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Odds Modelling and Testing Inefficiency of Sports Bookmakers Rmodel

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Abstract

In this paper I am applied a diagonal inflated bivivariate poisson as well as a simple staking model whereby evaluate the efficiency of odds price of Asian Handicap and Goal Line offered by 40 sports bookmakers. Finally I get a breakdown profit & lose table. While I used Kelly model next to this research which generated a profit every year.

Keywords: keywords, Bivariate poisson, Multivariate discrete model, Betting strategy, Soccer, English Premier League, Expected return, Maximum likelihood, Statistical forecast, Bookmakers, R, Excel.

1. Introduction

The odds modelling in Europe and United States are very popular since decades. However statistical odds modelling and algorithmic staking has not yet popular in Far East Asia.

By refer to *Dixon & Coles 1996*¹, *Karlis & Ntzoufras 2005*² and also *Dixon & Pope 2004*³ I tried to collect soccer data from year 2006 to 2011. The purpose of the research is testing the inefficiency of soccer odds offered by 29 bookmakers as well as making profit from bookmakers.

The paper *Dixon & Coles 1996* inspired by the *Maher 1982*⁴ to identify the offence and defence index of every single team where *Karlis & Ntzoufras 2005* enhanced to be more complicated model. *Moya 2012*⁵ taken 40000 customers' data from bwin to analyse and

¹Refer to reference paper 02

²Refer to reference paper 08

³Refer to reference paper 05

⁴Refer to reference paper 01

⁵Refer to reference paper 10

profit and lose and applied diversified staking strategies to make profit from bookmakers. *Goddard 2004*⁶ model an ordered probit regression and placed stkes on English soccer leagues from 1998 to 2002 and finally yeild 1998/99 = 0.116, 1999/00 = 0.008, 2000/01 = -0.008, 2001/02 = 0.160.

Well, *Dixon & Robinson 1997*⁷ has built a rebirth model on 90 minutes In-Play soccer gaming. *Crowder, Dixon, Anthony & Robinson 2001*⁸ applied MCMC⁹ model for soccer result prediction and do a comparison with previous *Dixon & Coles 1996* model where concludes that previous model forecast more precisely.

Similar with *Dixon & Coles 1996*, *Karlis & Ntzuofras 1998*¹⁰ has encountered an issue which is a number of nil-nil tied games. while *Dixon & Coles 1996* applied an inflation on low scores games while *Karlis & Ntzuofras 2005* built an extra distribution parameter to settle it.

The latest research paper wrote by Dixon is that *Dixon & Pope 2004* which have reviewed the previous model and testing the efficiency on correct score of 3 major firms in UK. *Karlis & Ntzuofras 2007* make a summary of evolution on his research which is apply Skellam's distribution on bivariate poisson model to resolve the obstacle of draw games.

Section 2 discribe a statiscal model applicable to soccer odds modelling. Section 3 talk about the dataset while section 4 model focus on staking model. Section 5 present the result and last section conclude.

2. Modelling

2.1. Basic Model

As mentioned in *Karlis & Ntzuofras 2005*, bivariate Poisson models are appropriate for modeling paired count data exhibiting correlation. Paired count data arise in a wide context including:

- marketing (number of purchases of different products)
- epidemiology (incidents of different diseases in a series of districts)
- accident analysis (number of accidents in a site before and after infrastructure changes)
- medical research (the number of seizures before and after treatment)
- sports (the number of goals scored by each one of the two opponent teams in soccer)
- econometrics (number of voluntary and involuntary job changes)

Where I just to name a few among the use.

Bivariate Poisson regression models

⁶Refer to reference paper 09

⁷Refer to reference paper 03

⁸Refer to reference paper 04

⁹Markov Chain Monte Carlo model

¹⁰Refer to reference paper 06

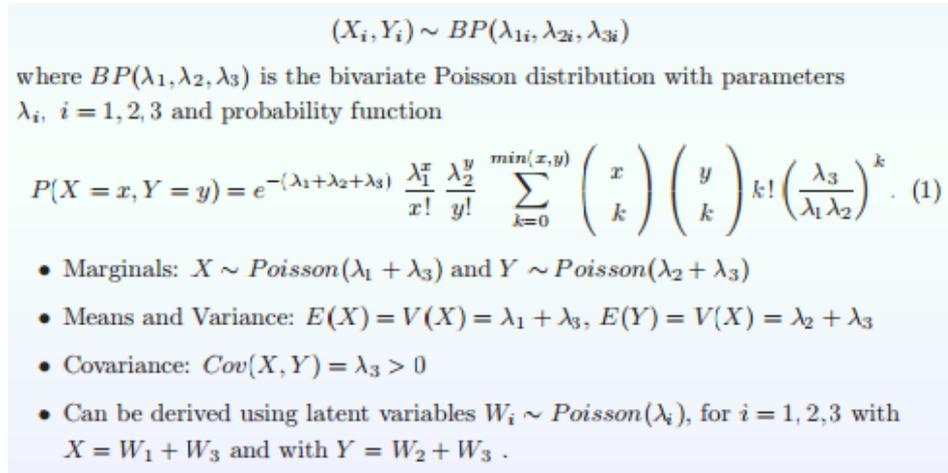


Figure 1: Bivariate Poisson regression models

From above formula, bivariate poisson basically measure the correlation between X and Y compare to double poisson models. However, as I mentioned which is *Dixon & Coles 1996* modified a little on the score 0-0, 1-0, 1-1 and vice versa.

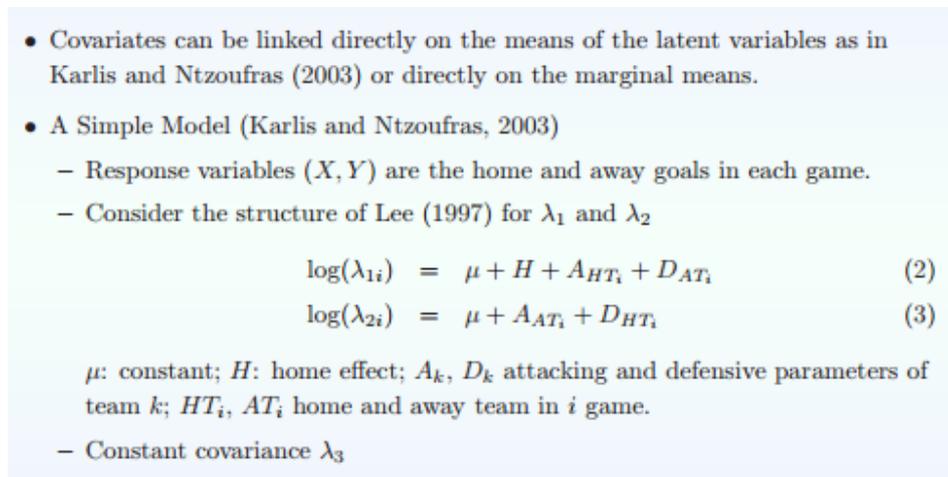


Figure 2: Double Poisson regression models

A Double poisson model can be easily applied by generalized linear model. The covariates is a constant parameter across all soccer matches or teams as we know from figure 2.

Diagonal Inflated Bivariate Poisson regression models

Due to the bivariate is not accurate enough and applicable to predict the real life soccer result. *Karlis & Ntzoufras 2005* introduced a more complicated model which able to inflated the probabilities of the occurrence on draw games.

Under this approach a diagonal inflated model is specified by

$$P_D(x, y) = \begin{cases} (1-p)BP(x, y | \lambda_1, \lambda_2, \lambda_3), & x \neq y \\ (1-p)BP(x, y | \lambda_1, \lambda_2, \lambda_3) + pD(x, \theta), & x = y, \end{cases} \quad (4)$$

where $D(x, \theta)$ is discrete distribution with parameter vector θ . Such models can be fitted using the EM algorithm.

Important: diagonal inflation improves in several aspects: better draw prediction, overdispersed marginals, introduce correlation

Figure 3: Diagonal Inflated Bivariate Poisson regression models

The author then introduced Skellam's distribution which measure the correlation between X and Y on draw games, he term it as Zero-Inflated Poisson Model.

Skellam's Distribution for Football Scores

- Response variable: $Z = X - Y$ the goal difference in each game.
- Same structure for parameters λ_1 and λ_2 as in Bivariate Poisson:

$\log(\lambda_{1i}) = \mu + H + A_{HT_i} + D_{AT_i} \quad (6)$

$\log(\lambda_{2i}) = \mu + A_{AT_i} + D_{HT_i} \quad (7)$

μ : constant; H : home effect; A_k, D_k attacking and defensive parameters of team k ; HT_i, AT_i home and away team in i game.

- Use the zero inflated variation of Skellam's distribution to model the excess of draws. Hence we define the zero inflated Poisson Difference (ZPD) distribution as

$f_{ZPD}(0 | p, \lambda_1, \lambda_2) = p + (1-p)f_{PD}(0 | \lambda_1, \lambda_2) \quad \text{and}$

$f_{ZPD}(z | p, \lambda_1, \lambda_2) = (1-p)f_{PD}(z | \lambda_1, \lambda_2), \quad (8)$

for $z \in \mathbb{Z} \setminus \{0\}$; where $p \in (0, 1)$ and $f_{PD}(z | \lambda_1, \lambda_2)$ is given by (5).

Figure 4: Skellam's Distribution for Football Scores

Well, when we talk about the parameter to measure the relationship. How can we know what models might fit into it? *Karlis & Ntzoufras 2005* has compare few models which are :

- Discrete distribution (with an adjustable paramters)
- Poisson distribution
- Geometric distribution

They built 12 statistical models to compare and get the best fit model. For more details

kindly refer to the paper.

