

Tip-Off Titans: Hedonic Price Analysis of Autographed NBA Memorabilia

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Abstract:

Studies have explored the economics surrounding the emergence of superstars, but relatively little research exists on the associated memorabilia markets. Using a sample of autographed artifacts, on sale through an internet outlet, hedonic analysis is used to gain insight into the significant characteristics of price determination. The data consists of current and former autographs of National Basketball Association (NBA) players on photographs. This study explores price differences with respect to a number of independent variables related to the artifact and player status. A notable difference emerges among framed and limited edition pieces, and pieces signed by top-ranked players.

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1.0 Introduction

The Cambridge Dictionary defines an autograph as “a signature, especially of a famous person”. Autographs have been collected for centuries and the market has changed throughout the course of history. In the 16th century, autographs memorabilia was mainly used by German scholars for networking purposes. In the 19th century, it was seen as more of a leisure activity concerned with preserving the past. There came a shift in the 1920s where autograph collecting became more of a novelty and idolization of popular and unpopular figures of both the current and past. This shift paralleled the media revolution; the emergence of new technology and especially popular baseball cards.

Currently, the autographed memorabilia is highly contestable: there are no entry or exit barriers, though sunk costs, and participants have the same access to comparable technology. The sheer size of the market is very large with there being listing after listing on sites such as Craigslist and eBay, among other numerous dealers. The State Department estimates the value of the market to be \$1.5 billion. There are, however, concerns of authenticity with each item; especially on eBay and Craigslist. It is a very free market with virtually no regulation and private firms that authenticated the items are essentially the regulators.

This study aims to enhance the understanding of the autographed NBA memorabilia market. This is also new research; there are no other studies that have studied the autographed memorabilia market for NBA items.

The paper was guided by three research objectives that differ from other studies: First it investigates memorabilia in a market that had not been studied before; Second, it incorporates social media into the hedonic model to examine the influence of social clout on the price of autographs: Last, it analyzes three different scenarios: all players, current players, and retired players. There is no empirical work in the literature concentrating on the NBA memorabilia market. This paper successfully fills this void.

The rest of this paper is organized as follows: Section 2 gives a brief literature review. Section 3 outlines the empirical model and data. Finally, section 4 presents and discusses the empirical results. This is followed by a conclusion in section 5.

2.0 Literature Review

Individuals enter the autographed memorabilia market for a variety of reasons; a lot see memorabilia as a good investment, they may want to preserve a certain period or event in history, or have a particular fondness for a star. Autographed memorabilia has been stimulated and become more accessible to the average person through the internet. Like other collectibles, autographed memorabilia is characterized by an aura of uniqueness where it is thought the items are irreplaceable. This is even more evident for cases in which the autograph is from someone who has died or it was signed early in their career. Characteristics of the signatory are likely to influence the price elasticity of demand for items as well. Autographs of players with more championships, points, and awards could very well have much higher prices on their signed memorabilia compared to others with less popular personas.

Hedonic price analysis was introduced by Kelvin Lancaster and is commonly used to determine real estate prices (Lancaster, 1966). This study is based off of a study that used hedonic analysis to study autographed memorabilia of past and present cultural icons. Differences emerge autographs graphs and those without and found differences in prices with respect to the industry the individual famous for (Collins et al., 2006). The death effect was studied surrounding an increase in prices of celebrity memorabilia around the time of that person's death. It was found that the sports memorabilia market prices increase due to a nostalgia effect, which is a temporary rise in prices until they stabilize (Matheson et al., 2004).

The determinants of franchise values of North American professional sports leagues were studied by Humphreys. Facility ownership, metropolitan population, and local competitors have significant hedonic price values (Humphreys et al., 2008). Similarly, the hedonic valuation North American stadium naming rights was studied. The finding conclude the value is related to the size of the potential market, facilities capacity, status of the resident team, and the overall potential for diversity of the facility usage (Gerrard et al., 2007). The immersion of French autographs in the global market was studied. It was determined that page count, type of author, and type of document explained more than half of the price difference (Mendoza et al., 2014).

