Exploring the Evolution of the NFL Draft Pick Trade Market Over Time

Ari Nathanson

Dartmouth Sports Analytics, Dartmouth College

December 22, 2023

ABSTRACT

Building on the work of Cade Massey and Richard Thaler in 2005, this paper investigates changes and trends in the market for National Football League draft picks over the past 40 years. This period has seen significant advancements in the way NFL franchises approach the draft, including the Jimmy Johnson trade value chart, first employed by the Dallas Cowboys in the 1990s. Still, many (including Massey and Thaler) argue that teams continue to significantly overvalue early draft picks. This paper uses a Weibull distribution to model the market value of picks based on their position and year. Looking at each ten-year window, this study generates "rolling" variables to represent trade frequency, market consensus, discount rate, and the rate at which pick value decreases as pick number increases. The graphs of these four variables inform the division of the 40-year period into distinct phases. The findings suggest some maturation of the trade market over time, characterized by more trading and lower discount rates. However, the value decay rate has fluctuated, without a clear downward trend. This paper highlights the complex interplay between innovation, tradition, strategy, and psychological biases in the NFL draft.

INTRODUCTION

In 1989, Jimmy Johnson took over as coach of the Dallas Cowboys. He inherited a depleted roster on the heels of a 3-13 campaign, its third consecutive losing season after a still-record 20 consecutive winning seasons. Johnson had a clear strategy for improvement: amass as much draft capital as possible. However, in order to capitalize on his bounty of picks, he needed to know how to properly value them. At Johnson's request, vice president Mike McCoy put together the National Football League's first draft pick trade value chart. It assigned the first overall pick an arbitrary value of 3,000 and a decreasing value to each successive pick. Using the chart, the Cowboys completed a whirlwind of trades in an attempt to exploit perceived market inefficiencies, drafting 42 players from 1991 to 1993. McCoy created the chart based on

past trade behavior and his own gut instinct—not using advanced analytics. Nevertheless, it led the Cowboys to resounding success. Headlined by homegrown talent including Troy Aikman, Michael Irvin, and Emmitt Smith, Dallas won three Super Bowls in the early 1990s. Soon after, the chart became a fixture of draft rooms around the league. Whereas previously teams had traded picks arbitrarily (as acknowledged by former Cowboys executive Gil Brandt), they now treated pick-trading as a more exact science. Yet Johnson's chart was not without its critics. In 2005, business professors Cade Massey of the University of Pennsylvania Wharton and Richard Thaler of the University of Chicago Booth published "The Loser's Curse." They presented a compelling argument that NFL teams—even after the spread of Johnson's chart—significantly overestimated the value of picking high in the draft. They also criticized the going discount rate (the cost of exchanging a future pick for a present pick) as exorbitantly high. In the years since, a plethora of alternative charts have been developed, claiming to more accurately reflect picks' true value. Yet according to Bill Belichick, "everybody probably [still] uses about the same value chart." How exactly did the proliferation of the Jimmy Johnson trade chart affect the draft pick trade market? Did criticism of the Johnson chart, exemplified by the seminal 2005 Massey-Thaler study, change NFL teams' thinking? What other events, if any, had an impact? In this paper, I will investigate all of these questions through an in-depth analysis of the draft pick trade market over the past 40 years.

METHODS

I start by compiling a dataset of all trades involving NFL draft picks from 1983 to 2023, which encompasses the data used by Massey and Thaler as well as that of years after the paper was published. All data are collected from Pro Sports Transactions Archive. First, I remove all trades involving picks in the 2024 and 2025 drafts, as these draft orders have not been set at the time of writing and thus the exact position of these picks is yet to be determined (teams are only allowed to trade draft picks up to two years in advance). From here, I narrow down the dataset by excluding all trades involving veteran players or the

rights to these players. This reduces the size of the data set by roughly 50 percent. Finally, I eliminate all of the following: trades involving picks that were forfeited for supplemental draft picks, trades involving picks in the 1984 USFL draft, exchange of picks as compensation for coaching hires or players lost in free agency, trades involving "past considerations," and trades with reporting errors or inconsistencies that I could not resolve. These latter cuts, taken together, reduce the size of the dataset by no more than 5 percent. I am left with a dataset of 856 trades.