2.2. Model Enhancement

There has a popular quote in sportsbook betting industry which is term as FORM. There is a fluctuation of the ability and aggressiveness on sports competition as time goes by. Lets review the *Dixon & Coles 1996* model and fit the decay parameter into our basic model.

Choice of Weighting Function ϕ

There are various possible choices for the weighting function ϕ in equation . One possibility would be

$$\phi(t) = \begin{cases} 1 & t \leq t_0, \\ 0 & t > t_0, \end{cases}$$

in which case, at time t , all results within the last t_0 time units would be given equal weight in the inference. Instead, we work with the model

$$\phi(t) = \exp(-\xi t),$$

in which all previous results, downweighted exponentially according to a parameter $\xi > 0$, are included in the inference at time t . The static model arises as the special case $\xi = 0$, whereas taking increasingly large values of ξ gives relatively more weight to the most recent results.

Optimizing the choice of ξ is problematic, since equation defines a sequence of non-independent ‘likelihoods’, whereas we require ξ such that the overall predictive capability of the model is maximized. In fact, in subsequent sections, we restrict attention to the prediction of match outcomes rather than match scores. Therefore it is pragmatic to choose ξ to optimize the prediction of outcomes. First note that the probability of a home win in match k is estimated as

$$p_k^H = \sum_{l, m \in B_H} \Pr(X_k = l, Y_k = m)$$

where $B_H = \{(l, m): l > m\}$, and the score probabilities are determined from the maximization of model (4.5) at $t(k)$, the time of match k . Similar expressions hold for p_k^A and p_k^D , the probabilities of an away win and a draw respectively. Now define

$$S(\xi) = \sum_{k=1}^N (\delta_k^H \log p_k^H + \delta_k^A \log p_k^A + \delta_k^D \log p_k^D)$$

where, for example, $\delta_k^H = 1$ if match k is a home win and $\delta_k^H = 0$ otherwise, and p_k^H , p_k^A and p_k^D are the maximum likelihood estimates from model , with weighting parameter set at ξ . Considering only the outcomes, and not the scores, equation is the analogue of a predictive profile log-likelihood. A plot of $S(\xi)$ against ξ , with time units taken to be half-weeks, is given in Fig. 1. The function is maximized at $\xi = 0.0065$, and all subsequent results are given with respect to this choice of ξ , though in fact the results are robust across a range of ξ -values.

Figure 5: decay rates

After simulation, I get a decay rate which is almost 0.0065 and similar with *Dixon & Coles 1996*. However, due to I consider the soccer matches has come out result once the whistle is blew. Therefore I’ve tried to build another model which is similar with Weibull model to make the decay rate flexible compare to constantly annum. few models, which are:

- Count in the soccer result once a soccer match is finished to get a dynamic decay rates to refresh next prediction odds price.
- Follow *Dixon & Coles 1996* which taken a constant decay rates for a soccer session.
- Count in the soccer result once a week to get a weekly dynamic decay rates to predict next week soccer matches.

I got a vector of decay rates around 0.0045 with the standard deviation not more than 1~10%. which is similar with the model at MatchOdds.org.

3. Data

3.1. Soccer Sports Dataset

- 1) test the efficiency of 29 bookmakers' Asian Handicap prices.
- 2) comparison between EM model, observations/outcome, and also pure probabilities of products offered by 29 bookmakers.
- 3) 29 bookmakers exclude below 11 companies:
 - i) bwin
 - ii) Interwetten
 - iii) William Hill
 - iv) SSP International
 - v) Betfair
 - vi) Intralot
 - vii) SNAI
 - viii) SingaporePools
 - ix) Stan James
 - x) Unibet
 - xi) Coral

3.2. Odds Price Dataset

In order to test the efficiency of my model. I took quite long time period¹¹ to gather data from below websites. You are feel free to browse over the dataset via [200611 EngAllOdds](https://200611.com)¹²

Data source :

¹¹After I completed the odds modelling part. took time more than 10 hours per day and around half year time manually copy and paste the odds price (soccer matches data, all events in all English 9 leagues + cups as well as all Japanese leagues and tournaments for both prematch as well as the rebirth modelling, and also testing staking model's purpose)

¹²The spreadsheet file locate inside the **dataset** of **Odds Modelling and Testing Inefficiency of Sports-Bookmakers 2008-2010** by [@yo Eng Lian Hu](https://200611.com) to see the odds price of every single soccer match.

1. the soccer matches and also Asian Handicap odds prices of 29 bookmakers getting from 3 websites below:
 - <http://www.500wan.com>
 - <http://www.bet007.com>
 - <http://www.nowgoal.com>
2. English soccer leagues from 2006/07 to 2010/11 collected as my sample data, which are include:
 - 1) English Premier League
 - 2) English League Championship
 - 3) English Division 1
 - 4) English Division 2
 - 5) English FA Cup
 - 6) English League Cup
 - 7) English League Trophy
 - 8) English FA Trophy / English Challenge Cup
3. Season 2006/07 and 2007/08 used for EM model, however odds price of only seasons 2008/09 and 2009/10 gathered and use for testing efficiency.
 - there are 4389 soccer matches used as sample in our research.
 - unfortunately, odds prices of around 10 to 20 soccer matches inside research works have no data source.
 - open prices and closed prices collected but only open prices get into research works.

3.3. Conversion to Odds Price

Odds Price based on Pure Probabilities

From above description we know the bookmakers has charges a certain spread margin / overrounds / vigorish.

Odds Price based with Vigorish

Therefore we need to convert to a net probabilities without vigorish to compare with our time series diagonal inflation bivariate poisson regression model.

A typical set of bookmakers' odds for a particular match might be (8:13, 12:5, 4:1) for a home win, draw and away win respectively. Thus, in this example, a stake of 13 units on a home win would yield a profit of 8 units if that outcome occurred. Odds $o_1:o_2$ transform to a probability p by using the formula

$$p = o_2 / (o_1 + o_2).$$

The above set of odds then corresponds to the set of probabilities (0.62, 0.29, 0.20), which has a sum of 1.11. This phenomenon is standard in betting markets: if the bookmakers are accurate in their probability specifications, they have an in-built 'take', corresponding to their expected profit, which in the above example is 11%. To win money from bookmakers, in the sense of having a positive expected return, requires a determination of probabilities which is sufficiently more accurate than those obtained from the odds in order to overcome the bookmakers' take. We first rescale multiplicatively the bookmakers' odds so that they sum to 1. Denote these probabilities for match k by b_k^H , b_k^D and b_k^A for a home win, draw and away win respectively, and similarly let \hat{p}_k^H , \hat{p}_k^D and \hat{p}_k^A be the corresponding maximum likelihood estimates for this match under model \mathcal{M} . Comparisons of the two sets of probability estimates for each of the result outcomes are given in Fig. 3 for each match in our database. Overall there is reasonable agreement between the probability assessments, but the variability in these plots indicates the potential for positive gain if our model probabilities are accurate.

Figure 6: odds price with vigorish

Remarks : you are feel free to browse over [dataset](#) of **Odds Modelling and Testing Inefficiency of Sports-Bookmakers 2008-2010** by [©yo Eng Lian Hu](#) to observe the EM odds, odds price offered by bookmakers without vigorish as well as with vigorish for every single soccer match. Total soccer matches in this research project has 4389 across 8 leagues + tournaments in England.

4. Betting Strategies

4.1. Comparison of Efficiency of the Models

By refer to *Dixon & Pope 2004*, before we start build our staking model, we try to summarize the statistical prices offered by 40 sports bookmakers on both Asian Handicap and Goal Line.

