One of the most crucial findings of the nascent football analytics community was the discovery of shots ratios and their **powerful predictive power**. The discovery that year-on-year shot differential at the team level was repeatable, and largely skill driven (86% skill/14% luck), enabled the community to write and talk about a teams dominance without having to refer to league points or placings.

Football was merely catching up with what hockey had known for a number of years.

Shots Ratios/Differentials are, in general (obviously there are exceptions), a proxy for something else – control, **territory**, scoring chances and they tell us some, but not all, about a teams underlying dominance over it's it's opponents and it's fixture list. A team that takes **60% of the shots** in it's games will, over time, be more successful than a team that takes **30%** of the shots.

But there's a problem with using basic shots numbers as a cast iron indication of dominance and that problem is called goals. Specifically the effect that the scoring of a goal has on the dynamics of a game.

The team that takes the lead in any given fixture is likely to sit a little deeper and take fewer shots. The team that is trailing will attack more and take more shots – especially as time begins to tick down. The wisdom of this strategy – tactical or subconscious – is questionable, for what team would willingly choose to cede territory and concede an increasing number of shots?

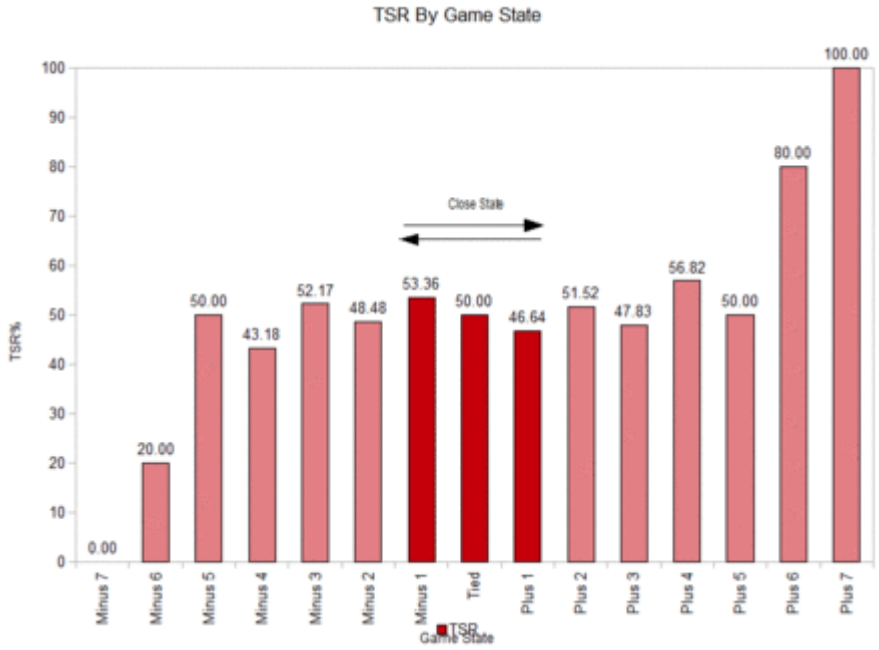
In this post I'm going to present some numbers on *Score Effects* which will show what teams do when leading or trailing by a goal and why those teams employ the seemingly odd strategies that they do.

**Note: I wish I had more data to use but my database melted into oblivion over the summer. Alas, we have 13/14 season to work with.*

TSR

Our entire sample is tens of thousands of minutes of football and nearly 3500 shots. But the crucial game states to look at are those which fall under ‘Close’: minus 1, tied and plus 1. This is where **85%** of game time takes place, **83.9%** of all shot events take place and it’s also the where we see the best examples of how goals lead to score effects.

I have included all game states in the following charts, but as stated above we are really only interested in the game states which fall under Close. The sample size of +3, +4 etc just isn’t big enough to draw any conclusions.



This is Total Shots Ratio (*shots for/shots for+shots against*) and straight away we see some things of interest:

- *Tied* TSR is **50%.**
- Teams at *Plus 1* get out-shot by a decent margin **46.6%** to **53.4%.**

