Madden Quarterback Paper Outlines

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Abstract

Outlines for Madden Quarterback Papers

1 Paper 1: Trying not to use expert knowledge

1.1 Overall Introduction

1. The goal is to use football team construction as a metaphor for overall portfolio construction
2. Football teams are built up of players who play different positions
3. Players at those positions have a variety of skill levels, but not only that they also have a variety of prototypes, e.g. running and pocket quarterbacks
4. We would like to understand the synergy of building these teams (e.g. certain types of quarterbacks pair best with certain other types of receivers, etc.)
5. We begin one position at a time, and then eventually bring them together into teams

1.2 Quarterback Introduction

1. All quarterbacks are evaluated on every attribute
2. However, some attributes are irrelevant to playing the position of quarterback. These include tackling, kick power, kick return ability, etc.
3. Right off the bat, we reduce to the 21 attributes that might apply to playing the position of quarterback

1.3 Process

1. The very first thing we can do is cluster the quarterbacks based on their performance on these categories, which is sort of useful but not sufficient
2. The idea that we have is to first cluster the attributes, then have new scores that represent those attribute clusters, then cluster the quarterbacks based on those attribute clusters, then use those clusters as archetypes and bring the scores back into it.
3. One issue with doing these clusters is that all good quarterbacks get clustered together
4. Another issue with clustering the attributes is that adding them up doesn't quite work (some are mostly 80s and 90s, some are mostly 60s and 70s, some range from like 20 to 90)...so we use z-scores to flatten that part out
5. Once we have the z-scores, we calibrate everybody down to a sum of zero so that the quarterbacks are clustered by tendencies and not by talent level, at least in theory

1.4 Process 2

1. Start with 119 quarterbacks and their scores on 21 criteria = QBOriginal
2. Calculate z-scores on those criteria = QBzscores

3. Take covariance matrix of those z-scores, and plot it to figure out which categories relate to each other

4. Create meta-feature scores by combining categories in the same cluster, either unweighted or weighted based on strength of correlation with each other = OverallQBscores

5. Normalize these scores down so that each sum is 0 = OverallQBnorm-scores. That is, if a player has (0.5, 1, -0.5, 1) his adjusted score is (0, 0.5, -1, 0.5).

6. Cluster quarterbacks based on these scores - categorize clusters as, for example, Scrambler, West Coast, Power Runner, Pocket QB, etc.

7. Weight attribute clusters in quarterback clusters by using pnorms (as in, -1 goes to approximately 0.16, 0 to 0.5, etc.) and then normalizing - clusweights

8. Evaluate each quarterback using his real scores (OverallQBscores) and the clusweights to get to QBScores - a matrix on which every quarterback has n scores, where n is the number of player clusters.

1.5 Problem

1. Try as we might, we cannot get the scores to make sense without any outside input whatsoever. Tom Brady too low, Tim Tebow too high, etc.

2. We tried a number of things here - we tried mixing and matching the criteria in a number of ways. We tried weighting them based on how interconnected they were with each other.

1.6 Conclusion

Conclude that it is not currently feasible to construct the rating system we desire with absolutely no reference to prior knowledge about the quality of these players and/or the relative importance of the categories.

2 Paper 2: Using expert knowledge

2.1 Introduction

1. We will use the overall rating as a guideline, but not as an actual factor. Basically, we will be roughly approximating criteria weights based on how predictive they are relative to the other criteria in a multiple regression against the overall score.

2. The first thing we do is still manually reduce to the original 21.

3. When we run the multiple regression (qbfit), we see that only ten of the criteria have a meaningful contribution to the Overall rating. We therefore have two potential sets of information to use: one using the full 21, and one reducing to just these 10.

2.2 Process V1

1. Process with just the 10 criteria that contribute meaningfully to the overall rating: began with QBReduced, cluster on covariance matrix (covar)

2. Clusters revealed three groups: Scrambling, Accuracy, Deep Ball. Weight factors within the groups based on their coefficients in the multiple regression. This is a four-column data frame (Overall, Scrambling, Accuracy, Deep Ball) called QBCluster - QBNormCluster is the one with normalized scores and no Overall (such that the three combined z-scores are made to sum to 0).

3. Cluster normalized scores on players to get five types: Scrambler, Mobile Deep Thrower, West Coast, Big Arm, Pocket Passer.

4. ReducedQBFit is the multiple regression of Overall against the 3 categories - use those coefficients as a baseline weighting of each multifeature in each player type cluster = standardunreducedweights

5. Weight adjustments for each cluster of player type based on pnorm on the adjusted z-score on the normalized score = clusterreducedweights

6. Final weights are adjustedreducedweights = average standard and cluster. Reapply these weights to the unnormalized cluster scores (QBClusterNoOverall) - this gives a zscore like total score. Take pnorm of that, multiply by 100, this is QBTotalScoresReduced.

2.3 Process V2

1. Process with all 21: began with QBOriginal, cluster on covariance matrix (covar2)

2. Clusters revealed five groups: RunningQB, Awareness, Throwing, FastRun, PowerRun. Weight factors *within the groups* based on their coefficients in the multiple regression. Turn this into what is now a six-column data frame (Overall, RunningQB, Awareness, Throwing, FastRun, PowerRun) and call it QBCluster2. Also do the same thing with normalized scores (QBNormCluster2).

3. Cluster normalized scores on the players to get 5 types: Scrambler, Low Awareness Balanced, West Coast, Pocket Passer, High Awareness Balanced.

4. UnreducedQBfit2 is the multiple regression of Overall against the 5 categories - use those coefficients as a baseline weighting of each multifeature in each player type cluster = standardunreducedweights2

5. Weight adjustments for each cluster of player type based on pnorm on the adjusted z-score on the normalized score = clusterunreducedweights2.

6. Final weights are adjustedunreducedweights2 = average standard and cluster. Then re-apply these weights to the unnormalized cluster scores (QBCluster2NoOverall) - this gives a z-score-esque total score. Take pnorm of it, multiply by 100. This is now QBTotalScoresUnreduced2.

References