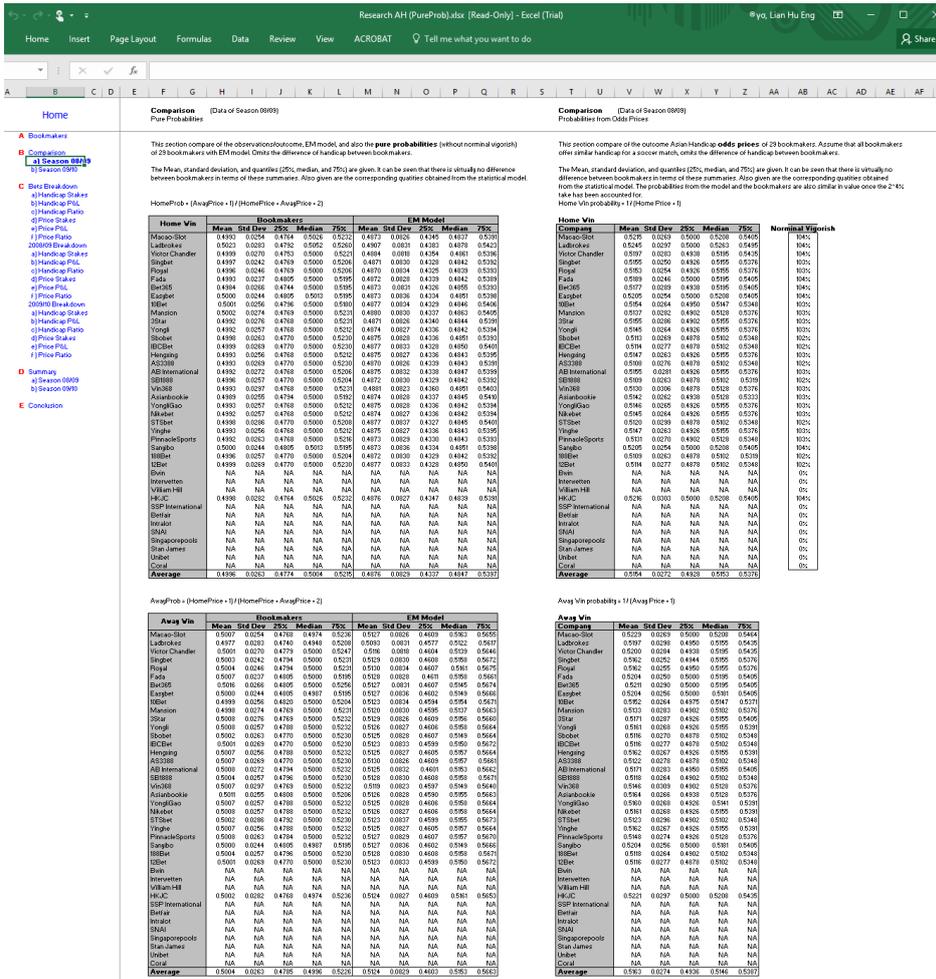
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<p>The section compares the observed outcomes, EM model and also the pure probabilities (without normal vigoris) of 23 bookmakers with EM model. On the difference of handicap between bookmakers.</p> <p>The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is virtually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model.</p> <p>The section compares the outcome Asian Handicap odds prices of 23 bookmakers. Assume that all bookmakers offer similar handicap for a soccer match, omits the difference of handicap between bookmakers.</p> <p>The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is virtually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model. The probabilities from the model and the bookmakers are also similar in value once the 2% take has been accounted for.</p> <p>Home Win probability = 1/(Away Price + 1)</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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<td>0.474</td> <td>0.494</td> <td>0.517</td> <td>0.482</td> <td>0.026</td> <td>0.435</td> <td>0.493</td> <td>0.545</td> <td>0.483</td> <td>0.026</td> <td>0.474</td> <td>0.494</td> <td>0.517</td> <td>0.483</td> </tr> <tr> <td>Asiabookie</td> <td>0.493</td> <td>0.027</td> <td>0.477</td> <td>0.500</td> <td>0.508</td> <td>0.492</td> <td>0.026</td> <td>0.435</td> <td>0.493</td> <td>0.545</td> <td>0.493</td> <td>0.027</td> <td>0.477</td> <td>0.500</td> <td>0.508</td> <td>0.493</td> </tr> <tr> <td>VongGai</td> <td>0.495</td> <td>0.024</td> <td>0.478</td> <td>0.500</td> <td>0.520</td> <td>0.493</td> <td>0.029</td> <td>0.437</td> <td>0.493</td> <td>0.541</td> <td>0.495</td> <td>0.024</td> <td>0.478</td> <td>0.500</td> <td>0.520</td> <td>0.495</td> </tr> <tr> <td>Milbet</td> <td>0.484</td> <td>0.024</td> <td>0.476</td> <td>0.487</td> <td>0.512</td> <td>0.483</td> <td>0.021</td> <td>0.437</td> <td>0.481</td> <td>0.547</td> <td>0.484</td> <td>0.024</td> <td>0.476</td> <td>0.487</td> <td>0.512</td> <td>0.484</td> </tr> <tr> <td>ETBet</td> <td>0.496</td> <td>0.024</td> <td>0.476</td> <td>0.500</td> <td>0.520</td> <td>0.493</td> <td>0.026</td> <td>0.437</td> <td>0.492</td> <td>0.545</td> <td>0.496</td> <td>0.024</td> <td>0.476</td> <td>0.500</td> <td>0.520</td> <td>0.496</td> </tr> <tr> <td>Yngja</td> <td>0.487</td> <td>0.023</td> <td>0.477</td> <td>0.500</td> <td>0.520</td> <td>0.493</td> <td>0.026</td> <td>0.439</td> <td>0.492</td> <td>0.545</td> <td>0.487</td> <td>0.023</td> <td>0.477</td> <td>0.500</td> <td>0.520</td> <td>0.487</td> </tr> <tr> <td>Phonedeports</td> <td>0.493</td> <td>0.022</td> <td>0.476</td> <td>0.500</td> <td>0.521</td> <td>0.492</td> <td>0.020</td> <td>0.431</td> <td>0.489</td> <td>0.546</td> <td>0.493</td> <td>0.022</td> <td>0.476</td> <td>0.500</td> <td>0.521</td> <td>0.493</td> </tr> <tr> <td>Sarglio</td> <td>0.498</td> <td>0.022</td> <td>0.495</td> <td>0.500</td> <td>0.505</td> <td>0.497</td> <td>0.028</td> <td>0.430</td> <td>0.491</td> <td>0.546</td> <td>0.498</td> <td>0.022</td> <td>0.495</td> <td>0.500</td> <td>0.505</td> <td>0.498</td> </tr> <tr> <td>IB8bet</td> <td>0.498</td> <td>0.027</td> <td>0.477</td> <td>0.500</td> <td>0.520</td> <td>0.493</td> <td>0.028</td> <td>0.433</td> <td>0.493</td> <td>0.546</td> <td>0.498</td> <td>0.027</td> <td>0.477</td> <td>0.500</td> <td>0.520</td> <td>0.498</td> </tr> <tr> <td>IBet</td> <td>0.495</td> <td>0.027</td> <td>0.478</td> <td>0.500</td> <td>0.520</td> <td>0.493</td> <td>0.023</td> <td>0.431</td> <td>0.494</td> <td>0.541</td> <td>0.495</td> <td>0.027</td> <td>0.478</td> <td>0.500</td> <td>0.520</td> <td>0.495</td> </tr> <tr> <td>Evni</td> <td>NA</td> </tr> <tr> <td>Interwetten</td> <td>NA</td> </tr> <tr> <td>VillamHill</td> <td>NA</td> </tr> <tr> <td>HEC</td> <td>0.498</td> <td>0.022</td> <td>0.477</td> <td>0.500</td> <td>0.522</td> <td>0.493</td> <td>0.023</td> <td>0.440</td> <td>0.493</td> <td>0.545</td> <td>0.498</td> <td>0.022</td> <td>0.477</td> <td>0.500</td> <td>0.522</td> <td>0.498</td> </tr> <tr> <td>ESP International</td> <td>NA</td> </tr> <tr> <td>Biarif</td> <td>NA</td> </tr> <tr> <td>Imapcc</td> <td>NA</td> </tr> <tr> <td>SBK</td> <td>NA</td> </tr> <tr> <td>Singaporepools</td> <td>NA</td> </tr> <tr> <td>Stan James</td> <td>NA</td> </tr> <tr> <td>Unibet</td> <td>NA</td> </tr> <tr> <td>Corax</td> <td>NA</td> </tr> <tr> <td>Average</td> <td>0.495</td> <td>0.028</td> <td>0.473</td> <td>0.500</td> <td>0.522</td> <td>0.493</td> <td>0.020</td> <td>0.438</td> <td>0.493</td> <td>0.543</td> <td>0.495</td> <td>0.028</td> <td>0.473</td> <td>0.500</td> <td>0.522</td> <td>0.495</td> <td>0.028</td> </tr> </tbody> </table>													Home Win						Home Win						Nominal Vigorish	Company	Mean	Std Dev	25%	Median	75%	Company	Mean	Std Dev	25%	Median	75%	Macao-Box	0.418	0.028	0.473	0.500	0.522	0.413	0.023	0.440	0.493	0.545	0.413	0.023	0.440	0.493	0.545	0.413	Ladbrokes	0.508	0.028	0.473	0.500	0.522	0.495	0.023	0.445	0.491	0.546	0.508	0.028	0.473	0.500	0.522	0.508	Victor Chandler	0.495	0.022	0.473	0.500	0.521	0.490	0.023	0.437	0.487	0.546	0.495	0.022	0.473	0.500	0.521	0.495	Singbet	0.498	0.024	0.473	0.500	0.522	0.493	0.022	0.435	0.493	0.549	0.498	0.024	0.473	0.500	0.522	0.498	Paya	0.499	0.023	0.473	0.500	0.521	0.490	0.024	0.433	0.486	0.546	0.499	0.023	0.473	0.500	0.521	0.499	Fafa	0.491	0.025	0.473	0.500	0.505	0.492	0.023	0.434	0.496	0.545	0.491	0.025	0.473	0.500	0.505	0.491	Bar365	0.484	0.026	0.474	0.500	0.505	0.482	0.021	0.437	0.482	0.549	0.484	0.026	0.474	0.500	0.505	0.484	Target	0.494	0.024	0.465	0.500	0.505	0.492	0.042	0.470	0.454	0.570	0.494	0.024	0.465	0.500	0.505	0.494	IBet	0.498	0.027	0.476	0.500	0.508	0.493	0.025	0.430	0.496	0.545	0.498	0.027	0.476	0.500	0.508	0.498	Macron	0.495	0.029	0.476	0.500	0.520	0.491	0.022	0.432	0.488	0.546	0.495	0.029	0.476	0.500	0.520	0.495	ISB	0.494	0.020	0.478	0.500	0.521	0.492	0.022	0.436	0.491	0.546	0.494	0.020	0.478	0.500	0.521	0.494	Yongli	0.493	0.023	0.478	0.500	0.520	0.491	0.022	0.436	0.488	0.546	0.493	0.023	0.478	0.500	0.520	0.493	Bobet	0.489	0.026	0.479	0.500	0.520	0.493	0.028	0.438	0.494	0.546	0.489	0.026	0.479	0.500	0.520	0.489	BCEBet	0.495	0.023	0.478	0.500	0.520	0.492	0.022	0.435	0.488	0.546	0.495	0.023	0.478	0.500	0.520	0.495	Hengping	0.492	0.028	0.478	0.500	0.520	0.493	0.028	0.433	0.496	0.546	0.492	0.028	0.478	0.500	0.520	0.492	AB International	0.494	0.024	0.479	0.500	0.520	0.490	0.020	0.435	0.493	0.546	0.494	0.024	0.479	0.500	0.520	0.494	SBIB8	0.495	0.027	0.478	0.500	0.520	0.493	0.023	0.435	0.496	0.545	0.495	0.027	0.478	0.500	0.520	0.495	Vivi88	0.483	0.026	0.474	0.494	0.517	0.482	0.026	0.435	0.493	0.545	0.483	0.026	0.474	0.494	0.517	0.483	Asiabookie	0.493	0.027	0.477	0.500	0.508	0.492	0.026	0.435	0.493	0.545	0.493	0.027	0.477	0.500	0.508	0.493	VongGai	0.495	0.024	0.478	0.500	0.520	0.493	0.029	0.437	0.493	0.541	0.495	0.024	0.478	0.500	0.520	0.495	Milbet	0.484	0.024	0.476	0.487	0.512	0.483	0.021	0.437	0.481	0.547	0.484	0.024	0.476	0.487	0.512	0.484	ETBet	0.496	0.024	0.476	0.500	0.520	0.493	0.026	