Price Dynamics in Live Event Ticket Sales: Evidence from College Football Resale Markets

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Abstract

Tickets to live events, such as sporting events, are commonly resold on the secondary market up until the date of the event, with prices determined by the time of sale and the quality of the seat. Simple dynamic pricing models predict that prices for homogeneous seats decrease as the date of the event approaches, and previous research has tested these predictions in various live event settings. In this research, I use novel data on secondary market college football ticket transactions to test the application of dynamic pricing models to this market. Unlike other live events, college football ticket prices are also strongly influenced by the information known about the game at the time of sale. In estimating the price path in this market, I measure the role of information changes on ticket prices. I find that after controlling for expected game quality, college football ticket prices do tend to decrease over time. However, a ticket to a higher quality game commands a higher price, meaning that when expected game quality increases over a portion of the ticket sales horizon, prices may instead increase during this portion of the sales horizon.

Introduction

Every day, thousands of sports fans, music lovers, and theatregoers seek to purchase tickets to attend their favorite live events in the United States. One aspect of the live event ticket markets in which these transactions occur is the presence of secondary markets, in which ticket holders may elect to resell their tickets at prices of their choosing. Because ticket holders continuously have the opportunity to change their listing price throughout the ticket sales horizon, previous researchers have applied simple theoretical dynamic pricing (DP) models to live event ticket markets, with the goal of determining if these models' predictions of price over time are realized in this setting. Specifically, one such model predicts price paths that decrease over time, all else equal, a prediction that past research has observed in specific live event ticket markets, such as for baseball tickets. Here, I extend this research by analyzing the secondary market for college football tickets, using novel data from the 2021 season. However, given the nature of college football, perceived game quality at the time of sale can be expected to play a stronger role in sellers' pricing decisions compared to other ticket markets. As a result, exogenous increases in perceived game quality, which would have a positive effect on prices, may counteract a theorized decreasing price path over time.

Theoretical Framework

Consider a ticket holder who is pondering listing his ticket for resale on the secondary market on day t. On any given day during the ticket holder's decision horizon, I recursively define his expected value from listing his ticket as follows, where p is the seller's chosen listing price and q is the probability of sale given his own price p and the current level of interest in the game d:

$$v_{it} = p_{it}q_{it}(p_{it}, d_{it}) + (1 - q_{it}(p_{it}, d_{it}))E_t(v_{it+1})$$

Taking the first-order condition of the above equation yields the following equation for the seller's value-maximizing listing price:

$$p^*_{it} = E_t(v_{it+1}) + \frac{q_{it}(p^*_{it}, d_{it}) + (1 - q_{it}(p^*_{it}, d_{it}))\frac{\partial E_t(v_{it+1})}{\partial p_{it}}}{|\frac{\partial q_{it}(p^*_{it}, d_{it})}{\partial p_{it}}|}$$

Theoretical Framework *continued*

Notably, from the above equation, the seller sets his price based on his expected opportunity cost of waiting to list until the next day, which is represented by the first term. It can be shown that when d does not change over time, this term decreases in t, leading to a prediction of a decreasing price path over time. (The second term has an ambiguous effect on the price path.) This result reflects the fact that sellers' have fewer opportunities to resell when the game approaches and represents the negative effect of ticket expiration on prices. However, because d may increase over time if a particular game's perceived quality increases, the decreasing price path prediction may no longer hold, prompting the need for empirical analysis to measure the importance of this variable.

Empirical Model

I utilize a fixed effects model to relate a ticket's price to the number of days before the game at which the transaction occurred and to a measure of known game quality at the time of sale. In this model, I control for a ticket's location within a stadium by classifying tickets into one of four seating zones, and I include game and calendar-year time fixed effects:

$$\log(P_{igt\tau}) = \beta_0 + \delta_t 1\{days_t\} + \beta_1 Q_{gt} + \beta_2 s_{ig} + \mu_g + \gamma_\tau + \epsilon_{igt\tau}$$

In this specification, variables are subscripted by i, g, t, and τ, which represent the individual transaction, the game for which the transaction occurred, the time of the transaction relative to the game, and the time of the transaction relative to the year, respectively. P represents the ticket price, $1\{days_t\}$ is a set of indicator variables that represent days-to-game bins, Q is a measure of known game quality, and s is a measure of seat quality.

