

Four Factors applied by murrayyyy

The "Four Factors" was a theory written by Dean Oliver. A lot of times you will see percentages assigned to them but this is how it started out: Saying above that shooting is "the most important" of the four factors hints at what this section is about: The Four Factors aren't all equivalent in value. You can do better at your opponent in three of these factors and still lose. You can be a good team at three factors and poor at the other and only end up with a mediocre team. Identifying the factors that are generally important then helps in identifying a strategy for constructing a successful team.

Specifically, at the NBA level, the general ranking of importance of the Four Factors is:

1. Shooting percentage (10)
2. Turnovers per possession (5-6)
3. Offensive rebounding percentage (4-5)
4. Getting to the foul line (2-3)

The number after each of the factors is an approximate weight on the factor, on a scale from one to ten, which indicates how important it is to winning a game. So, with shooting being most important, turnovers and offensive rebounds end up about half as important. Getting to the line is half again as important.

Notice that there are no percentages assigned to them. Most sites will give you numbers and I will say that you must come up with your own weights when looking at the factors. The general assignments are:

- Shooting 40%
- Turnovers 25%
- Rebounding 20%
- Free Throws 15%

Those categories are very vague so we should examine what the best ways to examine a team's abilities in the four factors are.

**Shooting.** The simplest way to evaluate shooting is through an effective field goal percentage, one that combines 2-point shots with 3-point shots. This is given as

$$\text{Eff FG\%} = (\text{FGM} + 0.5 * \text{FG3M}) / \text{FGA}$$

**Turnovers.** The impact of turnovers is through a turnover percentage, or the number of turnovers a team commits per possession. In fact, all the measures you will find here are effectively percentages of some total. In this case, possessions can be counted in a game or they can be estimated as :

$$\text{Poss.} = \text{FGA} - \text{OR} + \text{TO} + 0.4 * \text{FTA}$$

Evaluated this number for both an offense and a defense, then averaging, gives a pretty good estimate. Dividing turnovers by this number gives a turnover percentage.

Offensive rebounding. Measuring a team's ability to get offensive rebounds is simple. It is also important because it creates 2nd chance points. It is just their offensive rebounding percentage, a measure shown in NBA official stats, which is found through this formula.

$$OR\% = OR / (OR + Opponents Def Reb)$$

Getting to the foul line. There are multiple ways to assess this. Since actually getting fouled is the more variable skill than making foul shots, you can measure this skill as FTA/FGA but I often prefer to make some account for ability to make the foul shots, too, and use FTM/FGA

Those are the measurements of the Four Factors referred to herein.

[http://www.basketball-reference.com/leagues/NBA\\_2014.html#misc::none](http://www.basketball-reference.com/leagues/NBA_2014.html#misc::none)

The link provides the offensive and defensive stats for the four factors without me doing any work(why do it when someone else has). Why would I want to know the offensive and defensive factors? Because if you can project what two teams will do offensively and defensively, you should have a pretty good understanding of what all those factors combined will predict in a game situation. So my approach can be seen as an “eight factors” of basketball instead of four factors. I also see this chart as useful because if you sort any of the four factors a league average also pops up. Therefore you can see that a team is performing above/below the league average.

I’m sure you are now saying, “Great, but how do I use this data to create a spread?” Well if we assume both teams play near their averages, we can generally see what a game should be. There are exceptions to the rules. Not being able to account for injured players is a major problem. Teams usually have 8 outstanding games and 8 horrible games. It is hard to predict when that will happen. Days rest are also a factor that has to be figured in based off studies done by:

[http://www.nbastuffer.com/How\\_Rest\\_Day\\_Stats\\_can\\_Give\\_you\\_the\\_Edge\\_in\\_Your\\_NBA\\_Predictions.html](http://www.nbastuffer.com/How_Rest_Day_Stats_can_Give_you_the_Edge_in_Your_NBA_Predictions.html)

For my example, I will use the Brooklyn Nets v Philadelphia 76ers game (December 20th) as an example. The Nets were favored by 6.5 points.

Rk	Team	eFG%	TOV%	ORB%	FT/FGA	eFG%	TOV%	DRB%	FT/FGA
26	Brooklyn Nets	0.493	14	23.7	0.253	0.507	13.2	73.4	.257
30	Philadelphia 76ers		0.486	15.5	25.4	0.18	0.528	14.3	74.3 0.222
	AWAY	-1.4	-0.8	-2.9	-0.4				
	HOME	-4.2	-1.2	-0.3	-4.2				
		-1.12	-0.1	0.52	-0.57				-2.54

If anyone has followed my odds they know that I said the 76ers would win this game by 2.1 pts. I will admit that I don't use the exact factor percentages that others discuss (because Oliver just had weights, not concrete %'s) which are for you to decide on.