Studies have even been done on hammer prices for classical music manuscripts. One particular study showed the trace, name of the composer, and scarcity of the piece contribute to the value (Georges et al., 2012). Castronova studied the auction value of gaming avatars; he

found that the level is more important than gender, however, comparable female avatars so that a discount (Castronova, 2003).

3.0 Data and Empirical Methodology

3.1 Data

This study uses panel data obtained in April of 2016, obtained from the Mounted Memories internet retail outlet. Data was collected from the entire collection of autographed photographs offered by Mounted Memories. The company has thousands of autographed memorabilia items that are available to order online. Valuations are done by the company for each item and they are at a fixed price point. Sometimes, if the item doesn't sell or there is a special going on, the price will be reduced. Because the study could not capture for how long the item was on sale for, or how long it took for the item to be on sale, the data capture is only the original price listed. Mounted Memories team of appraisers must be assumed they can make the best estimate of what consumers are willing to pay. This study is measuring the variations in prices that the appraisers attribute to various characteristics.

After collecting the price of the autograph and name of the person who signed it, information it was gathered on the type of artifact. The data was separated into three different types: all photographs, current photographs, and retired photographs. All photographs include the entire collection of autographed photos on The Mounted Memories. Current photographs include only photographs of current players. Retired photographs include only photographs of retired players. These were separated into three different economic models. Artifacts were examined with respect to the size of the photograph, if the item is framed, if the item is inscribed and if the item is a limited edition.

The size of the photograph is important to the price because it requires more input for the manufacture to print it. The larger photographs are usually more exclusive to pieces that are limited edition. At retail and resale, framing is integral to the collectors for display purposes and preservation. Whether or not the item was inscribed is also recorded. Collectors may value this because inscriptions may include quirky or personal notes that are not regularly seen on other photographs. Also recorded was whether or not the item is a limited-edition. Items with a lower run of merchandise usually have higher prices.

Characteristics of the signatory were then recorded which were thought to influence the price. Data on the person's Hall of Fame status, awards they one during their career, whether or not they are alive, their social media clout, and their overall historical NBA ranking. The agent of the photograph was not available, but with the relatively young age of the NBA in human history, whether or not the signatory is a live is used as a proxy. It is also important to note that a person's signature can change over the years, although it is difficult to record directly from the handwriting. Some collectors may value the earlier signature more, but there has been no empirical evidence to suggest there is a significant influence on the price.

Whether or not the person is alive can be important to collectors. If the person is not alive, it may influence the price in a higher direction. This is because collectors will be sure the market will not be swamped with more items, and the supply will be caught off; there will obviously be no more new, authentic signatures. A player's Hall of Fame status is used as a proxy for talented players who have retired, but may have not yet died. The number of awards they one during their career at the time the data was collected can be a lagging indicator for the price. With respect to current players, the number of new social media followers they gained in the past 12 months can be a leading indicator for either explaining current prices or future prices of memorabilia. Also observed was the overall historical NBA ranking. This characteristic of the signatory measures the overall popularity and influence on the game.

Data was collected on 1043 separately itemized autographs, with listing prices ranging from \$2079 for a framed Michael Jordan photo, down to \$15 for a photograph of David Lee. When exploring the determinants of price, a problem occurred for recording autographs which have more than one signature. This was seen a lot with players who won a championship signing the same artifact. It is not likely that this means the artifact multiplied by the number of people who signed it, but there is a premium to be paid. There were also discrepancies with the prices of some artifacts by being extremely overpriced to the point where it looked like a glitch in the data. In both of the previously mentioned occurrences, those observations were removed from the data set.

Additionally, the data split up into two more categories; current photos and retired photos; these contained 694 and 350 respective photos each. While at first glance the categories may seem very similar to each other, the characteristics of each differ by some very defining factors. The model that captures all photos simply gives a general price determination for the entire

market. Current photos are different because the social media factor is added in and variables for retired photos focus more on the lasting legacy of the player.

Summary statistics are provided in Tables 1 through 3.

