

# Massey Thaler 2013 Notes : Improving the NFL Draft Trade "Chart"

## 1. Value of a draft pick as implied by Draft Trades (the Market)

$$\sum_{i=1}^m V(t_i^H) = \sum_{j=1}^n V(t_j^L)$$

ex  $V(1) = V(7) + V(11)$

$t_i^L = i^{\text{th}}$  pick in the draft  
 $r = H$  means team with higher pick that is "trading down"  
 $r = L$  means team with lower pick that is "trading up"  
 $i = \text{rank}$  among multiple picks in a trade  
 $i=1$  means best pick  
 $V(t)$  = value of  $t^{\text{th}}$  pick relative to the first pick

$$V(t_i^r) = e^{-\lambda(t_i^r - 1)^{\beta}}$$

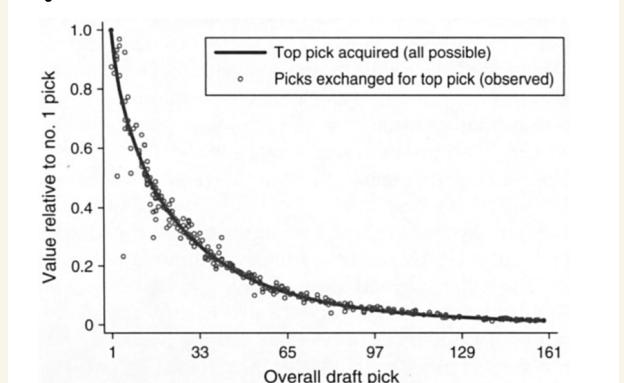
Weibull distribution. note  $V(1) = 1$ .  
Should be nonparametric  $V$ , not Weibull...

$$\Rightarrow t_i^H = \left[ \frac{1}{\lambda} \log \left( \sum_{j=1}^n e^{-\lambda(t_j^L - 1)^{\beta}} - \sum_{i=2}^m e^{-\lambda(t_i^H - 1)^{\beta}} \right) \right]^{\frac{1}{\beta}} + 1$$

Nonlinear Regression to find  $(\hat{\lambda}, \hat{\beta})$

→ Value of draft pick  $t$  is  $\hat{V}(t) = e^{-\hat{\lambda}(t-1)^{\hat{\beta}}}$

Figure 1 Estimated Trade Value of Draft Picks



② Market value (compensation) as a function of performance

$$\log(\text{comp}_{i,t}) =$$

$$\begin{aligned}
 & \alpha + \sum_n \mathbf{1} \left\{ \begin{array}{l} \text{player } i \text{ in year } t \\ \text{is in category } n \end{array} \right\} \cdot \sum_{r=1}^5 B_{n,i} e^{-\eta(r-1)} \\
 & + \sum_j \pi_j \mathbf{1} \left\{ \begin{array}{l} \text{player } i \text{ in year } t \\ \text{plays position } j \end{array} \right\} \\
 & + \sum_{j=6,7,8} k_j \mathbf{1} \left\{ \begin{array}{l} \text{player } i \text{ in year } t \\ \text{is in year } j \\ \text{so } t = -j \end{array} \right\} \\
 & + \delta V_i \quad (\text{optional term}) \\
 & + \varepsilon_{i,t}
 \end{aligned}$$

$V_i = \exp(-t)$  is a function  
 of a player's original draft pick.  
 Including this barely impacts  
 the regression.

Performance category  $n \in \{ \text{PRO bowl}, \geq 14 \text{ stars}, 1-13 \text{ stars}, \text{bench player, not in the league} \}$   
 in years 6-8