0.437	0.492	0.545	0.496	0.024	0.476	0.500	0.520	0.496	Yngja	0.487	0.023	0.477	0.500	0.520	0.493	0.026	0.439	0.492	0.545	0.487	0.023	0.477	0.500	0.520	0.487	Phonedeports	0.493	0.022	0.476	0.500	0.521	0.492	0.020	0.431	0.489	0.546	0.493	0.022	0.476	0.500	0.521	0.493	Sarglio	0.498	0.022	0.495	0.500	0.505	0.497	0.028	0.430	0.491	0.546	0.498	0.022	0.495	0.500	0.505	0.498	IB8bet	0.498	0.027	0.477	0.500	0.520	0.493	0.028	0.433	0.493	0.546	0.498	0.027	0.477	0.500	0.520	0.498	IBet	0.495	0.027	0.478	0.500	0.520	0.493	0.023	0.431	0.494	0.541	0.495	0.027	0.478	0.500	0.520	0.495	Evni	NA	Interwetten	NA	VillamHill	NA	HEC	0.498	0.022	0.477	0.500	0.522	0.493	0.023	0.440	0.493	0.545	0.498	0.022	0.477	0.500	0.522	0.498	ESP International	NA	Biarif	NA	Imapcc	NA	SBK	NA	Singaporepools	NA	Stan James	NA	Unibet	NA	Corax	NA	Average	0.495	0.028	0.473	0.500	0.522	0.493	0.020	0.438	0.493	0.543	0.495	0.028	0.473	0.500	0.522	0.495	0.028																																																																																																																																																																																
Home Win						Home Win						Nominal Vigorish																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
Company	Mean	Std Dev	25%	Median	75%	Company	Mean	Std Dev	25%	Median	75%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
Macao-Box	0.418	0.028	0.473	0.500	0.522	0.413	0.023	0.440	0.493	0.545	0.413	0.023	0.440	0.493	0.545	0.413																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Ladbrokes	0.508	0.028	0.473	0.500	0.522	0.495	0.023	0.445	0.491	0.546	0.508	0.028	0.473	0.500	0.522	0.508																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Victor Chandler	0.495	0.022	0.473	0.500	0.521	0.490	0.023	0.437	0.487	0.546	0.495	0.022	0.473	0.500	0.521	0.495																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Singbet	0.498	0.024	0.473	0.500	0.522	0.493	0.022	0.435	0.493	0.549	0.498	0.024	0.473	0.500	0.522	0.498																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Paya	0.499	0.023	0.473	0.500	0.521	0.490	0.024	0.433	0.486	0.546	0.499	0.023	0.473	0.500	0.521	0.499																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Fafa	0.491	0.025	0.473	0.500	0.505	0.492	0.023	0.434	0.496	0.545	0.491	0.025	0.473	0.500	0.505	0.491																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Bar365	0.484	0.026	0.474	0.500	0.505	0.482	0.021	0.437	0.482	0.549	0.484	0.026	0.474	0.500	0.505	0.484																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Target	0.494	0.024	0.465	0.500	0.505	0.492	0.042	0.470	0.454	0.570	0.494	0.024	0.465	0.500	0.505	0.494																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
IBet	0.498	0.027	0.476	0.500	0.508	0.493	0.025	0.430	0.496	0.545	0.498	0.027	0.476	0.500	0.508	0.498																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Macron	0.495	0.029	0.476	0.500	0.520	0.491	0.022	0.432	0.488	0.546	0.495	0.029	0.476	0.500	0.520	0.495																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
ISB	0.494	0.020	0.478	0.500	0.521	0.492	0.022	0.436	0.491	0.546	0.494	0.020	0.478	0.500	0.521	0.494																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Yongli	0.493	0.023	0.478	0.500	0.520	0.491	0.022	0.436	0.488	0.546	0.493	0.023	0.478	0.500	0.520	0.493																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Bobet	0.489	0.026	0.479	0.500	0.520	0.493	0.028	0.438	0.494	0.546	0.489	0.026	0.479	0.500	0.520	0.489																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
BCEBet	0.495	0.023	0.478	0.500	0.520	0.492	0.022	0.435	0.488	0.546	0.495	0.023	0.478	0.500	0.520	0.495																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Hengping	0.492	0.028	0.478	0.500	0.520	0.493	0.028	0.433	0.496	0.546	0.492	0.028	0.478	0.500	0.520	0.492																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
AB International	0.494	0.024	0.479	0.500	0.520	0.490	0.020	0.435	0.493	0.546	0.494	0.024	0.479	0.500	0.520	0.494																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
SBIB8	0.495	0.027	0.478	0.500	0.520	0.493	0.023	0.435	0.496	0.545	0.495	0.027	0.478	0.500	0.520	0.495																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Vivi88	0.483	0.026	0.474	0.494	0.517	0.482	0.026	0.435	0.493	0.545	0.483	0.026	0.474	0.494	0.517	0.483																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Asiabookie	0.493	0.027	0.477	0.500	0.508	0.492	0.026	0.435	0.493	0.545	0.493	0.027	0.477	0.500	0.508	0.493																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
VongGai	0.495	0.024	0.478	0.500	0.520	0.493	0.029	0.437	0.493	0.541	0.495	0.024	0.478	0.500	0.520	0.495																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Milbet	0.484	0.024	0.476	0.487	0.512	0.483	0.021	0.437	0.481	0.547	0.484	0.024	0.476	0.487	0.512	0.484																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
ETBet	0.496	0.024	0.476	0.500	0.520	0.493	0.026	0.437	0.492	0.545	0.496	0.024	0.476	0.500	0.520	0.496																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Yngja	0.487	0.023	0.477	0.500	0.520	0.493	0.026	0.439	0.492	0.545	0.487	0.023	0.477	0.500	0.520	0.487																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Phonedeports	0.493	0.022	0.476	0.500	0.521	0.492	0.020	0.431	0.489	0.546	0.493	0.022	0.476	0.500	0.521	0.493																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Sarglio	0.498	0.022	0.495	0.500	0.505	0.497	0.028	0.430	0.491	0.546	0.498	0.022	0.495	0.500	0.505	0.498																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
IB8bet	0.498	0.027	0.477	0.500	0.520	0.493	0.028	0.433	0.493	0.546	0.498	0.027	0.477	0.500	0.520	0.498																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
IBet	0.495	0.027	0.478	0.500	0.520	0.493	0.023	0.431	0.494	0.541	0.495	0.027	0.478	0.500	0.520	0.495																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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HEC	0.498	0.022	0.477	0.500	0.522	0.493	0.023	0.440	0.493	0.545	0.498	0.022	0.477	0.500	0.522	0.498																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Average	0.495	0.028	0.473	0.500	0.522	0.493	0.020	0.438	0.493	0.543	0.495	0.028	0.473	0.500	0.522	0.495	0.028																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