Next, I build a model to estimate the market value of draft picks as a function of their position and year (relative to the current year). My methodology closely mirrors that used by Massey and Thaler. Under the assumption that pick value decreases monotonically with draft position, I model pick value using a Weibull distribution. The value of the *n*th pick in year *y*'s draft is:

$$v(n) = (1 + d)^{y_0 - y} e^{-\lambda (n-1)^{\beta}}$$

where y_0 is the current year and **λ**, **β**, and *d* are parameters to be estimated. Note that *d* represents the discount rate. Also note that the value of the first overall pick in the current year's draft is 1. Now, for each trade, assume each side receives a set of picks with equal total value. One important assumption is that future years' picks (for which the draft order is undetermined) are valued at their ultimate position. This assumption is not unreasonable because teams can roughly project where a team will be drafting based on recent performance and future outlook, especially within a two-year window. We have:

$$\sum_{i=1}^{s} v(n_i^A) = \sum_{j=1}^{t} v(n_j^B)$$

where team A trades "up" to receive *s* picks and team B trades "down" to receive *t* picks, where $i = 1$ and $j = 1$ are the highest-ranked picks received by teams A and B, respectively. (Picks are ranked first according to year, with picks in the current year coming first. Within a given year, picks are ranked by

their position. The team acquiring the highest-ranked pick in the trade is said to be trading "up", while the other is trading "down.") If we substitute the first equation into the second and solve for the highest pick in the draft, we get:

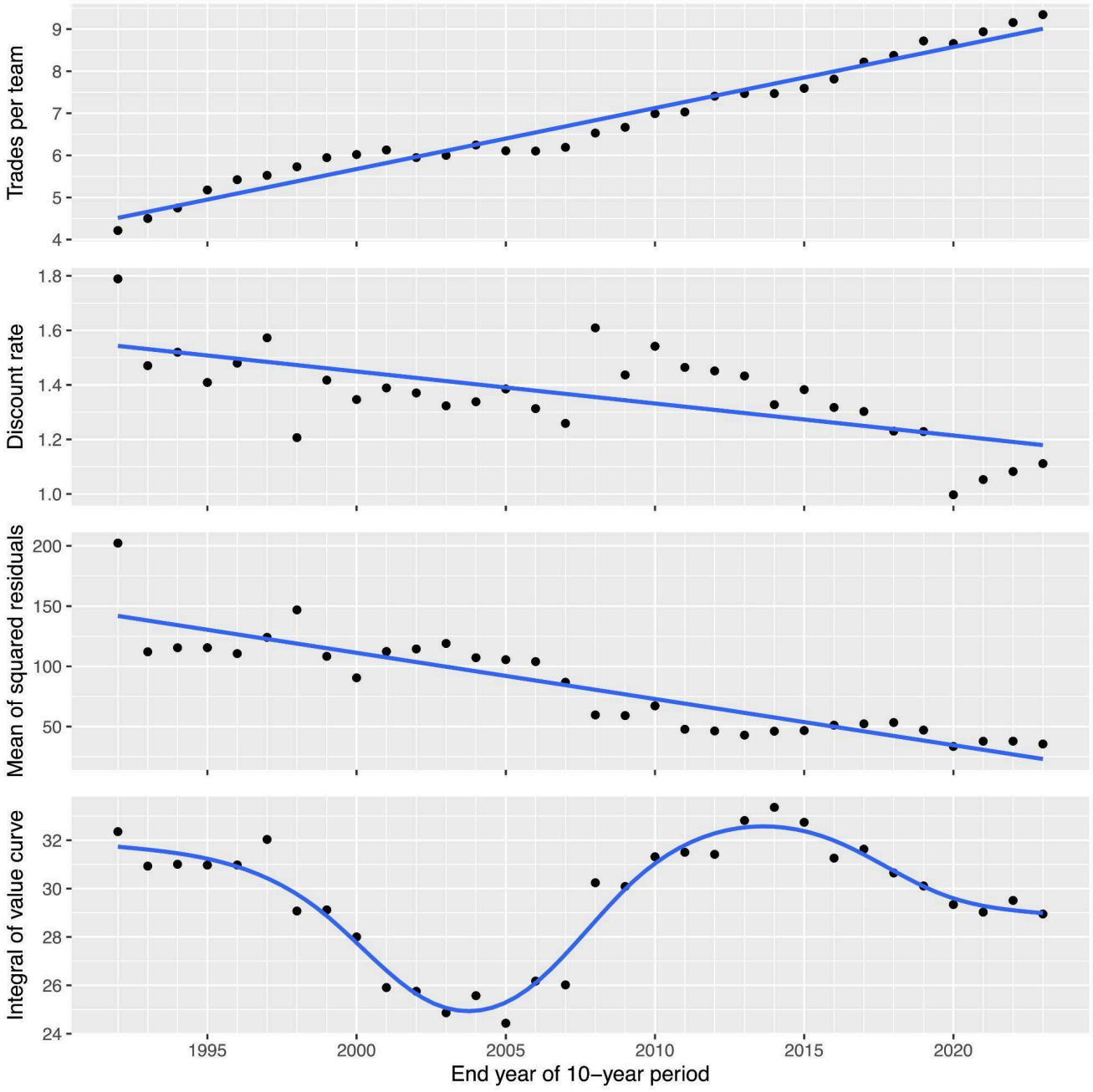
$$n_i^A = \left(-\frac{1}{\lambda} log\left((1+d)^{y_1^A - y_0}\left(\sum_{j=1}^{t}(1+d)^{y_0 - y_j^B} e^{-\lambda\left(n_j^B - 1\right)^{\beta}} - \sum_{i=2}^{s}(1+d)^{y_0 - y_i^A} e^{-\lambda\left(n_i^A - 1\right)^{\beta}}\right)\right)\right)^{1/\beta} + 1$$

