higher ticket sales in the following season because the team is expected to perform as well as before. RIVPERFORM refers to the performance of the crosstown rival's basketball program during the previous season. If the rival performs better, more people will be interested in watching their games. The demand by neutral spectators for tickets will decrease because of the superior performance of the rival's basketball team. All three performance variables are non-numerical measures. During the analysis a winning record received the value 1 and a losing record the value 0. Similarly, if the team outperformed the crosstown rival in the previous season, the season received the value 1 and if the rival performed better, the season received a 0.

Finally, a variable measuring the state of the economy can always expected to be a significant determinant of revenue. The Gross State Product (GSP) of New York has been listed throughout the years 2006-2013, the length of this research. The GSP measures the annual expenditures in a specific state and can be helpful in determining the revenue of a college basketball program. An increasing GSP of New York leads to the assumption of an increasing income level of the fan base of the college's basketball team located in New York. If the fan base has more money available for leisure activities, it is likely that more people attend college basketball games. Likewise a decreasing GSP of New York could lead to a decreasing attendance at college basketball games because the fan base has less money available to spend.

RESULTS

In every aspect of organizational analysis, empirical evidence is worth more than a theoretical approach. Table 1 shows the results of testing the previous stated assumptions about various determinants of college basketball revenue. Some of the variables proved to affect revenues, whereas other than assumed some of the variables did not show significant evidence of their effect on generating revenue throughout a college basketball season. At a predetermined significance level of 0.05 (5%) four of the suggested nine variables prove to have a significant effect on generating revenue since their p-value is less than 5%. The p-value or significance tests the null hypothesis stating that all coefficients are equal to zero. If this is the case, the coefficient has no effect on the dependent variable, which is revenue. A p-value or

significance lower than the predetermined 0.05 enables the rejection of the null hypothesis and proves the significance of the coefficient.

The time of the competition (COMPTIME), the weighted average ticket price (We_Tk_Pr), the performance in the last three games (GAMEREC), the performance in the previous year (PREPERFORM) and the Gross State Product (GSP) are insignificant with p-values of 0.382, 0.127, 0.604, 0.874 and 0.667 respectively. Since these variables were included in the regression model, it has to be valued as insufficient for a forecast to predict future revenues due to the low R-squared value of 0.483. The R-squared statistic determines the strength of a regression model since it measures the explained variation of the data. Values between 0 and 1 are possible whereas an R-square statistic close to 1 is desired. A statistic of 1 would indicate that 100% of the data variability around the mean can be described by the underlying model. This model's R-square statistic with a value of 0.483 indicates that only 48.30% of the variability can be described by this model which is not enough to give a significant revenue forecast.

Table 1: Coefficients

Variable	Step-1: Regression			Step-2: Regression			Step-3: Regression		
	Stand. Coefficient Beta	T stat	Sig.	Stand. Coeff. Beta	T stat	Sig.	Stand. Coeff. Beta	T stat	Sig.
Constant		.314	.754		1215	.237		6.598	.000
X1_COMPDAY	.359*	4.131	.000	.319*	4.112	.000	.283*	3.918	.000
X2_COMP TIME	.075	.878	.382	.069	.868	.387	Removed		
X3_OPP QUAL	.330*	4.172	.000	.311*	4.278	.000	.327*	4.560	.000
X4_Total_Adv	.277*	3.300	.001	.277*	3.636	.000	.307*	4.112	.000
X5_We_Tk_Pr	.151	1.539	.127	.101	1.370	.174	Removed		
X6_GAMEREC	.044	.520	.604		Removed		Removed		
X7_PRE PERFORM	-.031	-.159	.874		Removed		Removed		
X8_RIV PERFORM	.278*	2.531	.013	.305*	4.209	.000	.311*	4.266	.000
X9_GSP	-.079	-.432	.667		Removed		Removed		
	R-square=0.483			R-square=0.481			R-square=0.465		

*. Significant at the 0.05 level (2-tailed)