<table border="1"> <thead> <tr> <th colspan="6">Away Prob - (Home Price + 1) / (Home Price + Away Price + 2)</th> <th colspan="6">Away Win</th> </tr> <tr> <th>Company</th> <th>Mean</th> <th>Std Dev</th> <th>25%</th> <th>Median</th> <th>75%</th> <th>Company</th> <th>Mean</th> <th>Std Dev</th> <th>25%</th> <th>Median</th> <th>75%</th> </tr> </thead> <tbody> <tr> <td>Macao-Box</td> <td>0.508</td> <td>0.028</td> <td>0.473</td> <td>0.500</td> <td>0.522</td> <td>0.509</td> <td>0.023</td> <td>0.441</td> <td>0.502</td> <td>0.550</td> <td>0.508</td> </tr> <tr> <td>Ladbrokes</td> <td>0.492</td> <td>0.028</td> <td>0.474</td> <td>0.474</td> <td>0.500</td> <td>0.506</td> <td>0.021</td> <td>0.454</td> <td>0.504</td> <td>0.557</td> <td>0.492</td> </tr> <tr> <td>Victor Chandler</td> <td>0.505</td> <td>0.022</td> <td>0.473</td> <td>0.500</td> <td>0.521</td> <td>0.508</td> <td>0.023</td> <td>0.452</td> <td>0.507</td> <td>0.550</td> <td>0.505</td> </tr> <tr> <td>Singbet</td> <td>0.502</td> <td>0.024</td> <td>0.473</td> <td>0.500</td> <td>0.522</td> <td>0.508</td> <td>0.022</td> <td>0.441</td> <td>0.502</td> <td>0.549</td> <td>0.502</td> </tr> <tr> <td>Paya</td> <td>0.503</td> <td>0.025</td> <td>0.485</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.024</td> <td>0.450</td> <td>0.504</td> <td>0.548</td> <td>0.503</td> </tr> <tr> <td>Bar365</td> <td>0.506</td> <td>0.029</td> <td>0.485</td> <td>0.500</td> <td>0.524</td> <td>0.507</td> <td>0.021</td> <td>0.441</td> <td>0.507</td> <td>0.552</td> <td>0.506</td> </tr> <tr> <td>Target</td> <td>0.505</td> <td>0.024</td> <td>0.485</td> <td>0.500</td> <td>0.505</td> <td>0.507</td> <td>0.042</td> <td>0.459</td> <td>0.507</td> <td>0.552</td> <td>0.505</td> </tr> <tr> <td>IBet</td> <td>0.502</td> <td>0.027</td> <td>0.482</td> <td>0.500</td> <td>0.504</td> <td>0.507</td> <td>0.025</td> <td>0.455</td> <td>0.504</td> <td>0.552</td> <td>0.502</td> </tr> <tr> <td>Macron</td> <td>0.508</td> <td>0.029</td> <td>0.479</td> <td>0.500</td> <td>0.521</td> <td>0.509</td> <td>0.023</td> <td>0.459</td> <td>0.509</td> <td>0.551</td> <td>0.508</td> </tr> <tr> <td>ISB</td> <td>0.506</td> <td>0.020</td> <td>0.478</td> <td>0.500</td> <td>0.521</td> <td>0.508</td> <td>0.022</td> <td>0.454</td> <td>0.509</td> <td>0.554</td> <td>0.506</td> </tr> <tr> <td>Yongli</td> <td>0.507</td> <td>0.023</td> <td>0.478</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.023</td> <td>0.450</td> <td>0.509</td> <td>0.551</td> <td>0.507</td> </tr> <tr> <td>Bobet</td> <td>0.501</td> <td>0.026</td> <td>0.479</td> <td>0.500</td> <td>0.520</td> <td>0.508</td> <td>0.028</td> <td>0.450</td> <td>0.507</td> <td>0.554</td> <td>0.501</td> </tr> <tr> <td>BCEBet</td> <td>0.509</td> <td>0.024</td> <td>0.477</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.023</td> <td>0.459</td> <td>0.508</td> <td>0.551</td> <td>0.509</td> </tr> <tr> <td>Hengping</td> <td>0.508</td> <td>0.028</td> <td>0.478</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.028</td> <td>0.450</td> <td>0.508</td> <td>0.549</td> <td>0.508</td> </tr> <tr> <td>AB International</td> <td>0.508</td> <td>0.024</td> <td>0.477</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.023</td> <td>0.450</td> <td>0.508</td> <td>0.549</td> <td>0.508</td> </tr> <tr> <td>SBIB8</td> <td>0.502</td> <td>0.024</td> <td>0.477</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.020</td> <td>0.450</td> <td>0.508</td> <td>0.549</td> <td>0.502</td> </tr> <tr> <td>Vivi88</td> <td>0.507</td> <td>0.026</td> <td>0.478</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.026</td> <td>0.441</td> <td>0.502</td> <td>0.550</td> <td>0.507</td> </tr> <tr> <td>Asiabookie</td> <td>0.507</td> <td>0.027</td> <td>0.478</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.020</td> <td>0.459</td> <td>0.508</td> <td>0.549</td> <td>0.507</td> </tr> <tr> <td>VongGai</td> <td>0.506</td> <td>0.024</td> <td>0.478</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.021</td> <td>0.453</td> 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<td>0.504</td> </tr> <tr> <td>IB8bet</td> <td>0.502</td> <td>0.023</td> <td>0.477</td> <td>0.500</td> <td>0.521</td> <td>0.508</td> <td>0.028</td> <td>0.450</td> <td>0.508</td> <td>0.551</td> <td>0.502</td> </tr> <tr> <td>IBet</td> <td>0.505</td> <td>0.024</td> <td>0.477</td> <td>0.500</td> <td>0.521</td> <td>0.507</td> <td>0.023</td> <td>0.459</td> <td>0.508</td> <td>0.551</td> <td>0.505</td> </tr> <tr> <td>Evni</td> <td>NA</td> </tr> <tr> <td>Interwetten</td> <td>NA</td> </tr> <tr> <td>VillamHill</td> <td>NA</td> </tr> <tr> <td>HEC</td> <td>0.504</td> <td>0.022</td> <td>0.478</td> <td>0.500</td> <td>0.521</td> <td>0.508</td> <td>0.022</td> <td>0.452</td> <td>0.508</td> <td>0.550</td> <td>0.504</td> </tr> <tr> <td>ESP International</td> <td>NA</td> </tr> <tr> <td>Biarif</td> <td>NA</td> </tr> <tr> <td>Imapcc</td> <td>NA</td> </tr> <tr> <td>SBK</td> <td>NA</td> <td>NA</td> <td></td></tr></tbody></table>													Away Prob - (Home Price + 1) / (Home Price + Away Price + 2)						Away Win						Company	Mean	Std Dev	25%	Median	75%	Company	Mean	Std Dev	25%	Median	75%	Macao-Box	0.508	0.028	0.473	0.500	0.522	0.509	0.023	0.441	0.502	0.550	0.508	Ladbrokes	0.492	0.028	0.474	0.474	0.500	0.506	0.021	0.454	0.504	0.557	0.492	Victor Chandler	0.505	0.022	0.473	0.500	0.521	0.508	0.023	0.452	0.507	0.550	0.505	Singbet	0.502	0.024	0.473	0.500	0.522	0.508	0.022	0.441	0.502	0.549	0.502	Paya	0.503	0.025	0.485	0.500	0.521	0.507	0.024	0.450	0.504	0.548	0.503	Bar365	0.506	0.029	0.485	0.500	0.524	0.507	0.021	0.441	0.507	0.552	0.506	Target	0.505	0.024	0.485	0.500	0.505	0.507	0.042	0.459	0.507	0.552	0.505	IBet	0.502	0.027	0.482	0.500	0.504	0.507	0.025	0.455	0.504	0.552	0.502	Macron	0.508	0.029	0.479	0.500	0.521	0.509	0.023	0.459	0.509	0.551	0.508	ISB	0.506	0.020	0.478	0.500	0.521	0.508	0.022	0.454	0.509	0.554	0.506	Yongli	0.507	0.023	0.478	0.500	0.521	0.507	0.023	0.450	0.509	0.551	0.507	Bobet	0.501	0.026	0.479	0.500	0.520	0.508	0.028	0.450	0.507	0.554	0.501	BCEBet	0.509	0.024	0.477	0.500	0.521	0.507	0.023	0.459	0.508	0.551	0.509	Hengping	0.508	0.028	0.478	0.500	0.521	0.507	0.028	0.450	0.508	0.549	0.508	AB International	0.508	0.024	0.477	0.500	0.521	0.507	0.023	0.450	0.508	0.549	0.508	SBIB8	0.502	0.024	0.477	0.500	0.521	0.507	0.020	0.450	0.508	0.549	0.502	Vivi88	0.507	0.026	0.478	0.500	0.521	0.507	0.026	0.441	0.502	0.550	0.507	Asiabookie	0.507	0.027	0.478	0.500	0.521	0.507	0.020	0.459	0.508	0.549	0.507	VongGai	0.506	0.024	0.478	0.500	0.521	0.507	0.021	0.453	0.508	0.551	0.506	Milbet	0.506	0.024	0.478	0.500	0.521	0.507	0.021	0.453	0.508	0.551	0.506	ETBet	0.504	0.024	0.478	0.500	0.521	0.507	0.021	0.453	0.508	0.551	0.504	Yngja	0.507	0.022	0.478	0.500	0.521	0.507	0.020	0.457	0.508	0.549	0.507	Phonedeports	0.507	0.022	0.478	0.500	0.521	0.507	0.020	0.457	0.508	0.549	0.507	Sarglio	0.504	0.022	0.485	0.500	0.505	0.507	0.028	0.454	0.507	0.550	0.504	IB8bet	0.502	0.023	0.477	0.500	0.521	0.508	0.028	0.450	0.508	0.551	0.502	IBet	0.505	0.024	0.477	0.500	0.521	0.507	0.023	0.459	0.508	0.551	0.505	Evni	NA	Interwetten	NA	VillamHill	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	HEC	0.504	0.022	0.478	0.500	0.521	0.508	0.022	0.452	0.508	0.550	0.504	ESP International	NA	Biarif	NA	Imapcc	NA	NA	NA	NA	SBK	NA	NA																																																																																																																																																																																																																																																																																																																																																					
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Rmodel: Odds Modelling and Testing Inefficiency of Sports Bookmakers