I can now optimize the parameters **λ**, **β**, and *d* using least squares regression to create a model.

I use this model to examine changes in the draft pick market over time. For each year between 1992 and 2023, I look at the ten-year period leading up to that year. I optimize the parameters over each of these ten-year subsets to create a best-fit curve, plotting pick value on the y-axis against draft position on the x-axis. From these curves I generate four "rolling" variables that represent different aspects of the draft market. First, I look at the number of trades per team (using the mean number of active NFL teams over the ten-year interval) to measure market activity. Second, I record the value of the parameter d, or the discount rate. Third, I use the mean of the squared residuals as a proxy variable for the degree of consensus among teams on how picks should be valued. Last, I look at the integral of the best-fit curve from $n = 1$ to $n = 336$ (the maximum number of picks in any year during this time period). It represents how sharply value decreases as draft position increases; note that the steeper the drop in value, the less the area under the curve. I graph all four of these variables with respect to year. Using these four graphs, I attempt to identify "eras" within the evolution of the draft pick trade market and see if and how they correspond to significant developments in the NFL. I will then run regression analysis of the data subsets corresponding to these eras.

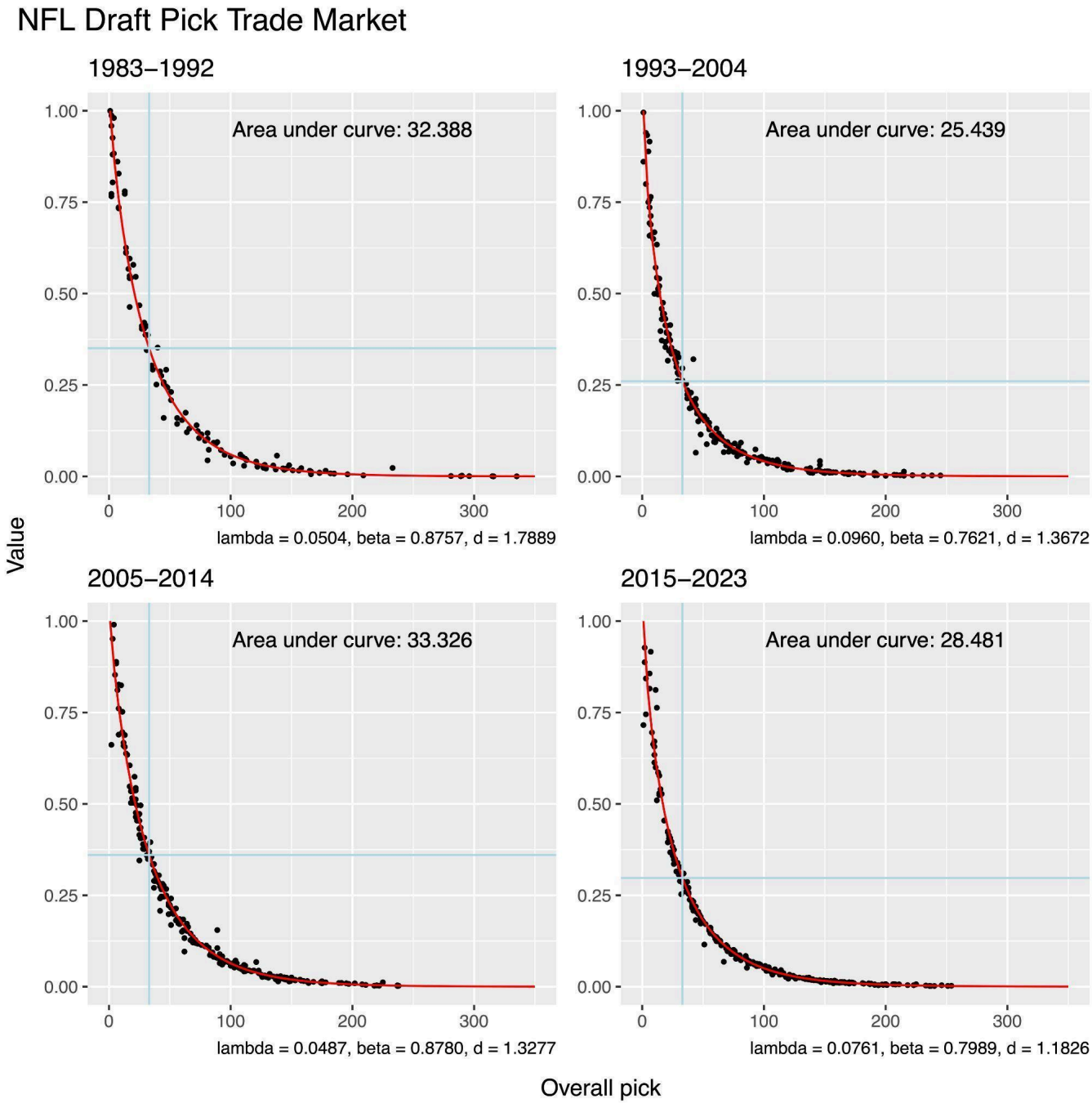
RESULTS

Below are rolling plots of trades per team, discount rate, mean of squared residuals, and integral of best-fit value curve calculated over ten-year intervals from 1983 to 2023. I fitted the first three plots using linear regression as they exhibited clear linear trends, while the last plot I fitted using polynomial regression.



Based on the trends displayed in the above graphs, I divided the 40-year period into four distinct eras. Below are plots of the best-fit value curves (red) for those eras. The points (black) represent individual trades, with the x-coordinate being the highest ranked pick in the trade and the y-coordinate being the net

