

# Impact of established clubs on probability of survival in top leagues

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## INTRODUCTION

Football leagues across the world apply the European promotion-relegation model, where the best teams in the highest-ranking minor league are promoted to the major league from which the worst teams are relegated to the former.

This research proposes a simple statistical model that calculates the probability of non-established clubs avoiding relegation, by assuming the existence of a cohort of established clubs, which rarely if ever are relegated

It is the number of established clubs which is critical, rather than which clubs should be so categorised

## MODEL

The statistical model proposed utilises three items of data: T = the Total number of clubs in the league in question; E = the number of clubs that are deemed to be members of the Established group; R = the number of clubs that are Relegated from the league in question

Assuming that all clubs outside the established group have an equal chance of surviving, it follows that the probability (P) of a non-established club avoiding relegation in a given season is:

$$P = (T - E - R)/(T - E)$$

**The probability of a non-established club surviving n seasons is therefore P<sup>n</sup>.**

Some leagues have end-of-season play-offs involving a club, or clubs, from the top-tier, as well as clubs from the next tier. For example, in Germany at the end of a season the 16th-place club in the First Bundesliga plays a two-leg relegation match against the third-place club of the Second Bundesliga for the final spot in the First Bundesliga. If the outcome of such a relegation match was 50:50 then the value of R would be 2.5 on average.

## SAMPLE

Tested model against the English Football Premier League (EFPL) for its first twenty-one seasons: from 1992/93 up to and including 2012/13<sup>1</sup>

There were seven "ever-present" clubs (Arsenal, Aston Villa, Chelsea, Everton, Liverpool, Manchester United and Tottenham)

Four clubs had been present for at least sixteen seasons (Newcastle (19), Blackburn (18), West Ham (17), and Manchester City (16))

The minimum size of EFPL Established Group was set at 7 with a maximum of 11 because of the major financial investments in Manchester City, and the fact that the next highest number of EFPL seasons for any club was 14

These 11 clubs accounted for 51% of the total club-seasons (allowing for there being 22 clubs in the EFPL for its first three seasons, and 20 each season subsequently) despite only representing 24% of the 45 clubs that have played in the EFPL during this time.

## OBSERVED PROBABILITY OF AVOIDING RELEGATION

To calculate the observed probability of non-established clubs avoiding relegation required analysis of the number of seasons in the spells that non-established clubs had spent in the EFPL. To this end, two values of lengths of spells (LOS) were examined:

- A. The LOS of non-established clubs truncated from 1992/93 onwards (i.e. the first season of the EFPL); and
- B. The LOS of non-established clubs where the full LOS for all clubs that played in 1992/93 are used, i.e. using the date these clubs entered the English Football League Division One, the forerunner of the EFPL

The importance of B is illustrated by Nottingham Forest, which was relegated in 1992/93 having been promoted to Football League Division One in 1977; this spell is attributed a LOS of one season for A, but a LOS of sixteen seasons for B

The results are set out in Table 1, Table 2 and Figure 1.

The number of seasons was limited to eight because the probability for not being relegated within eight seasons, assuming eleven established clubs, was less than 0.05.

## RESULTS

Table 1 shows that the model probability for a non-established club not being relegated within eight seasons ranges from 0.04 to 0.12, according to size of cohort of established clubs. Assuming that there are no established clubs has a probability of 0.27, which is nearly 600% greater than the probability for a cohort of eleven established clubs. This clearly demonstrates the need to assume the existence of cohorts of established clubs; the question is the size to be assumed

Table 2 provides the probabilities of non-established clubs surviving in the EFPL based upon the number of seasons observed in each club's spell in the league. The first two sets are the observed probabilities with the LOS truncated from 1992/93 onwards (based on A) for the two sizes of established group. The third and fourth sets are the observed probabilities with the full LOS (based on B) for the two sizes of established group. To be consistent with Table 1, Table 2 is also limited to eight seasons

Observed probability of club surviving two seasons is only 0.36 assuming a full established group of 11 clubs, i.e. odds of almost 2:1 on of a newly promoted club being relegated within two seasons

Observed probability of club surviving eight seasons is only 0.09 assuming a full established group of 11 clubs, i.e. odds of almost 10:1 on of a newly promoted club being relegated during this period

## MODEL VALIDITY

The results from applying t-tests to appropriate matched pairs (all of which had seven degrees of freedom) were:

- The five sets of probability distributions generated by the proposed statistical model (see Table 1), gave ten different sets of matched pairs. Comparisons were appropriate for all. The resulting (two-tailed) significance for each and every pair was less than 0.01, supporting the observation that the means were significantly different statistically between each. This indicates that the assumed size of established group matters to the results
- Four sets of matched pairs were created across Table 1 and Table 2: the model probability distribution for an established group of seven clubs (in Table 1) was compared to each observed probability distribution for the established group of seven ever-presents (in Table 2). The same comparisons were made for the full established group of eleven clubs. The resulting (two-tailed) significance for each and every pair was greater than 0.05, supporting the observation that the means were not significantly different statistically. This suggests that the model reasonably reflects the observed distribution for each size of established group
- The four sets of observed probability distributions (see Table 2), gave six different sets of matched pairs. Comparisons were appropriate for all. The resulting (two-tailed) significance for "Actual Excluding 'Established Group of 7' – LOS 92/93+" and "Actual Excluding 'Established Group of 11' – Full LOS" was 0.23, reflecting their highlighted similarities. All other pairs had (two-tailed) significance less than 0.01, supporting the observation that the means were significantly different statistically. This indicates that the established group size and calculation of LOS impact on the results

Together the above suggest that the model reasonably reflects the observed distribution for each size of established group.