The first numbers for home and away are simply the ((offensive eFG% minus the defensive eFG%) multiplied times \*100) to give me a solid number. As you can see, both teams have horrible defensive eFG on the season (76ers are 4.2% points worse).

The second numbers are the TOV% (defensive TOV% subtracted from the offensive). Obviously I do it this because the more turnovers you get compared to the amount you commit will create more offensive opportunities for your team. Once again, both teams turn it over more than they create turnovers.

The third is checking out the ORB% on offense and defense. If a team gets more offensive rebounds then it gives up, it has more opportunities for 2nd chance points or free possessions. (Off Reb minus (100 minus Def reb%{Gives the defensive OFF reb%}). With the pace figure on the chart we get the data that the league average per game is 94.1 this year. A team who gets a lot of offensive rebounds is now adding free chances with a high ORB% or a low defensive ORB%. Notice in our example that the 76ers are better than the Nets on the ORB% and they don't give up as many ORB on defense.

The fourth is just FT/FGA turned into a real number by multiplying times 100. If one teams gets to the line more than another team it's an advantage in two areas. They create foul trouble for the team they are playing if it is higher. It also provides opportunities to add points while the clock is not moving.

Now that I've made these into "real" numbers, how can I use this information? I subtract the home teams stats from the away stats and multiply those numbers times the value we have assigned the factors.  $(-4.2 - (-1.4)) * .40 = -1.12$ . Do this for all the factors and then add them up and multiple times 2 (to be honest, I forget why I do this but it works. If I lie and say I do it because there are two teams will you promise not to ask me?) and you get -2.54 "points". This is what would happen if both teams played on a neutral court. (With the negative value it is saying that the road team, being the Nets, win by 2.54 points most of the time. If it was positive it would be the home team or the 76ers in this case.) This game was played in Philadelphia so you need to assign a "home court" factor to the -2.54 points. I will leave this for you to determine (A home court value) but odds are it will push the line closer to 0. Remember that Las Vegas has set the line at -6.5 and now our line is getting farther away from that number.

So let us examine the game results. How did the 76ers win the game?

	1	2	3	4	OT	T
BRK	31	26	26	25	12	120

PHI 29 31 22 26 13 121

	Pac	eFG%	TOV%	ORB%	FT/FGA	ORtg
BRK	97.8	.582	14.0	11.9	.247	111.2
PHI	97.8	.555	13.8	27.9	.100	112.1

We thought the eFG difference would be a .028 advantage for the Nets and it was even better. We thought the TOV% was almost even (0.1 for the Nets) and it was really (0.2 for the 76ers). We thought the 76ers had a clear advantage in ORB and it was even better than expected. The 16% difference is where the game was really won. We knew that the Nets had a clear advantage in FT/FGA but remember, it is only worth 15% of the overall value.

<http://www.basketball-reference.com/boxscores/201312200PHI.html> (box score for examinations)

Let's see what happens when we put those numbers back in to examine how the game turned out

eFG%	TOV%	ORB%	FT/FGA	eFG%	TOV%	DRB%	FT/FGA
0.582	14	11.9	0.247	0.555	13.8	72.1	0.1
0.555	13.8	27.9	0.1	0.582	14	89.1	0.247
AWAY	2.7	-0.2	-16	24.7			
HOME	-2.7	0.2	17	10			
	-2.16	0.1	6.6	-2.205	4.67		

Those stats say the 76ers should win and they did win. Now it's not by the same number that we said but remember, we are trying to find advantages in the lines. Our numbers showed the 76ers not getting enough points before the home court is added in compared to Vegas. Games that we and Vegas predict to have the same number show us no statistical advantage and don't give us a "cushion" to feel good about.

<http://www.rawbw.com/~deano/index.html>

<http://www.basketballonpaper.com/book.html>

<http://www.basketball-reference.com/about/factors.html>

<http://www.nba.com/thunder/news/factors050127.html>

<http://www.nba.com/hawks/four-factors>

[http://www.nbastuffer.com/component/option,com\\_glossary/Itemid,90/catid,41/func,view/term,Fo  
ur%20Factors/](http://www.nbastuffer.com/component/option,com_glossary/Itemid,90/catid,41/func,view/term,Fo<br/>ur%20Factors/)

<http://www.emptythebench.com/2009/12/11/advanced-basketball-statistics-101/>