Above figure shows a comparison between the mean, standard deviation, quantile 25%, median, quantile 75% of Asian Handicap odds price without vigorish of total soccer matches in season 2008/09.

Rmodel: Odds Modelling and Testing Inefficiency of Sports Bookmakers

Research AH (Odds/Probab) (Read-Only) - Excel (Trial)

Home Insert Page Layout Formulas Data Review View ACROBAT Tell me what you want to do

Home (Data of Season 08/09 and 09/10)

Comparison (Data of Season 08/09 and 09/10)
Probabilities from Odds Prices

The section compares the three alternative models, EM model, and also the **pure probabilities** (without normal vigourish) of 23 bookmakers with EM Model Odds in terms of handicap between bookmakers.

The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is virtually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model.

Home Prob - (Avg(Price - 1)) / (Home(Price - Avg(Price + 2))

Home Win	Bookmakers					EM Model				
	Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%
Macauslot	0.4934	0.0263	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Ladbrokes	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Wynn-Chandler	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Singbet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Royal	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Fada	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Bet365	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
ExpBet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Mansion	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
SBG	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Yongli	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Bobet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
IBet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Hengging	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
ACS365	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
AB International	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Win88	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Kuanhai	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
YongGao	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
FTBet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Vigora	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
PinakSports	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Sargbet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
IBet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
IBet	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
Bwin	NA									
Interwetten	NA									
WilliamHill	NA									
HUIC	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221
SSP International	NA									
Betair	NA									
IBet	NA									
ENAI	NA									
SingaporeSports	NA									
Ban-James	NA									
Unibet	NA									
Coral	NA									
Average	0.4938	0.0268	0.4740	0.5000	0.5221	0.4933	0.0263	0.4740	0.5000	0.5221

Home Win probability: 1 / (Home(Price + 1))

Comparison (Data of Season 08/09 and 09/10)
Probabilities from Odds Prices

The section compares the outcome Fair-Handicap **odds prices** of 23 bookmakers. Assume that all bookmakers offer similar hand-odds for a soccer match, omits the difference of handicap between bookmakers.

The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is virtually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model. The probabilities from the model and the bookmakers are also similar in value once the 2% take has been accounted for.

Home Win probability: 1 / (Home(Price + 1))

Home Win	Bookmakers					EM Model					Normal Vigorish
	Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%	
Macauslot	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Ladbrokes	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Wynn-Chandler	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Singbet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Royal	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Fada	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Bet365	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
ExpBet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Mansion	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
SBG	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Yongli	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Bobet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
IBet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Hengging	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
ACS365	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
AB International	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Win88	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Kuanhai	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
YongGao	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
FTBet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Vigora	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
PinakSports	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Sargbet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
IBet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
IBet	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
Bwin	NA	0.0271									
Interwetten	NA	0.0271									
WilliamHill	NA	0.0271									
HUIC	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271
SSP International	NA	0.0271									
Betair	NA	0.0271									
IBet	NA	0.0271									
ENAI	NA	0.0271									
SingaporeSports	NA	0.0271									
Ban-James	NA	0.0271									
Unibet	NA	0.0271									
Coral	NA	0.0271									
Average	0.5221	0.0271	0.5000	0.5221	0.5442	0.5221	0.0271	0.5000	0.5221	0.5442	0.0271

Home Win probability: 1 / (Home(Price + 1))

Above figure shows a comparison between the mean, standard deviation, quantile 25%, median, quantile 75% of Asian Handicap odds price with vigorish of total soccer matches in season 2008/09 and 2009/10.

Research AH (OddProb).xlsx (Read-Only) - Excel (Trial) Syo, Lian Hu Eng

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Home **Comparison** (Data of Season 06/09) **Comparison** (Data of Season 06/09)

A Bookmakers This section compare the observations from home, EM model, and also the pure probabilities (without normal vigoris) of 23 bookmakers with EM model. Drop the difference of handicap between bookmakers.

B Comparison This section compare of the outcome Asian Handicap odds prices of 23 bookmakers. Assume that all bookmakers offer similar handicap for a soccer match, onto the difference of handicap between bookmakers.

1) Season 08/09 The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is usually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model.

C Book Breakdown The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is usually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model. The probabilities from the model and the bookmakers are also similar in value once the 2% fee has been incorporated for.

a) Handicap Status Home Vn probability = 1/(HomePrice + 1)

b) Handicap P/L Home Vn probability = 1/(HomePrice - 1)

c) Handicap Ratio Home Vn probability = 1/(HomePrice - AvgPrice + 2)

d) Price Status Home Vn probability = 1/(HomePrice - AvgPrice + 2)

e) Price P/L Home Vn probability = 1/(HomePrice - AvgPrice + 2)

f) Price Ratio Home Vn probability = 1/(HomePrice - AvgPrice + 2)

2) Season 06/09 Home Vn probability = 1/(HomePrice - AvgPrice + 2)

a) Handicap Status Home Vn probability = 1/(HomePrice - AvgPrice + 2)

b) Handicap P/L Home Vn probability = 1/(HomePrice - AvgPrice + 2)

c) Handicap Ratio Home Vn probability = 1/(HomePrice - AvgPrice + 2)

d) Price Status Home Vn probability = 1/(HomePrice - AvgPrice + 2)

e) Price P/L Home Vn probability = 1/(HomePrice - AvgPrice + 2)

f) Price Ratio Home Vn probability = 1/(HomePrice - AvgPrice + 2)

D Summary Home Vn probability = 1/(HomePrice - AvgPrice + 2)

a) Season 06/09 Home Vn probability = 1/(HomePrice - AvgPrice + 2)

b) Season 06/09 Home Vn probability = 1/(HomePrice - AvgPrice + 2)

E Conclusion Home Vn probability = 1/(HomePrice - AvgPrice + 2)

Home Vn	Bookmakers					EM Model				
	Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%
Macao-Slo	0.4933	0.0254	0.4784	0.5028	0.5232	0.4872	0.0262	0.4749	0.4837	0.5291
Ladbrokes	0.5023	0.0203	0.4782	0.5026	0.5232	0.4897	0.0261	0.4750	0.4876	0.5423
Victor Chandler	0.4939	0.0270	0.4783	0.5000	0.5231	0.4894	0.0288	0.4754	0.4891	0.5296
Bigbet	0.4907	0.0242	0.4769	0.5000	0.5236	0.4811	0.0260	0.4720	0.4842	0.5202
Royal	0.4936	0.0246	0.4769	0.5000	0.5236	0.4870	0.0264	0.4725	0.4830	0.5293
Fada	0.4932	0.0237	0.4805	0.5000	0.5299	0.4872	0.0262	0.4729	0.4842	0.5289
Baribet	0.4984	0.0266	0.4744	0.5000	0.5295	0.4873	0.0261	0.4726	0.4895	0.5293
Expert	0.5000	0.0244	0.4805	0.5033	0.5299	0.4873	0.0286	0.4734	0.4895	0.5298
IBet	0.5001	0.0256	0.4796	0.5000	0.5290	0.4877	0.0264	0.4720	0.4846	0.5406
Mansion	0.5002	0.0274	0.4789	0.5000	0.5231	0.4900	0.0280	0.4737	0.4883	0.5405
10bet	0.4992	0.0276	0.4788	0.5000	0.5232	0.4874	0.0262	0.4736	0.4844	0.5294
Yongli	0.4992	0.0257	0.4788	0.5000	0.5232	0.4874	0.0267	0.4738	0.4842	0.5294
188bet	0.4992	0.0276	0.4788	0.5000	0.5232	0.4875	0.0267	0.4738	0.4842	0.5295
BCBet	0.4989	0.0269	0.4770	0.5000	0.5230	0.4877	0.0263	0.4728	0.4850	0.5400
Henging	0.4993	0.0258	0.4789	0.5000	0.5232	0.4875	0.0267	0.4738	0.4842	0.5295
AC3388	0.4932	0.0269	0.4770	0.5000	0.5230	0.4870	0.0268	0.4729	0.4844	0.5291
ABInternational	0.4932	0.0272	0.4788	0.5000	0.5236	0.4875	0.0262	0.4738	0.4847	0.5298
8888	0.4936	0.0297	0.4788	0.5000	0.5234	0.4872	0.0260	0.4729	0.4842	0.5292
Vin388	0.4933	0.0297	0.4788	0.5000	0.5232	0.4881	0.0262	0.4730	0.4895	0.5400
AsianBookie	0.4933	0.0295	0.4784	0.5000	0.5232	0.4874	0.0268	0.4729	0.4846	0.5400
YongliGao	0.4933	0.0257	0.4788	0.5000	0.5232	0.4875	0.0268	0.4738	0.4842	0.5294
108bet	0.4932	0.0257	0.4788	0.5000	0.5232	0.4875	0.0267	0.4738	0.4842	0.5294
STSBet	0.4938	0.0286	0.4770	0.5000	0.5236	0.4877	0.0267	0.4737	0.4837	0.5400
188bet	0.4932	0.0263	0.4788	0.5000	0.5236	0.4873	0.0262	0.4738	0.4842	0.5295
PinakolSports	0.4932	0.0263	0.4788	0.5000	0.5236	0.4873	0.0262	0.4738	0.4842	0.5295
Sargbo	0.5000	0.0244	0.4805	0.5033	0.5299	0.4873	0.0286	0.4734	0.4895	0.5298
IBSBet	0.4936	0.0257	0.4770	0.5000	0.5234	0.4872	0.0260	0.4729	0.4842	0.5292
IBet	0.4939	0.0269	0.4770	0.5000	0.5230	0.4877	0.0263	0.4728	0.4850	0.5400
Bwin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Interwetten	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vibum Hill	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HKJC	0.4938	0.0282	0.4784	0.5028	0.5232	0.4876	0.0267	0.4747	0.4838	0.5291
SSP International	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Betfair	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IBet	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SBUK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Singaporepools	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rian James	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unibet	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coral	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average	0.4936	0.0263	0.4774	0.5004	0.5239	0.4876	0.0263	0.4737	0.4847	0.5297