## FINANCIAL CONSEQUENCES OF RELEGATION

Relegation from EFPL has had serious financial consequences for good proportion of the 34 non-established clubs that participated in EFPL up to and including 2012/13

Eight clubs went into administration within a short period following relegation from the EFPL and several others experienced significant financial difficulties<sup>2</sup>

Despite large increases in revenue clubs in the EFPL and Football League have year-on-year collectively failed to post a pre-tax profit, with many clubs in the Football League entering into administration<sup>3</sup>

Football clubs looking for promotion to the EFPL need to assess the potential financial impact of relegation, alongside the antecedent probability of a non-established club avoiding relegation, in order to appropriately project the (financial) risks for the club of future relegation

Such risk calculation is essential for any non-established club, newly promoted or otherwise, in any country and sport applying European promotion-relegation model, because finances are relative.

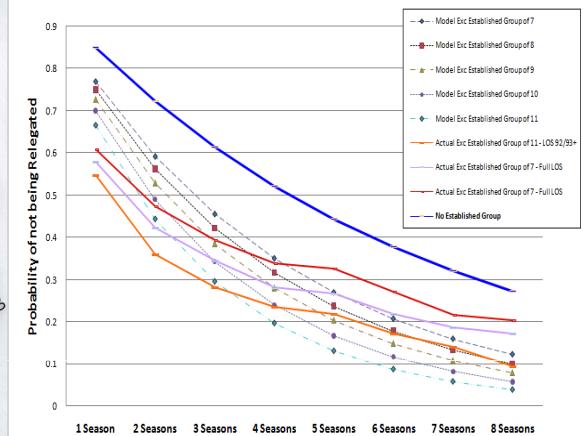
Table 1: Model Probabilities of a Non-Established Club Surviving in EFPL – Three Clubs Relegated

Probability of Club outside "Established Group"	Assumed Number of Clubs in "Established Group"						Excess Probability of No "Established" Clubs Compared to "Established Group"					
	None	7	8	9	10	11	7	8	9	10	11	
NOT being relegated in First season =	0.85	0.77	0.75	0.73	0.70	0.67	11%	13%	17%	21%	28%	
NOT being relegated within Two seasons =	0.72	0.59	0.56	0.53	0.49	0.44	22%	28%	37%	47%	63%	
NOT being relegated within Three seasons =	0.61	0.46	0.42	0.38	0.34	0.30	35%	46%	60%	79%	107%	
NOT being relegated within Four seasons =	0.52	0.35	0.32	0.28	0.24	0.20	49%	65%	87%	117%	164%	
NOT being relegated within Five seasons =	0.44	0.27	0.24	0.20	0.17	0.13	65%	87%	118%	164%	237%	
NOT being relegated within Six seasons =	0.38	0.21	0.18	0.15	0.12	0.09	82%	112%	155%	221%	330%	
NOT being relegated within Seven seasons =	0.32	0.16	0.13	0.11	0.08	0.06	101%	140%	198%	289%	448%	
NOT being relegated within Eight seasons =	0.27	0.12	0.10	0.08	0.06	0.04	122%	172%	248%	373%	598%	



Probability of Club outside "Established Group"	Actual Exc "Established Group of 11"				Actual Exc "Established Group of 7"				Actual Exc "Established Group of 11" of 7"			
	LOS 92/93+	LOS 92/93+	Full LOS	Full LOS	LOS 92/93+	LOS 92/93+	Full LOS	Full LOS	LOS 92/93+	LOS 92/93+	Full LOS	Full LOS
NOT being relegated in First season =	0.55	0.58	0.58	0.61	0.36	0.42	0.42	0.47	0.28	0.34	0.34	0.39
NOT being relegated within Two seasons =	0.36	0.42	0.42	0.47	0.28	0.34	0.34	0.39	0.23	0.28	0.28	0.34
NOT being relegated within Three seasons =	0.28	0.34	0.34	0.39	0.23	0.28	0.28	0.32	0.22	0.27	0.27	0.32
NOT being relegated within Four seasons =	0.22	0.27	0.27	0.32	0.22	0.27	0.27	0.32	0.17	0.22	0.22	0.27
NOT being relegated within Five seasons =	0.17	0.22	0.22	0.27	0.17	0.22	0.22	0.27	0.14	0.18	0.19	0.22
NOT being relegated within Six seasons =	0.14	0.18	0.18	0.23	0.14	0.18	0.19	0.23	0.09	0.14	0.17	0.20
NOT being relegated within Seven seasons =	0.12	0.16	0.16	0.21	0.12	0.16	0.17	0.21	0.08	0.12	0.14	0.18
NOT being relegated within Eight seasons =	0.10	0.12	0.12	0.16	0.10	0.12	0.13	0.16	0.06	0.09	0.11	0.14

Figure 1: Probability of Non-Elite Group Club Not Being Relegated In First Eight Seasons



## CONCLUSIONS

- Model is valid and easy to use
- Size of established group can be flexed for sensitivity analyses if required
- Simple and practical means of investigating the probability of non-established clubs avoiding relegation in any top league
- Informs evaluation of financial risk
- Can be applied in any country and sport utilising European promotion-relegation model
- EFPL analysis shows the existence of cohorts of established clubs must be assumed, otherwise the projected probability of survival greatly overstated
- It is the number of established clubs, rather than deliberation about which clubs should or should not be included, which is critical

## REFERENCES

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