Dependent Variable: Y_REV

Although the model as a whole cannot be used to determine future revenues, it provides comprehensive information about the researched variables. All variables which are significant in determining the revenue also have a positive effect on revenue. Meaning, as the variable increases the revenue can be expected to increase as well. For example, when the college basketball team faces an opponent with a high quality, higher revenues can be expected. In order to use the model to forecast revenues the insignificant variables have to be eliminated from the regression model. This process provides a three step regression listed in table 1. After all insignificant variables have been eliminated the following significant variables are left. COMPDAY referring to the day of the competition, OPPQUAL measuring the quality of the opposing teams, Total_Adv standing for the total advertisement spent at each game and RIVPERFORM referring to the performance of the crosstown rival's basketball program during the previous season. This process leaves

Table2: OPPQUAL effect on revenues

	OppQual	Y_Rev	Total_Adv	We_Tk_Pr
	Mean	53845.900	2859.567	15.200
1	N	3	3	3
	Std. Deviation	19220.6465	2682.9799	1.4799
	Mean	51908.420	3321.787	15.060
2	N	15	15	15
	Std. Deviation	8314.4191	2273.6068	.8253
	Mean	54541.396	4153.398	15.235
3	N	48	48	48
	Std. Deviation	10353.2065	3136.2862	.9120
	Mean	57852.944	4185.631	15.212
4	N	16	16	16
	Std. Deviation	10516.4422	3745.0535	.6334
	Mean	69662.161	5205.381	15.384
5	N	31	31	31
	Std. Deviation	22703.7974	3565.7213	1.1446

all significant variables with p-values of 0.000. COMPDAY is as expected a determinant which affects revenue. For management this can be an important indicator for the scheduling process. Analyzing the data indicated that the game attendance was generally greater at games held on a weekend instead of during the week. OPPQUAL has one of the highest impacts on revenues. Table 2 lists mean revenues, total advertisement spent and weighted average ticket prices per game at each opponent quality. The significance of the opponent quality as a revenue determinant is reflected in the substantial increase of the revenue means. On average, against opponents with a team quality of five, an increase in revenues of at

least \$10,000 can be expected. Especially games against the crosstown rival or NCAA ranked teams clarify the effect the opponent quality has on revenue. Every season those games generate the highest revenue due to the high attendance numbers. Also interesting is the allocation of the total advertisement spent per season. Besides advertisements for the whole season, most of the advertisement money is spent for games against opponents with a higher quality. This could be an additional factor why those games generate the most revenue.

The total advertisement expense (Total_Adv) affects revenues largely. However, the advertisement expenses cannot be increased infinitely. Regarding advertisement expenses, it is important for the management to find the optimum point at which the additional dollar of revenue generated by an additional dollar spent on advertisement is maximized. At some point you cannot efficiently increase the number of people reached by the advertisement and each additional dollar spent on advertisement decreases profits since the maximum possible revenue affected by advertisement has already been reached.

Both performance variables demonstrate to have an impact on revenues simply considering the mean revenue generated throughout the last eight basketball seasons. Table 3 provides an overview about the mean revenue generated per game in a season following an unsuccessful (PREPERFORM=0) and successful (PREPERFORM=1) year by the college basketball team. As expected a strong performance in the previous season leads to an increase in revenues per game on average by \$4,539.59 compared to revenues generated throughout a season following an unsuccessful year. However, taking into consideration the regression result, the effect on revenue by PREPERFORM is not sufficient due to the high p-value of 0.874. The high value can be explained by the coefficient's high standard error of 6955.297 referring to a high variation of revenues leading to an insignificance of the PREPERFORM effect on revenue.

