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Economics of the English Premier League

Soccer is the most popular sport in the world, and on any given day one goal could make all the difference in the world. Consider the English Premier League where Liverpool currently leads Manchester City by a single point. As of less than one week ago at the time of writing, Liverpool trailed Manchester City by four points, tied with crosstown rival Everton in a 0-0 match entering stoppage time. Six minutes into stoppage time, Divock Origi scored one of the most improbable goals of the season, a rebound off a ball miss hit by Virgil van Dijk that bounced off the cross bar twice and fell right on the head of Origi who directed it into the goal. Origi had played 6 minutes prior to scoring the goal the entire season, and this goal has now changed the entire dynamic of the top of the Premier League. This begs the first economic question of our analysis, what is the elasticity of a demand for goal? Are goals elastic or inelastic goods? We look at some data in order to try to determine an answer.

For the second question of our analysis, we look to my favorite team soccer team, Tottenham FC. During the offseason, while each of the other top 5 teams in the Premier League signed key additions, the Spurs decided to sign no new players. This decision stems from the fact that Tottenham had already spent their entire budget on their new stadium. This asks our second economic question, was this the proper allocation of resources? Should the Spurs owners have considered a different solution where they perhaps spent less on the new stadium or waited a year and signed a few players to the club? Although we do not have data for this question, we discuss this from basic microeconomic theory.

For our first question, we will try to determine the price elasticity of demand, or what the percent increase in demand for an additional goal is where there is a one percent increase in cost. To answer this question, we examine data from the Premier League's fantasy site, where I have been able to webscrape data. We have converted that data into a CSV file that we are able to import into R. From there, we can clean the data in order to be used for economic analysis. Our dependent variable will be price[1] and we will examine goals as our independent variable, among others. We start with a basic log-log regression, so both our independent and dependent variables are both displayed as percentages, and therefore elasticity of demand can easily be calculated. When we create our equation, $\ln(\widehat{Cost}) = \beta_0 + \beta_1 * \ln(\widehat{Goals})$ we see the coefficients for our betas are:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	47.9482	0.7687	62.38	<2e-16 ***
Goals	2.8185	0.1397	20.17	<2e-16 ***

Thus, for every non-goalie in the Premier League, the percentage increase in cost for a one percent increase in goals scored is about 2.82% (note to calculate elasticity of demand we would invert number to have a one percent increase in cost and see what our demand percentage increase or decrease is). We can also create a scatterplot as seen below:

[1] Note that price is not actual contract value, but the value an individual on EPL's fantasy site is willing to spend on the player. Thus, it is similar to real world price but not exactly a player's contract.

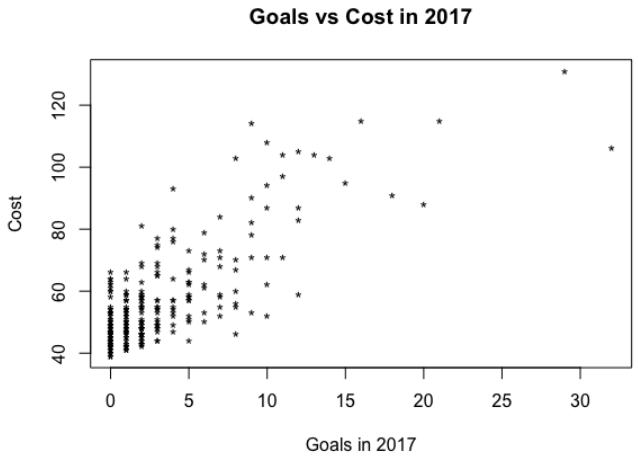

Figure 1: Goals vs Cost in 2017[2]

There are a few things that we can discuss in our initial regression, and a few limitations. First, this contains data for all non-goalies in the EPL in 2017. There are a lot of players who are defenders, or deep midfielders who did not register a goal, or more than a few goals throughout the course of the season. Thus, in our subsequent regression, we will only focus on forwards as defenders cost could also be based upon their defending, passing, or how often they are able to keep a clean sheet based on what team they are on. We could add other things into our regression like playing time, assists, or other things a forward may be judged on, but to keep our model simple we will only focus on goals scored for forwards. Thus, the betas for our new model are

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	48.1655	4.2606	11.305	1.46e-13 ***
Goals	2.8683	0.4195	6.837	4.68e-08 ***