value of all other picks in the trade (that is, the total value of picks received by the team trading down minus the value of all other picks traded along with the highest ranked pick). Thus, points that lie below the best-fit curve are trades in which the team trading up gets an above-market-value return, while points that lie above favor the team trading down. The light blue lines show the estimated value of the 33rd overall pick, which in today's draft is the first pick of the second round.



DISCUSSION

Out of the four initial graphs, the clearest trend is seen in the evolution of trades per team over time: there is a consistent, linear increase from 4.21 trades per team from 1983-1992 to 9.34 from 2014-2023. Recall that this only includes trades that consist purely of draft picks; trades involving NFL players or the rights to them were excluded. Still, there has been a marked increase in overall trade activity, with 2023's 41 draft-day trades setting an all-time record. One explanation might be that, with the rise of modern analytics, teams are more confident in their ability to benefit from trades, whether through superior scouting or by having a more accurate draft pick valuation formula than the competition (arbitrage). Another somewhat contradictory explanation is that there might now be *more* consensus on how to value picks than ever before. This could lead to increased liquidity, market confidence, and, ultimately, trading volume. The graph of mean squared residuals supports this latter hypothesis; over time, the average amount by which trades deviate from market estimates has decreased in roughly linear fashion. From 1983-1992, this value was 202.26, meaning that the average trade's highest ranked pick differed by an average of $(202.26)^{½} = 14.22$ picks from the model's expectation. The 2014-2023 model was only off by an average of 5.97 picks. In other words, the model has been able to fit the data increasingly well over the past several decades. This points to the increased use of a relatively standardized pick valuation formula—perhaps Johnson's chart—across NFL front offices.