Home Vn	Bookmakers					EM Model				
	Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%
Macao-Slo	0.5007	0.0254	0.4789	0.4974	0.5238	0.5027	0.0262	0.4809	0.5061	0.5405
Ladbrokes	0.4977	0.0203	0.4740	0.4840	0.5200	0.5050	0.0261	0.4877	0.5022	0.5401
Victor Chandler	0.5001	0.0270	0.4779	0.5000	0.5247	0.5086	0.0288	0.4804	0.5038	0.5446
Bigbet	0.5003	0.0242	0.4754	0.5000	0.5231	0.5029	0.0260	0.4808	0.5058	0.5472
Royal	0.5004	0.0246	0.4754	0.5000	0.5231	0.5100	0.0264	0.4807	0.5081	0.5475
Fada	0.5007	0.0237	0.4805	0.5000	0.5299	0.5129	0.0262	0.4811	0.5096	0.5461
Baribet	0.5016	0.0266	0.4805	0.5000	0.5295	0.5127	0.0261	0.4807	0.5045	0.5474
Expert	0.5000	0.0244	0.4805	0.4807	0.5299	0.5127	0.0286	0.4802	0.5048	0.5496
IBet	0.4999	0.0256	0.4820	0.5000	0.5294	0.5123	0.0260	0.4804	0.5064	0.5471
Mansion	0.4998	0.0274	0.4789	0.5000	0.5231	0.5120	0.0280	0.4805	0.5107	0.5462
10bet	0.5000	0.0276	0.4789	0.5000	0.5232	0.5129	0.0260	0.4809	0.5096	0.5469
Yongli	0.5008	0.0257	0.4788	0.5000	0.5232	0.5128	0.0267	0.4808	0.5096	0.5464
188bet	0.5002	0.0276	0.4789	0.5000	0.5232	0.5129	0.0260	0.4807	0.5096	0.5464
BCBet	0.5001	0.0269	0.4770	0.5000	0.5230	0.5123	0.0263	0.4809	0.5090	0.5472
Henging	0.5007	0.0258	0.4789	0.5000	0.5232	0.5128	0.0267	0.4808	0.5097	0.5464
AC3388	0.5007	0.0269	0.4770	0.5000	0.5230	0.5120	0.0268	0.4809	0.5077	0.5468
ABInternational	0.5008	0.0272	0.4784	0.5000	0.5232	0.5125	0.0262	0.4801	0.5092	0.5462
8888	0.5004	0.0297	0.4788	0.5000	0.5232	0.5129	0.0260	0.4808	0.5076	0.5461
Vin388	0.5007	0.0297	0.4788	0.5000	0.5232	0.5129	0.0262	0.4807	0.5048	0.5460
AsianBookie	0.5001	0.0295	0.4800	0.5000	0.5236	0.5125	0.0268	0.4808	0.5095	0.5462
YongliGao	0.5007	0.0257	0.4788	0.5000	0.5232	0.5128	0.0268	0.4808	0.5096	0.5464
108bet	0.5009	0.0257	0.4789	0.5000	0.5232	0.5128	0.0267	0.4808	0.5097	0.5464
STSBet	0.5007	0.0286	0.4782	0.5000	0.5230	0.5123	0.0267	0.4809	0.5095	0.5470
188bet	0.5007	0.0286	0.4788	0.5000	0.5232	0.5128	0.0267	0.4809	0.5095	0.5464
PinakolSports	0.5008	0.0283	0.4784	0.5000	0.5232	0.5127	0.0268	0.4807	0.5097	0.5470
Sargbo	0.5000	0.0244	0.4805	0.4807	0.5299	0.5127	0.0286	0.4802	0.5048	0.5496
IBSBet	0.5004	0.0257	0.4786	0.5000	0.5230	0.5120	0.0260	0.4809	0.5095	0.5471
IBet	0.5001	0.0269	0.4770	0.5000	0.5230	0.5123	0.0263	0.4809	0.5096	0.5472
Bwin	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Interwetten	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vibum Hill	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HKJC	0.5002	0.0282	0.4788	0.4974	0.5236	0.5124	0.0267	0.4809	0.5091	0.5462
SSP International	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Betfair	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IBet	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SBUK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Singaporepools	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rian James	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Unibet	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coral	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Average	0.5004	0.0263	0.4795	0.4998	0.5243	0.5124	0.0263	0.4801	0.5092	0.5463

Home Vn	Bookmakers					EM Model				
	Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%
Macao-Slo	0.5229	0.0269	0.5000	0.5200	0.5449	0.5229	0.0269	0.5000	0.5200	0.5449
Ladbrokes	0.5245	0.0207	0.5000	0.5200	0.5449	0.5245	0.0207	0.5000	0.5200	0.5449
Victor Chandler	0.5237	0.0283	0.4838	0.5200	0.5426	0.5237	0.0283	0.4838	0.5200	0.5426
Bigbet	0.5255	0.0260	0.4836	0.5200	0.5376	0.5255	0.0260	0.4836	0.5200	0.5376
Royal	0.5253	0.0254	0.4836	0.5200	0.5376	0.5253	0.0254	0.4836	0.5200	0.5376
Fada	0.5257	0.0246	0.5000	0.5200	0.5409	0.5257	0.0246	0.5000	0.5200	0.5409
Baribet	0.5277									

Rmodel: Odds Modelling and Testing Inefficiency of Sports Bookmakers

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Home **Comparison** (Data of Season 09/10) **Comparison** (Data of Season 09/10)

A Bookmakers **Pure Probabilities** **Probabilities from Odds Prices**

This section compares the observations from the EM model, and also the **pure probabilities** (with normal vigorish) of 23 bookmakers with EM model. Over the difference of odds between bookmakers.

This section compares of the outcome Asian Handicap **odds prices** of 23 bookmakers. Assume that all bookmakers offer similar handicap for a soccer match, over the difference of odds between bookmakers.

The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is virtually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model.

The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is virtually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model. The probabilities from the model and the bookmakers are also similar in value once the 2% vig has been accounted for.

Home Win probability = 1/(Home Price + 1)

Home Win probability = 1/(Home Price + 1)

Home Win	Bookmakers					EM Model					Home Win	Comparison					Nominal Vigorish
	Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%		Mean	Std Dev	25%	Median	75%	
Macao Slot	0.4995	0.0262	0.4763	0.5000	0.5232	0.4937	0.0263	0.4400	0.490	0.5450	0.5213	0.0277	0.5000	0.5200	0.5425	0.64%	
Ladbrokes	0.5001	0.0262	0.4767	0.5000	0.5236	0.4985	0.0261	0.4425	0.4925	0.5445	0.5218	0.0265	0.4900	0.5200	0.5425	0.64%	
Victor Chandler	0.4991	0.0264	0.4753	0.5000	0.5220	0.4940	0.0263	0.4207	0.4927	0.5450	0.5203	0.0266	0.4900	0.5200	0.5425	0.64%	
Singbet	0.5000	0.0265	0.4768	0.5000	0.5232	0.4930	0.0264	0.4300	0.496	0.5460	0.5204	0.0264	0.4925	0.5200	0.5425	0.64%	
Fafa	0.4999	0.0272	0.4753	0.5000	0.5236	0.4926	0.0262	0.4304	0.494	0.5450	0.5204	0.0266	0.4925	0.5200	0.5425	0.64%	
Bet365	0.4982	0.0271	0.4740	0.5000	0.5195	0.4928	0.0263	0.4277	0.4923	0.5459	0.5204	0.0261	0.4900	0.5200	0.5425	0.64%	
Expobet	0.4998	0.0263	0.4805	0.5000	0.5200	0.4927	0.0262	0.4239	0.4924	0.5470	0.5204	0.0265	0.5000	0.5200	0.5425	0.64%	
bet1	0.4998	0.0267	0.4768	0.5000	0.5188	0.4930	0.0265	0.4200	0.496	0.5460	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Mansion	0.4998	0.0265	0.4745	0.5000	0.5220	0.4911	0.0263	0.4262	0.4921	0.5462	0.5204	0.0263	0.4900	0.5200	0.5425	0.64%	
Sisal	0.4998	0.0263	0.4765	0.5000	0.5232	0.4932	0.0262	0.4269	0.4921	0.5450	0.5204	0.0263	0.4900	0.5200	0.5425	0.64%	
Yongli	0.4998	0.0273	0.4763	0.5000	0.5232	0.4901	0.0269	0.4206	0.490	0.5460	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Shobet	0.5000	0.0269	0.4770	0.5000	0.5230	0.4937	0.0262	0.4206	0.4924	0.5460	0.5204	0.0264	0.4900	0.5200	0.5425	0.64%	
BCEBet	0.4991	0.0276	0.4745	0.5000	0.5230	0.4930	0.0263	0.4201	0.494	0.5461	0.5204	0.0266	0.4900	0.5200	0.5425	0.64%	
Hengshang	0.4999	0.0268	0.4756	0.5000	0.5230	0.4928	0.0260	0.4262	0.496	0.5460	0.5204	0.0264	0.4900	0.5200	0.5425	0.64%	
AS388	0.4998	0.0278	0.4764	0.5000	0.5230	0.4931	0.0262	0.4205	0.4921	0.5453	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
IB International	0.4999	0.0265	0.4765	0.5000	0.5232	0.4929	0.0261	0.4205	0.492	0.5450	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
SB888	0.5000	0.0271	0.4770	0.5000	0.5230	0.4930	0.0260	0.4205	0.4920	0.5460	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Vilbet	0.4973	0.0265	0.4770	0.5000	0.5232	0.4928	0.0262	0.4205	0.4920	0.5460	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Asianbookie	0.4998	0.0260	0.4763	0.5000	0.5232	0.4929	0.0260	0.4205	0.4920	0.5461	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
YongliGao	0.4998	0.0270	0.4763	0.5000	0.5232	0.4911	0.0269	0.4207	0.490	0.5460	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Nikebet	0.4977	0.0269	0.4744	0.5000	0.5230	0.4923	0.0261	0.4217	0.491	0.5461	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
STSbet	0.4999	0.0269	0.4767	0.5000	0.5230	0.4933	0.0262	0.4207	0.4925	0.5450	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Yongli	0.4999	0.0270	0.4765	0.5000	0.5232	0.4927	0.0262	0.4209	0.4922	0.5450	0.5204	0.0264	0.4900	0.5200	0.5425	0.64%	
PinnacleSports	0.4993	0.0260	0.4768	0.5000	0.5230	0.4929	0.0260	0.4201	0.496	0.5462	0.5204	0.0266	0.4900	0.5200	0.5425	0.64%	
Singbet	0.4999	0.0269	0.4768	0.5000	0.5232	0.4927	0.0262	0.4206	0.4924	0.5460	0.5204	0.0264	0.4900	0.5200	0.5425	0.64%	
IB888	0.5001	0.0270	0.4770	0.5000	0.5230	0.4931	0.0262	0.4206	0.4929	0.5460	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Unibet	0.4999	0.0265	0.4765	0.5000	0.5232	0.4929	0.0261	0.4205	0.492	0.5450	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Bwin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
Interwetten	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
Vilbet	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
IB International	0.4999	0.0262	0.4763	0.5000	0.5232	0.4932	0.0263	0.4401	0.4920	0.5450	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
bet1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
betfair	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
Sisal	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
SingaporePools	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
Stan James	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
Unibet	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
Coral	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0%	
Average	0.4994	0.0274	0.4764	0.5000	0.5224	0.4933	0.0260	0.4200	0.4920	0.5440	0.5204	0.0265	0.4900	0.5200	0.5425	0.63%	