Table 1: Summary Statistics for All Photos

Variable	Obs	Mean	Std. Dev.	Min	Max
FRAME	1042	0.519194	0.499871	0	1
x10	1042	0.485605	0.500033	0	1
x20	1042	0.386756	0.487241	0	1
INSCRIPTION	1042	0.18618	0.389439	0	1
LIMITED	1042	0.068138	0.252104	0	1
HOF	1042	0.34453	0.475443	0	1
AWARDS	1042	8.518234	7.929574	0	30
Top3	1042	0.028791	0.167298	0	1
Top25	1042	0.256238	0.436764	0	1
Top50	1042	0.404031	0.490939	0	1
PLOG	1042	5.082896	0.689544	2.704711	7.640114

Table 2: Summary Statistics for Current Photos

Variable	Obs	Mean	Std. Dev.	Min	Max
FRAME	649	0.51772	0.500071	0	1
x10	649	0.468413	0.499386	0	1
x20	649	0.389831	0.488088	0	1
x24	649	0.067797	0.251591	0	1
INSCRIPTION	649	0.189522	0.392225	0	1
LIMITED	649	0.057011	0.232042	0	1
AWARDS	649	4.429892	4.756584	0	21
SOCIAL	649	2.051196	3.420211	0.015	20.342
PLOG	649	5.06354	0.647086	2.704711	7.600897

Table 3: Summary Statistics for Retired Photos

Variable	Obs	Mean	Std. Dev.	Min	Max
FRAME	393	0.521629	0.5001687	0	1
x10	393	0.513995	0.5004412	0	1
x20	393	0.381679	0.4864178	0	1
LIMITED	393	0.086514	0.2814799	0	1
ALIVE	393	0.979644	0.1413957	0	1
HOF	393	0.913486	0.2814799	0	1
AWARDS	393	15.26972	7.497178	0	30
Top3	393	0.050891	0.2200544	0	1
Top25	393	0.600509	0.4904181	0	1
PLOG	393	5.114859	0.7542213	2.993229	7.640114

3.2 Empirical Model

For this study, three models will be used. This study will specifically analyze autographed photos of NBA players; both past and present. Each type of photo has different characteristics, so one model would not be as revealing. Hedonic analysis is undertaken using OLS.

Following Collins et al. (2006) this study adapted and modified the OLS model used to study a number of different autographs from signatories of different industries. We have specifically focused on the NBA market and added independent variables to describe the price determinants related to the artifact and characteristics of the player

The dependent variable is PLOG and the rest are independent variables that will explain price variation. PLOG is the log of the price of each item, which was also used in the base study. This captures the variance in the price elasticity of demands. Each independent variable is in linear functional form because they each gradually increase the price of the photo. Independent variables consist of seven variables obtained from various sources. Appendix A provides the name, description, and data source of each variable. The expected sign for each is built into each of the equations below.

ALL PHOTOS

$$\text{PLOG} = \alpha + \beta_1\text{FRAME} + \beta_2\text{X10} + \beta_3\text{X20} + \beta_4\text{INSCRIPTION} + \beta_5\text{LIMITED} + \beta_6\text{HOF} + \beta_7\text{AWARDS} + \beta_8\text{Top3} + \beta_9\text{Top25} + \beta_{10}\text{Top50}$$

First, $\beta_1\text{FRAME}$ is a dummy variable capturing whether or not the photo is framed. Second, $\beta_2\text{X10}$ is a dummy variable for whether or not the item is an 8x10 photo. Third, $\beta_3\text{X20}$ is a dummy variable for whether or not the item is a 16x20 photo. Fourth, $\beta_4\text{INSCRIPTION}$ is a dummy variable for whether or not the photo is inscribed. Fifth, $\beta_5\text{LIMITED}$ is a dummy variable for whether or not the item is a limited edition. Sixth, $\beta_6\text{HOF}$ is a dummy variable for whether or not the player is in the hall of fame. Seventh, $\beta_7\text{AWARDS}$ measures the number of awards the player won during their career. Eighth, $\beta_8\text{Top3}$ is a dummy variable for whether or not the player is in the top 3 all-time. Ninth, $\beta_9\text{Top25}$ is a dummy variable for whether or not the player is in the top 25 all-time. Tenth, $\beta_{10}\text{Top50}$ is a dummy variable for whether or not the player is in the top 50 all-time.