The discount rate graph also displays a negative trend, although it is not as steady as the trends in the other graphs discussed previously. The inconsistency of this trend may be attributable to a few factors. First, teams have long employed a very crude rule of thumb when it comes to trading future draft picks: "lose a year, gain a round." Of course, trading this year's seventh for next year's sixth is a lot different than swapping a late second for what turns out to be an early first rounder next year. Furthermore, from the perspective of individual franchises, discount rate is very context-dependent. For example, a team

with an aging star quarterback whose competitive window is closing might have a higher discount rate than a team deep in a rebuild. In addition, a moral hazard problem can occur: when a team's general manager (or another key decision-maker in the draft process) knows he is under pressure to succeed immediately or lose his job, he might operate with an inflated discount rate. All of these factors, when combined with the fact that the sample size of trades involving future picks is small, may create considerable year-to-year variability in the discount rate. Nevertheless, the overall downward trend does make sense in the broader context of the NFL. It is clear even to the casual fan that forfeiting 179% (the discount rate from 1983-1992) of a pick's value in order to move up a year is likely an overpay. The root cause of this irrational behavior is impatience, and with front offices becoming increasingly analytically-minded, impatience probably informs their decision making less and less.

These three graphs all display approximately linear, monotonic behavior. The fourth graph—the integral of the best-fit value curve—is the exception. The exact value of this integral does not have any meaning, but we can see that it has a local maximum around the 1983-1992 interval, bottoms out during 1995-2004, reaches a peak from 2005-2014, and then begins to decline again. The inflection points at roughly 2000 and 2010 are the points at which the integral starts to increase and decrease, respectively. (It is possible there is another inflection around 2018, but it is too early to tell.) Both of these years line up with events that may have significantly impacted the draft pick trade market. 2000 is roughly when teams across the NFL adopted the Johnson chart. While the chart did not present a radical new valuation formula (it was more of a codified observation of past trends), reliance upon it may have reduced the prevalence of massive, lopsided upward trades that skewed the data. Thus, it makes sense that the curve becomes flatter around this time. 2011 saw the ratification of a new collective bargaining agreement which established the rookie wage scale. This put an end to the exorbitant contracts offered to high first-round picks, such as quarterback Sam Bradford's 6 year, $78 million deal signed in 2010. As a result, the risks associated with drafting early decreased, and the surplus value generated by high-performing first-round picks increased.

It is not surprising, then, that the data show a steepening of the value dropoff around this time. Notably, the publication of the Massey-Thaler paper in 2005 does not seem to have had an immediate impact on the steepness of the value curve.

I chose the intervals of 1983-1994, 1995-2004, 2005-2014, and 2015-2023, which roughly correspond to the maxima and minima of the integral curve, to showcase a few snapshots of the draft pick market as it has fluctuated over time. The light blue lines, which intersect to show the value of the 33rd overall pick, demonstrate just how much steeper the value dropoff is in the second and fourth eras compared to the first and the third. The below table shows the values of some additional picks in the draft:

Era	1st overall	10th overall	33rd overall	100th overall
1984-1994	1.000	0.708	0.350	0.060
1995-2004	1.000	0.599	0.256	0.041
2005-2014	1.000	0.715	0.361	0.064
2015-2023	1.000	0.644	0.297	0.050

Table 1: Estimated market value of various overall draft picks

The other trends from the exploratory graphs discussed above—increasing trading volume, increasing goodness of fit, decreasing discount rate—all still hold when looking at these four graphs side-by-side.