Table 3: PREPERFORM effect on revenue

	PREPERFORM	Y_REV	Total_Ad v	We_Tk_ Pr
0.	Mean	55938.18	4422.681	15.476
	N	42	42	42
	Std. Dev.	12696.48	3202.9312	.3786
1.	Mean	60477.77	4230.32	15.114
	N	71	71	71
	Std. Dev.	17609.07	3293.3341	1.1405
	Mean	58790.48	4301.819	15.249
Total	N	113	113	113
	Std. Dev.	16145.49	3257.0180	.9424

Table 4: RIVPERFORM effect on revenue

	RIVPERFORM	Y_REV	Total_Ad v	We_Tk_ Pr
0.	Mean	54375.4	3780.743	15.173
	N	70	70	70
	Std. Dev.	15687.4	3420.1396	.7022
1.	Mean	65977.6	5150.081	15.372
	N	43	43	43
	Std. Dev.	14334.0	2807.5159	1.2381
	Mean	58790.4	4301.819	15.249
Total	N	113	113	113
	Std. Dev.	16145.4	3257.0180	.9424

In addition neutral spectators who just want to see a good basketball game will also take into consideration the performance of the rival university. Therefore RIVPERFORM has an additional impact on revenues explained by the low p-value which proves the variables significance as well as the results presented in table 4. It gives a brief overview about the effect of RIVPERFORM on revenues. The revenue in seasons in which the team outperformed their rival (RIVPERFORM=1) shows on average significantly higher revenues of \$65,977.69 per game compared to seasons in which the rival performed better (RIVPERFORM=0) with revenues averaging \$55,938.19 per game.

The economic variable GSP does not affect the college basketball team's revenues with a high p-value of 0.667. Also surprising is that the assumption, that an increase in GSP would increase the game attendance and revenues, has to be revised. The analysis shows GSP with a negative coefficient which leads to the conclusion that an increase in GSP would decrease revenue and a decrease in GSP increase revenue. Consequently college basketball tickets are an inferior good in the state of New York, meaning that as income levels rise, the demand for men's college basketball tickets decreases. However, this effect is not significant enough to impact revenue numbers throughout a season.

Conclusion

This research has proven that any available data can be informative and helpful for the management of a business, in this case a college basketball program. Data has been used to apply previous established theories and establish empirical evidence about the significance of various revenue determinants for a college basketball team. The variables COMPDAY, OPPQUAL, Total_Adv and RIVPERFORM can all be used in forecasting future revenues due to their proven significance in this regression model. For future research available data of the significant variables or predictions of outcomes of these variables in future college basketball seasons can be used to forecast revenues using the provided final regression equation:

$$\hat{Y} = 20347.76 + 11757.92X_1 + 4910.59X_3 + 1.40X_4 + 8852.22X_8$$

ENDNOTES

1. We are thankful for the helpful comments by Manimoy Paul in the process of our research and suggestions by the participants of the 67th annual meeting of the New York State Economics Association, October 2014.
2. The tables and regression results will be provided by the authors upon request.

REFERENCES

Brown, Robert W., and R. Todd Jewell. "Race, Revenues, and College Basketball." *The Review of Black Political Economy* 23.3 (1995): 75-90

- Gerdy, John R. "College Athletics as Good Business." *Sports in School: The Future of an Institution*. New York: Teachers College, 2000
- Lane, Erin, Juan Nagel, and Janet S. Netz. "Alternative Approaches to Measuring MRP: Are All Men's College Basketball Players Exploited?" (2012)
- McCormick, R. E., & Tinsley, M. (1987). "Athletics and academics: A model of university contributions." In B. L. Goff & R. D. Tollison (Eds.), *Sportometrics*, pp. 193-204.
- McEvoy, C. (2005). "The relationship between dramatic changes in team performance and undergraduate admissions applications." *SMART Journal*, 2(1)
- Murphy, R. G., & Trandel, G. A. (1994). "The relation between a university's football record and the size of its applicant pool." *Economics of Education Review*, 13, 265-270
- Nemhauser, George L. & Trick, Michael A. (1998) "Scheduling A Major College Basketball Conference." *Operations Research* 46(1):1-8
- Smith, D. R. "Big-Time College Basketball and the Advertising Effect: Does Success Really Matter?" *Journal of Sports Economics* 9.4 (2007): 387-406
- Toma, Douglas J., and Michael E. Cross. (1998). "Intercollegiate Athletics and Student College Choice: Exploring the Impact of Championship Seasons on Undergraduate Applications." *Research in Higher Education* 39(6): 633-661.