CURRENT PHOTOS

$$\text{PLOG} = \alpha + \beta_1\text{FRAME} + \beta_2\text{X10} + \beta_3\text{X20} + \beta_4\text{X24} + \beta_5\text{INSCRIPTION} + \beta_6\text{LIMITED} + \beta_7\text{AWARDS} + \beta_8\text{SOCIAL}$$

First, $\beta_1\text{FRAME}$ is a dummy variable capturing whether or not the photo is framed. Second, $\beta_2\text{X10}$ is a dummy variable for whether or not the item is an 8x10 photo. Third, $\beta_3\text{X20}$ is a dummy variable for whether or not the item is a 16x20 photo. Fourth, $\beta_4\text{X24}$ is a dummy variable for whether or not the item is a 16x24 photo. Fifth, $\beta_5\text{INSCRIPTION}$ is a dummy variable for whether or not the photo is inscribed. Sixth, $\beta_6\text{LIMITED}$ is a dummy variable for whether or not the item is a limited edition. Seventh, $\beta_7\text{AWARDS}$, measures the number of awards the player won during their career. Eighth, $\beta_8\text{SOCIAL}$ measures the number of new social media followers the player gained within the last 12 months.

RETIRED PHOTOS

$$\text{PLOG} = \alpha + \beta_1\text{FRAME} + \beta_2\text{X10} + \beta_3\text{X20} + \beta_4\text{LIMITED} + \beta_5\text{ALIVE} + \beta_6\text{HOF} + \beta_7\text{AWARDS} + \beta_8\text{Top3} + \beta_9\text{Top25}$$

First, β_1 FRAME is a dummy variable capturing whether or not the photo is framed. Second, β_2 X10 is a dummy variable for whether or not the item is an 8x10 photo. Third, β_3 X20 is a dummy variable for whether or not the item is a 16x20 photo. Fourth, β_4 LIMITED is a dummy variable for whether or not the item is a limited edition. Fifth, β_5 ALIVE is a dummy variable for whether or not the player is in the hall of fame. Sixth, β_6 HOF is a dummy variable for whether or not the player is in the hall of fame. Seventh, β_7 AWARDS measures the number of awards the player won during their career. Eighth, β_8 Top3 is a dummy variable for whether or not the player is in the top 25 all-time. Ninth, β_9 Top25 is a dummy variable for whether or not the player is in the top 3 all-time.

4.0 Empirical Results

Results: All Photos

Table 4: Regression results for All Photos

R-SQUARED=0.6232		
Variable	Coef.	P > t
FRAME	0.456046	0.000***
x10	-0.2556	0.000***
x20	0.204342	0.000***
INSCRIPTION	0.167855	0.000***
LIMITED	0.477288	0.000***
HOF	-0.60117	0.000***
AWARDS	0.034137	0.000***
Top3	0.323478	0.000***
Top25	0.191224	0.000***
Top50	0.297878	0.000***

Table 4 presents the regression analysis of the hedonic price model for the autographs of all photos. The model was able to explain a lot of the variance in price, with an R squared of 62%

and all of the independent variables being significant at the 99% confidence level. In terms of the artifact itself, framing adds value to the autograph. The smaller, 8 x 10 photos have a negative coefficient because they are the smallest photos in the lot. Therefore any autograph on a photo that is larger will yield a higher price. Inscriptions and limited edition also add value, with limited edition having the highest coefficient. This is not surprising, especially when limited edition means the supply is limited, therefore raising the price.

When looking at characteristics of the player, it was at first surprising that Hall of Fame status had a negative coefficient. We believe this to be the case because of highly correlated variables for the rest of the characteristics. This could also represent the overall demand for the NBA market; autographs for current players are more valuable than autographs of players who have retired and are in the Hall of Fame. The ranking of the players adds a premium; with players in the top three bearings the highest variance in price.