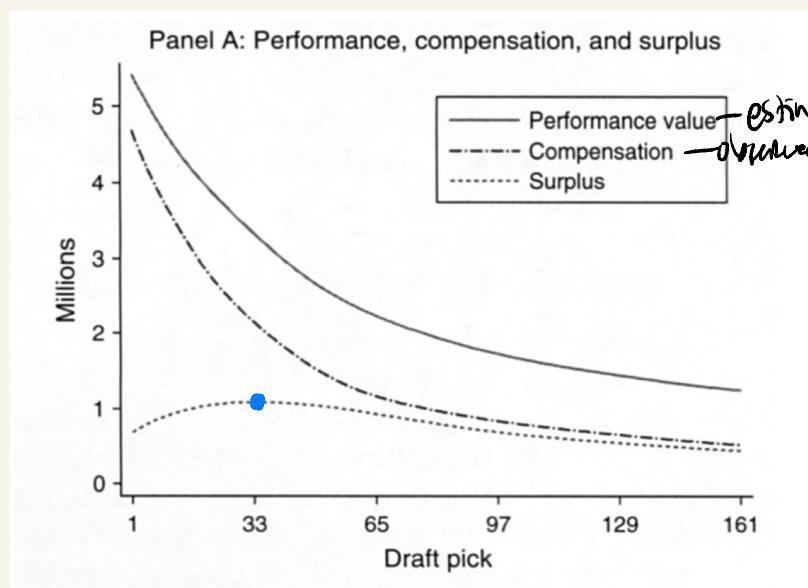
$$\Rightarrow \widehat{\text{Compensation}}_{i,t} = f(\text{performance})$$

### (3) Surplus Value of player $i$ in season $t$

$$\hat{S}_{i,t} = \hat{P}_{i,t} - C_{i,t}$$

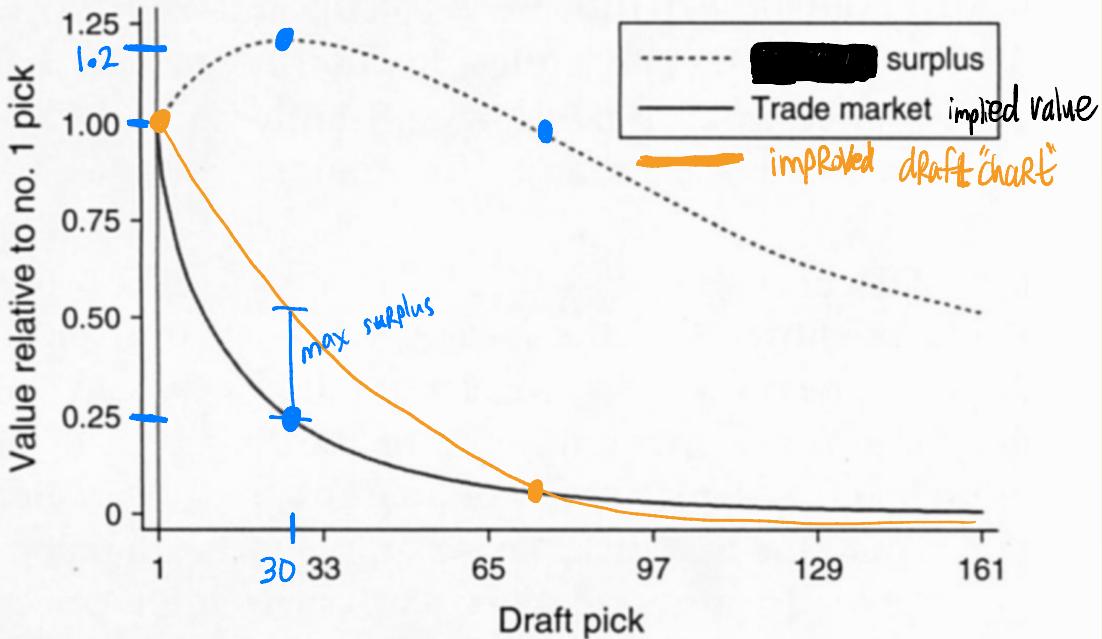
Predicted performance value, or estimated compensation from years 1-5 performance

actual compensation costs of player  $i$  in year  $t$



Use Surplus, not Performance itself, since it applies to players across All positions,  
If just WR, can use performance (e.g. Rec. Yards) directly

Panel B: Surplus vs. trade value



In expectation, late 1<sup>st</sup> Round and all 2<sup>nd</sup> Round picks are Undervalued in the current draft trade market!