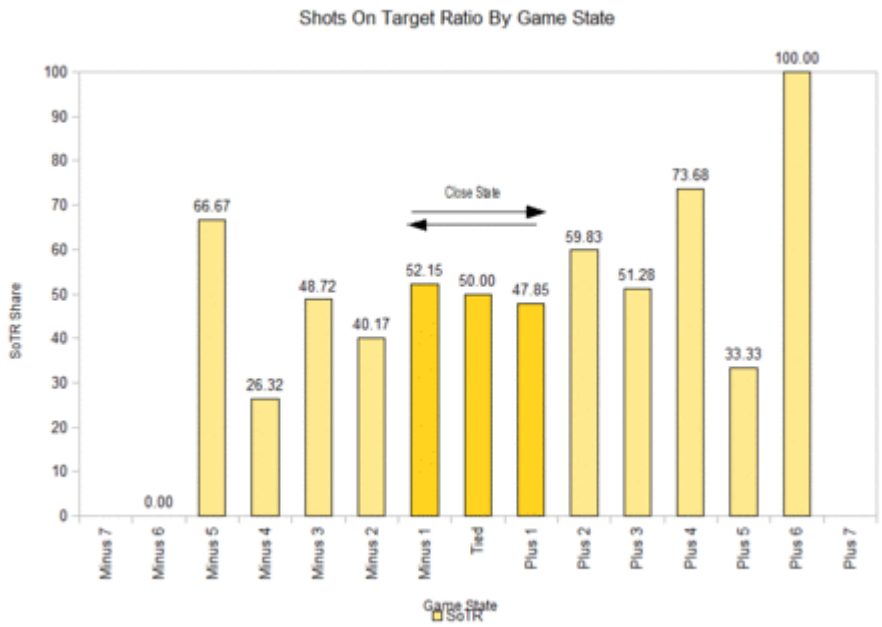
Why are teams out-shot when leading by a goal?
It’s a curious thing but teams who are leading by a goal tend to construct something that is called a ‘defensive shell’ [1] [2] that sees the leading team, in most cases and especially away from home, tighten up their defensive shape and drop deeper. For the leading team preventing an equalizer is more valuable than trying to score a second goal. All these things lead to the team at *plus 1* losing the shots battle and the team at *minus 1* winning the shots battle.

We often hear of **managers** who want their teams to play the same way when winning as they do when they are losing, but the data says that this doesn't actually happen (except for a few elite clubs). Why do teams play differently when leading? It could be tactical or it could be a collective response from players who are risk averse and want to protect the slender lead.

Quick Hit:

Team trailing at -1, on average, tends to out-shoot their opponents due to a mix of their own desperation to equalize and the leading teams' tactical conservatism in protecting their game position.

Shots On Target Ratio



This time we are looking at shots on target. Similar results are evident:

- Teams at +1 lose the shots battle **47.85%** to **52.15%**.

Teams who lead by a single goal (plus 1) are out-shot by TSR and SoTR but the shots on target battle is a little closer:

	Minus 1	Tied	Plus 1
TSR	53.36	50.00	46.64
SoTR	52.15	50.00	47.85

The table above likely shows some of the positive effects of a defensive shell. Yes, the leading team gives up an increased number of shots against and thus sees it's TSR suffer, but in defending deeper in a more compact shape it's shots on target ratio doesn't deflate to quite the same extent.

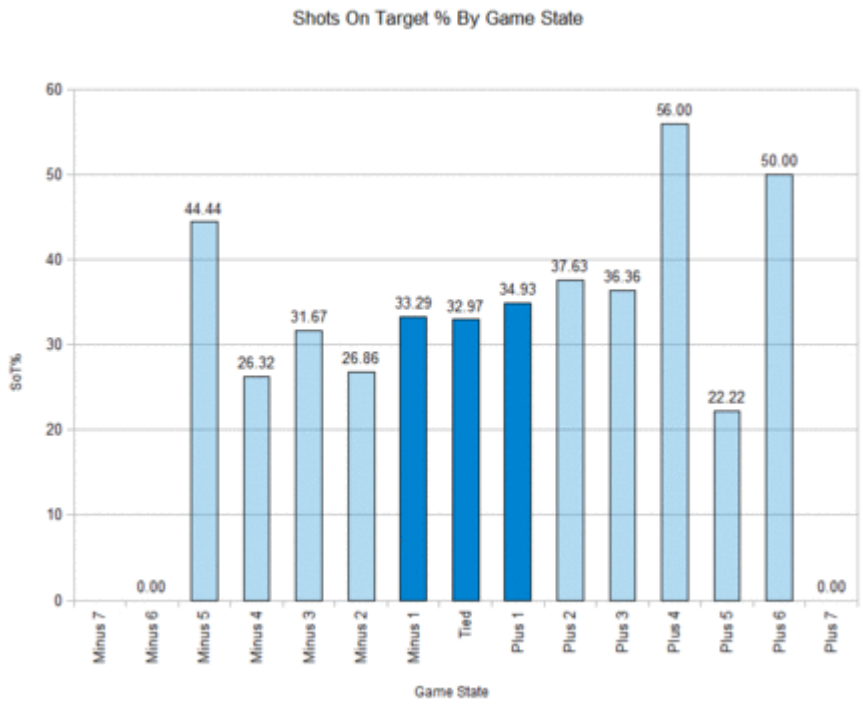
Two reasons why, at *plus 1*, SoTR is higher than TSR:

1. **The defensive shell works and forces the trailing opposition team to take shots from increased distances, from worse angles or under more pressure with less space.** The pressure, the bad angles and the increased distances all contribute to the leading team being able to prevent a higher number of the trailing teams shots from finding their way on target.
2. **The leading team is able to exploit the desperation of the trailing team and counter attack into more space with fewer defenders present.** That space and lack of defensive pressure leads to a higher percentage of the leading teams shots to find their way on target.

Quick Hit:
Teams trailing at -1 out-shoot their opponents by shots on target but the margin is smaller than when looking at total shots.

Shots On target Percentage

Complete for/against chart with SoT % rating.



This chart shows us the percentage of team *shots for* that end up on target.

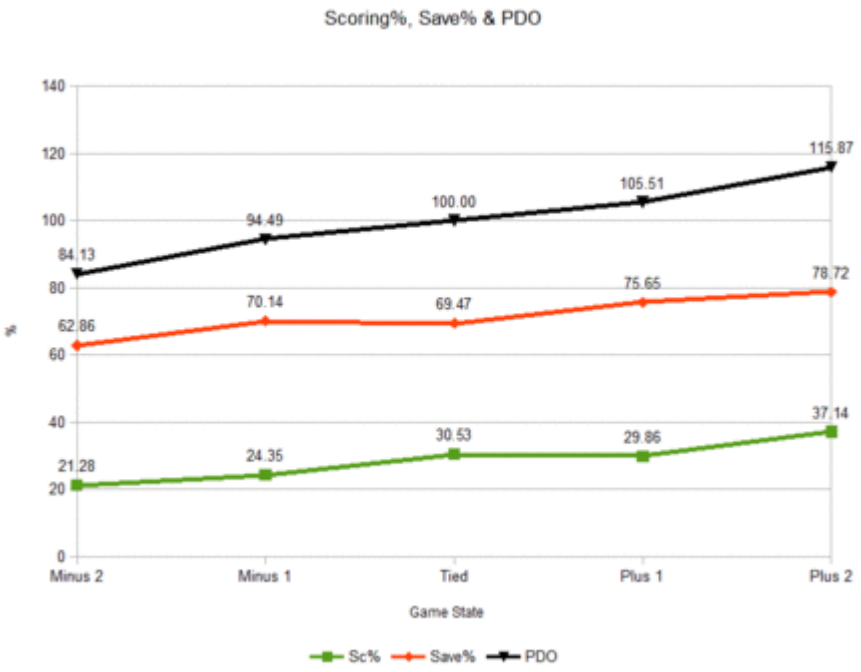
In the section above I talked about the space and lack of pressure the +1 team faces when attacking and we see the effects in this chart. Plus 1 SoT% is **34.93%** which is a touch higher than the number teams post at minus 1. The reasons for this can be seen in bold above.

It's pretty simple really, trailing teams find it harder to post good Sot efficiency numbers due to the leading teams shell. There may also be a touch of desperation to the trailing teams shots selection. The trailing team also cheats for offense which leaves them open to effective counters.

Quick Hit:

Team at +1 (and further) receives a boost in SoT For% & SoT Prevention%. Team at -1 suffers a decline in comparison to plus 1 in both Sot For% & SoT Prevention%.

Scoring%, Save% & PDO



As stated previously, any information outside of +1/-1 is likely too small a sample to be trusted at this point. *Close Game States* contain ~84% of the shots information so we shall focus on *close*.

It's also worth noting that there is massive variance in sc% and sv% in small samples (see Arsenal's scoring% at tied which is contributing to the high league Tied sc% for an explanation).

Scoring%

Scoring% at plus 1 sits at **29.8%** which is significantly higher than scoring% at minus 1. Again, the leading team, in general, attacks into more space with less defensive pressure so it's no real surprise to see plus 1 scoring% so much higher than scoring% at minus 1. Minus 1 scoring% runs into that defensive shell – lots of bodies/pressure/little space – and suffers for it.