As an additional specification, I allow for the estimation of different price paths by seating zone with the following model, which includes an interaction between the days-to-game indicators and seat quality:

$$\log(P_{igt\tau}) = \beta_0 + \delta_t 1\{days_t\} + \beta_1 Q_{gt} + \beta_2 s_{ig} + \zeta_{igt} 1\{days_t\} * s_{ig} + \mu_g + \gamma_\tau + \epsilon_{igt\tau}$$

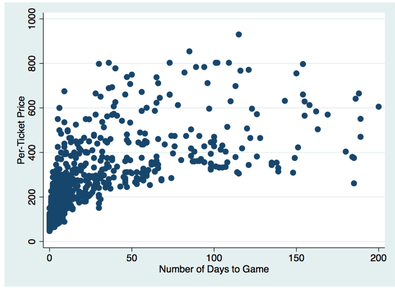
Data Description

I use data on secondary market college football ticket sales for the 2021 season, primarily collected from StubHub, the largest secondary market platform in the ticket industry. The data were obtained from SeatData, a subscription web database intended for use by ticket brokers interested in observing sales trends for particular events. For a given transaction, SeatData provides data on the date and time of sale, the zone, section, and row number of the seats, the number of tickets included in the transaction, and the per-ticket sales price. I select the home games for 30 of the 66 Power Five college football teams to include in an estimation sample. Specifically, I choose the teams that appeared in either the preseason AP rankings or the final AP rankings, or in both. In all, I observe 281,503 transactions across 178 games.

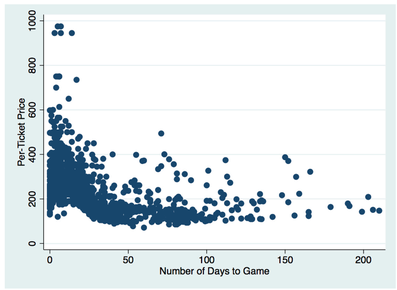
As a measure of the quality of each game in the data as known at the time of ticket sale, I use the Football Power Index (FPI) rankings for each of the two game participants at the time of sale. As another measure, I compute the Rank-Based Interest Factor (RBIF), which is a measure of game interest between 0 and 4.5 calculated using FPI team rankings, for each game-week pairing in the data.

Data Description *continued*

To illustrate the different price path trends observed for different games in the data, the below figure displays the price and timing of all ticket transactions for lower level sideline seats at two specific games.



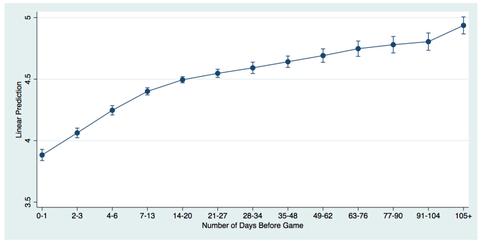
Nebraska at Oklahoma



Penn State at Iowa

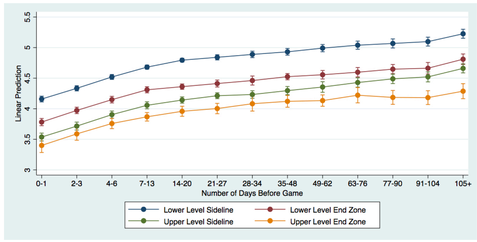
Results and Conclusion

I begin by estimating my first empirical model, first taking Q to be the vector consisting of home and away team FPI rankings on a reverse scale and then as the game's RBIF index. I produce an estimated price path based on the days-to-game estimates and present coefficients on the game quality variables below.



Variable	Estimate
Home FPI	0.012***
	(0.002)
Away FPI	0.002*
	(0.001)
RBIF	0.238***
	(0.066)

Next, I estimate my second empirical model, taking Q to consist of home and away team FPI rankings. The figure below depicts estimated price paths for each of the four seat location categories.



It is clear that, after controlling for known game quality, the data exhibit price paths that decrease with time, in accordance with the theoretical prediction. In particular, prices drop precipitously in the roughly two weeks prior to a game. However, at a fixed point in the sales horizon, an improvement in the home team's FPI ranking or an increase in a game's RBIF index is significantly associated with a higher price. As a result, this perceived quality effect works against the expiration effect, and if game quality changes are large enough, this positive effect may outweigh the expiration effect and lead to increasing prices for a period of time, as observed in the plot of Penn State at Iowa game prices.