Results: Current Photos

Table 5: Regression results for Current Photos

R-SQUARED=0.7741		
Variable	Coef.	P > t
FRAME	0.4718	0.000***
x10	-0.19327	0.000***
x20	0.103317	0.050**
x24	0.167977	0.010***
INSCRIPTION	0.211765	0.000***
LIMITED	0.175507	0.007***
AWARDS	0.055598	0.000***
SOCIAL	0.070879	0.000***

Table 5 presents the regression analysis of the hedonic price model of current photos. The model was able to explain the majority of the variance in price, with an R squared of 77%, and all the variables except one being significant at the 99% level. In terms of the artifact itself, we see similar results. Framing adds value and the 8 x 10 photos reduce the price. With this model, a larger photo was included which added value. The coefficient for inscriptions was surprisingly larger than the limited edition coefficient. This may be because there are a larger abundance of photos with inscriptions. The addition of social media yielded great results – it actually has a higher coefficient than the number of awards the player has. This is not surprising because younger players who have no awards can become popular especially fast. With the rapid transfer of information now, any player can become a star overnight, thus increase the value of their memorabilia.

Results: Retired Photos

Table 6: Regression results for Retired Photos

R-SQUARED=0.6413		
Variable	Coef.	P > t
FRAME	0.404018	0.000***
x10	-0.31803	0.002***
x20	0.272758	0.005***
LIMITED	0.677699	0.000***
ALIVE	0.646967	0.000***
HOF	0.192389	0.063*
AWARDS	0.015284	0.017**
Top3	0.458094	0.000***
Top25	0.20781	0.010***

Table 6 presents the regression analysis of the hedonic price model of retired photos. The model was able to explain a lot of the variance in price, with an R squared of 64%, and all of the

variables being significant at the 99% level except two. In terms of the artifact itself, we see similar results with respect to framing and the size of the photo. In this model, limited edition autographs add a lot of value to the piece of memorabilia. Surprisingly, if the player is alive has a positive coefficient. This may be due to the relative young age of the NBA- there aren't enough dead NBA players to change the coefficient. Hall of Fame status adds value in this model, which was expected. When looking at the overall ranking of players, we see that a higher premium is placed on top players, compared to the other models.

5.0 Conclusions

This study presents the first hedonic analysis of autographed memorabilia in the NBA market. The variables were able to explain a lot of the variation in prices, yielding high R-squared values. Framing consistently adds value, which matches the results from Collins et al. (2006). Even though framing consistently adds value, limited editions and inscriptions add most value to the pieces. Hall of fame status is significant across the board, especially when examining players who have retired.

If the player is alive is a positive coefficient. At first glance, the positive coefficient appears to be perverse but consistent with results from Collins et al. (2006). This could just represent a "supply" problem with dead players in sports, especially the NBA; there simply aren't enough dead NBA players to turn the coefficient negative. Overall, retired photos are slightly more expensive, most likely because they contain more pieces from a top-ranked player.

For the future, it will be interesting to see how player recognition using awards and social media is significant. In future studies, it would be helpful to include additional artifacts such as balls, jerseys etc. and to extend this research to other sports such as the NFL. A different analysis, such as a Box-Cox transformation, could also provide valuable insight into the hedonic analysis.

NAME	DESCRIPTION	SOURCE
INSCRIPTION	If the item is inscribed	Mounted Memories
LIMITED	If the item is a limited edition	Mounted Memories
FRAME	If the item is framed	Mounted Memories
AWARDS	Number of awards the player has	Basketball-Reference
ALIVE	If the player is alive	Basketball-Reference
HOF	If the player is in the Hall of Fame	Basketball-Reference
SOCIAL	Number of new followers in past year	HookIt
Top3	If the player is ranked top 3 all-time	ESPN
Top25	If the player is ranked top 25 all-time	ESPN
Top50	If the player is ranked top 50 all-time	ESPN
Top100	If the player is ranked top 100 all-time	ESPN
X10	Size of the photo is 8x10	Mounted Memories
X20	Size of the photo is 16x20	Mounted Memories
X24	Size of the photo is 20x24	Mounted Memories
PLOG	Log of the price of the item	Mounted Memories

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