Save%

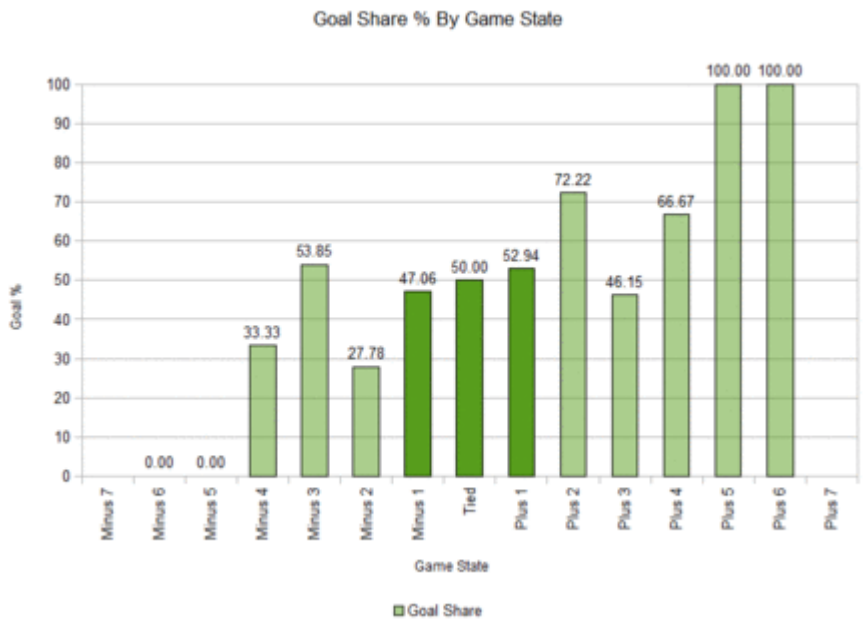
We see a boost for the leading teams save% (defensive shell, forcing shots to the outside). Save% at minus 1 is significantly when compared to plus 1. The trailing team may well be cheating for offense which leads to a higher percentage of shots against actually getting on target. That same cheating for offense may also contribute to a lower save%.

PDO

Add the scoring% and save% numbers together for each individual game state and we end up with a PDO rating. PDO gets a pretty big boost at +1 and a pretty sharp drop at -1.

Goal Share %

The final graph is the most telling.



Things we know so far: The trailing team is the stronger by the shots count but weaker in terms of efficiency and conversion percentages. The leading team has a tactical advantage in that they have possession of the lead, can tighten their defensive shape and in attack capitalize on the trailing teams desperation in trying to find an equalizer.

For the leading team, not conceding an equalizer is more valuable than scoring a second goal, and that tactical mindset is evident in all of the charts above. The result of all the things we have looked at can be easily summarized:

The leading team (+1) scores **52.94%** of the goals and concedes **47.06%.** And that is despite being out-shot by both total shots and shots on target. Tactics – defensive shape and counter attacking threat – actually matter a hell of a lot to the team that is leading by a single goal.

Those tactics **reduce** the oppositions efficiency and conversion percentages while **boosting** their own efficiency and conversion percentages. The result of those tactics is a greater likelihood that the next goal of the game will be scored by the team already leading.

Notes & Further Questions

I'm far from happy that I can't publish a study on score effects that features a far larger data sample but I felt that score effects and game states had begun to feature in my work to such an extent than an explanatory post on the topic was necessary.

Some of these numbers may well change over the course of the season, or over the course of the next three seasons but hey, I felt I had to address the topic.

The question of shot quality is a hot topic in football analytics these days. The question of how much shot quality matters needs to be answered, and it will be. But I do wonder to what extent scoring or save% boosts at +1 and +2 game states can sometimes skew our interpretation of teams' overall numbers.

We know 'good' teams can sometimes sustain PDO's north of the league average. Is that sustain positive proof of an ability to create better chances (shot quality) and prevent quality chances against or is it merely a function of the boost that good teams receive by spending a lot of time in winning (+1, +2) positions?

Are Arsenal's and Liverpool's save percentages indicative of a well rounded defensive scheme no matter if the scoreline is in their favour or not? Or are those teams save percentages and defensive schemes boosted by spending above and beyond an average of **45** minutes per game in a winning position?

Teams with good attacking and defensive schemes tend to find ways to get into the lead more often that not. Not all of a team X's impressive conversion numbers are due solely to score effects but some of it may well be.

On a individual player level who's to say that what looks like a sustained shot quality ability isn't just a function of playing on a dominant team who spend a huge chunk of their games in a positive game state? Scoring becomes easier when your team is winning by two or three against demoralized opposition.

Lots of questions, more miles to be covered.