CONCLUSION

My analysis confirms that the NFL draft pick market has undergone significant changes over the past 40 years. Teams trade picks more often and with a greater degree of consensus on how to value them. The premium on picks from the current year compared to future years has decreased, although still remains

high. The relative market value of picks within a given draft has fluctuated: the steepness of the value dropoff was most pronounced in the 1990s, before teams had a definitive valuation model, and then flattened throughout the 2000s with the adoption of the Johnson chart. Scholarly minds like Massey and Thaler hypothesized that, over time, the curve would continue to flatten and the discount rate would continue to fall as teams moved beyond the irrational forces of overconfidence and impatience. According to the data, this hasn't exactly happened. The value gap actually crept back up in the 2010s, although it has begun to show signs of plateauing. Importantly, Massey and Thaler published their paper before the implementation of the rookie wage scale, which likely affected front offices' calculations. Future research should revisit Massey and Thaler's analysis, especially since it was based on the surplus value generated by rookies under their contracts compared to similar production by veterans. Regardless, even if it is not market-optimal, teams seem to have been slow to move away from the Johnson chart. Perhaps this is because of psychological biases; perhaps it is because its near-universal adoption facilitates quick and easy trading; or perhaps it is because the nature of the draft means the least competent franchises end up with the most and highest picks. For as long as NFL franchises are steered by general managers on the hot seat, owners with delusions of grandeur, and, above all, the irrational whims of mobs of fans, the decisions they make will never be fully optimal.

References

Bill Belichick: Every team uses the same draft chart. (2019, April 10). NBC Sports. Retrieved December 22, 2023, from https://www.nbcsports.com/nfl/profootballtalk/rumor-mill/news/bill-belichick-every-team-uses-the-same-draft-chart

Brugler, D. (2023, July 10). *What is the NFL Supplemental Draft? Explaining the process, how players enter and when it takes place*. The Athletic. Retrieved December 22, 2023, from https://theathletic.com/4617204/2023/07/10/nfl-supplemental-draft-players/

Bushnell, H. (2022, April 25). *Do NFL teams overvalue first-round picks? The answer: Yes*. Yahoo Sports. Retrieved December 22, 2023, from https://sports.yahoo.com/the-chart-that-guides-nfl-draft-trades-has-a-glaring-flaw-it-isnt-very-good-134240503.html

Dajani, J. (2023, April 29). *2023 NFL Draft: Teams set record with 41 trades, with majority coming on Day 3*. CBS Sports. Retrieved December 22, 2023, from https://www.cbssports.com/nfl/news/2023-nfl-draft-teams-set-record-with-41-trades-with-majority-coming-on-day-3/

Fortier, S. (2022, April 25). *Why the 'Jimmy Johnson' draft trade chart has endured — so far*. Washington Post. Retrieved December 22, 2023, from https://www.washingtonpost.com/sports/2022/04/25/nfl-trade-value-chart/

Marousek, F. (2023). *Professional Football Draft Pick Transactions*. Pro Sports Transactions. Retrieved December 22, 2023, from https://www.prosportstransactions.com/football/DraftTrades/Years/

Massey, C., & Thaler, R. M. (2013, July). The Loser's Curse: Decision Making and Market Efficiency in the National Football League Draft. *Management Science*, *59*(7), 1479–1495.

National Football League Franchise Histories. (2021). Pro Football Hall of Fame. Retrieved December 22, 2023, from https://www.profootballhof.com/football-history/national-football-league-franchise-histories/

Reyes, L. (2014, May 25). *Is the NFL better off with the rookie wage scale?* USA TODAY Sports Wire. Retrieved December 22, 2023, from https://sportswire.usatoday.com/2014/05/25/nfl-draft-rookie-wage-scale-roger-goodell-cba-clowney-manziel-mack/

The rules of the NFL Draft. (2023). NFL Football Operations. Retrieved December 22, 2023, from https://operations.nfl.com/journey-to-the-nfl/the-nfl-draft/the-rules-of-the-draft/

Stuart, C. (2013, April 20). *Thoughts on Discount Rates When Trading NFL Draft Picks*. Football Perspective. Retrieved December 22, 2023, from https://www.footballperspective.com/thoughts-on-discount-rates-when-trading-nfl-draft-picks/

2024 NFL Trade Value Chart. (2023, December 12). Drafttek.com. Retrieved December 22, 2023, from https://www.drafttek.com/NFL-Trade-Value-Chart.asp

Yarris, B., & Robinson, D. (2023, April 21). *NFL Trade Value Charts: Different Draft Trade Value Charts To Follow*. Pro Football Network. Retrieved December 22, 2023, from https://www.profootballnetwork.com/nfl-trade-value-charts-different-draft-trade-value-charts-to-follow/