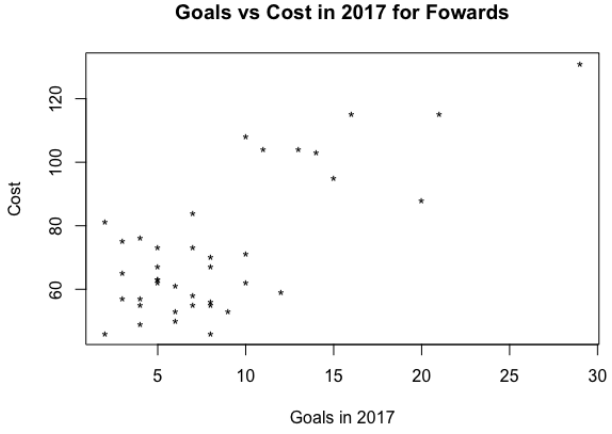

Figure 2: Goals vs Cost for Forwards in 2017

[2] Outliers for this graph include: Mohamad Salah with 32 goals at a price of 106 million and Harry Kane with 29 goals at 131 million.

Once again, we see that people are willing to pay a lot more for forwards who score goals, with everyone willing to pay 2.87 percent more for a player that has an extra 1 percent chance to score a goal. This falls in line with our analysis above that forwards would be paid more per goal than other positions based on the fact that they are paid most to score goals.

Using our economic concepts from class, we can discuss some things about the elasticity of goals scored. Note that our regression outputs show the percentage change in cost based on a one percentage change in goals scored, so we must invert this to deal with elasticity of demand as we are used to in microeconomics. Although the numbers might not translate perfectly due to this inversion, the important concept is that for a 1 percent increase in cost, there will be a less than 1 percent decrease in demand for forwards who score goals. Thus, we can conclude that goals in the Premier League are an inelastic good. This makes sense with our initial story, that one goal can change the course of an entire season and therefore owners are willing to pay whatever price is necessary to ensure that goals will be scored to help the team win the league, earn a Champion's League spot, or even to stay above the relegation zone.

In terms of our second economic concept, we will discuss a more theoretical idea of budget constraint. Tottenham FC is nearing completion in its new stadium in North London, and will conclude playing in Wembley Stadium shortly. The constructing of this new stadium, however, came at a large cost. Because so much of the Spurs budget was put into this stadium, last summer during the off season the Spurs decided to sign no new players. This decision can as somewhat of a headscratcher, as Tottenham had won their Champions League group that included eventual champions Real Madrid, not losing a single game in the group stage. However, in the first round, Tottenham blew a 1-0 home lead (3-2 aggregate) and lost to Juventus, the previous year's semifinalist. Beating the eventual champions and narrowly losing to the previous year's runner up makes one wonder why management did not spend any extra money to try to sign another player to possibly score a critical goal (as discussed above). Although we do not have any hard evidence, we can talk about things we do know and try to figure out why this decision occurred.

As we know from Microeconomics, everyone has budget constraints. In Tottenham's case, we will consider our two elements of budget to be new players and stadium. Since we know the cost of Tottenham's new stadium is around $1 billion and they signed $0 worth of new players, we can say that our budget is $1 billion.[3] We will make our standard three assumptions about our indifference curves: monotonicity, transitivity, and completeness. We will also make the assumption that their utility curve is very simple $U(X,Y) = XY$. We also know that since they did not sign any new players, then our value of either X or Y is 0. We can see immediately that this is not an optimal position on the indifference curve, as our current utility is 0 and any amount of signing of a new player would create an increase in utility. We also know our marginal rate of substitution in this case of the indifference curve is either 0 or infinity, based upon what we choose X and Y to be ($MRS = Y/X$). As before, this again shows that Tottenham FC did not make a wise economic decision when only investing money into their new stadium and not new signings for the club. The only case where their utility curve makes sense is when we have the function $U(X,Y) = X + 0Y$, where X is the new stadium and Y is new players. This utility curve though would imply that Tottenham has no utility at all for signing new players, increasing the ability and strength of their club, and that they only care about building the stadium no matter how bad the team is.

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[3] Perhaps this is not completely accurate as maybe Tottenham's owners had investors pay some of the money they would not have paid to new players, but for argument sake we will go with this number.