Home Win	Bookmakers					EM Model					Home Win	Comparison					Nominal Vigorish
	Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%		Mean	Std Dev	25%	Median	75%	
Macao Slot	0.5005	0.0264	0.4774	0.5000	0.5231	0.5069	0.0263	0.4501	0.5010	0.5500	0.5213	0.0277	0.5000	0.5200	0.5425	0.64%	
Ladbrokes	0.4987	0.0262	0.4742	0.4974	0.5233	0.5035	0.0261	0.4514	0.5043	0.5575	0.5218	0.0265	0.4900	0.5200	0.5425	0.64%	
Victor Chandler	0.5000	0.0265	0.4768	0.5000	0.5232	0.5060	0.0263	0.4452	0.5077	0.5603	0.5204	0.0266	0.4900	0.5200	0.5425	0.64%	
Singbet	0.5000	0.0269	0.4768	0.5000	0.5232	0.5069	0.0262	0.4541	0.5062	0.5618	0.5204	0.0264	0.4900	0.5200	0.5425	0.64%	
Fafa	0.5001	0.0265	0.4763	0.5000	0.5232	0.5070	0.0264	0.4560	0.5084	0.5617	0.5204	0.0266	0.4900	0.5200	0.5425	0.64%	
Bet365	0.5007	0.0271	0.4805	0.5000	0.5200	0.5072	0.0263	0.4541	0.5077	0.5623	0.5204	0.0261	0.4900	0.5200	0.5425	0.64%	
Expobet	0.5002	0.0263	0.4805	0.5000	0.5195	0.5072	0.0262	0.4541	0.5077	0.5623	0.5204	0.0265	0.5000	0.5200	0.5425	0.64%	
bet1	0.5006	0.0267	0.4802	0.5000	0.5204	0.5070	0.0265	0.4525	0.5084	0.5620	0.5204	0.0263	0.4900	0.5200	0.5425	0.64%	
Mansion	0.5002	0.0263	0.4770	0.5000	0.5232	0.5069	0.0262	0.4529	0.5075	0.5623	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Sisal	0.5005	0.0263	0.4768	0.5000	0.5232	0.5068	0.0262	0.4544	0.5079	0.5604	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Yongli	0.5005	0.0273	0.4768	0.5000	0.5232	0.5069	0.0262	0.4544	0.5079	0.5604	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Shobet	0.5000	0.0268	0.4770	0.5000	0.5230	0.5070	0.0263	0.4529	0.5076	0.5618	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
BCEBet	0.5000	0.0278	0.4770	0.5000	0.5230	0.5069	0.0262	0.4547	0.5079	0.5620	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Hengshang	0.5000	0.0260	0.4770	0.5000	0.5244	0.5072	0.0260	0.4560	0.5084	0.5617	0.5204	0.0264	0.4900	0.5200	0.5425	0.64%	
AS388	0.5004	0.0278	0.4770	0.5000	0.5236	0.5069	0.0262	0.4547	0.5079	0.5620	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
IB International	0.5002	0.0265	0.4768	0.5000	0.5232	0.5071	0.0261	0.4543	0.5081	0.5618	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
SB888	0.5000	0.0271	0.4770	0.5000	0.5230	0.5070	0.0260	0.4560	0.5080	0.5618	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Vilbet	0.5002	0.0265	0.4768	0.5000	0.5232	0.5072	0.0262	0.4541	0.5081	0.5618	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Asianbookie	0.5004	0.0260	0.4769	0.5000	0.5232	0.5071	0.0260	0.4529	0.5080	0.5618	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
YongliGao	0.5004	0.0270	0.4768	0.5000	0.5232	0.5071	0.0263	0.4529	0.5080	0.5618	0.5204	0.0265	0.4900	0.5200	0.5425	0.64%	
Nikebet	0.5021	0.0260	0.4762														

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<p>A Bookmakers</p> <p>B Season 08/09</p> <p>C Bias Breakdown</p> <p>a) Handicap States</p> <p>b) Handicap P/L</p> <p>c) Handicap Ratio</p> <p>d) P/Price Ratio</p> <p>e) P/Price P/L</p> <p>f) P/Price Ratio</p> <p>g) Handicap States</p> <p>h) Handicap P/L</p> <p>i) Handicap Ratio</p> <p>j) P/Price Ratio</p> <p>k) Handicap States</p> <p>l) Handicap P/L</p> <p>m) Handicap Ratio</p> <p>n) P/Price Ratio</p> <p>o) Handicap States</p> <p>p) Handicap P/L</p> <p>q) Handicap Ratio</p> <p>r) P/Price Ratio</p> <p>D Summary</p> <p>a) Season 08/09</p> <p>b) Season 08/09</p> <p>E Conclusion</p>											<p>This section compare of the observations outcome, EM model, and also the pure probabilities (without normal vigorish) of 23 bookmakers with EM model. Only the difference of handicap between bookmakers.</p> <p>The Mean, standard deviation, and quantiles (25%, median, and 75%) are given. It can be seen that there is virtually no difference between bookmakers in terms of these summaries. Also given are the corresponding quantiles obtained from the statistical model.</p> <p>OverProb : (UnderPrice - 1) / (OverPrice - UnderPrice + 2)</p> <table border="1"> <thead> <tr> <th rowspan="2">Over/Vin</th> <th colspan="5">Bookmakers</th> <th colspan="5">EM Model</th> </tr> <tr> <th>Mean</th> <th>Std Dev</th> <th>25%</th> <th>Median</th> <th>75%</th> <th>Mean</th> <th>Std Dev</th> <th>25%</th> <th>Median</th> <th>75%</th> </tr> </thead> <tbody> <tr><td>Macao Slot</td><td>0.4172</td><td>0.0205</td><td>0.4165</td><td>0.4165</td><td>0.4172</td><td>0.4165</td><td>0.0205</td><td>0.4165</td><td>0.4165</td><td>0.4172</td></tr> <tr><td>Ladbrokes</td><td>0.4168</td><td>0.0205</td><td>0.4170</td><td>0.4168</td><td>0.5014</td><td>0.4168</td><td>0.0205</td><td>0.4170</td><td>0.4168</td><td>0.5014</td></tr> <tr><td>Victor Chandler</td><td>0.4162</td><td>0.0204</td><td>0.4171</td><td>0.4170</td><td>0.5005</td><td>0.4162</td><td>0.0204</td><td>0.4171</td><td>0.4170</td><td>0.5005</td></tr> <tr><td>Fair Play</td><td>0.4168</td><td>0.0208</td><td>0.4173</td><td>0.4162</td><td>0.5071</td><td>0.4168</td><td>0.0208</td><td>0.4173</td><td>0.4162</td><td>0.5071</td></tr> <tr><td>Faia</td><td>0.4168</td><td>0.0207</td><td>0.4174</td><td>0.4172</td><td>0.5077</td><td>0.4168</td><td>0.0207</td><td>0.4174</td><td>0.4172</td><td>0.5077</td></tr> <tr><td>Bet365</td><td>0.4168</td><td>0.0209</td><td>0.4171</td><td>0.4170</td><td>0.5005</td><td>0.4168</td><td>0.0209</td><td>0.4171</td><td>0.4170</td><td>0.5005</td></tr> <tr><td>Esport</td><td>0.4168</td><td>0.0201</td><td>0.4170</td><td>0.4165</td><td>0.5025</td><td>0.4168</td><td>0.0201</td><td>0.4170</td><td>0.4165</td><td>0.5025</td></tr> <tr><td>Marsson</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>Yongli</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>Sinar</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>SBobet</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>BC365</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>Heuging</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>AB International</td><td>0.4162</td><td>0.0208</td><td>0.4167</td><td>0.4162</td><td>0.5071</td><td>0.4162</td><td>0.0208</td><td>0.4167</td><td>0.4162</td><td>0.5071</td></tr> <tr><td>SBIB8</td><td>0.4162</td><td>0.0208</td><td>0.4167</td><td>0.4162</td><td>0.5071</td><td>0.4162</td><td>0.0208</td><td>0.4167</td><td>0.4162</td><td>0.5071</td></tr> <tr><td>Asianbookie</td><td>0.4162</td><td>0.0208</td><td>0.4167</td><td>0.4162</td><td>0.5071</td><td>0.4162</td><td>0.0208</td><td>0.4167</td><td>0.4162</td><td>0.5071</td></tr> <tr><td>Marsson</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>Yongli</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> 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<tr><td>Marsson</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>Yongli</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>Sinar</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>SBobet</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>BC365</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td></tr> <tr><td>Heuging</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td><td>0.5004</td><td>0.4161</td><td>0.0209</td><td>0.4170</td><td>0.4164</td></tr></tbody></table>											Over/Vin	Bookmakers					EM Model					Mean	Std Dev	25%	Median	75%	Mean	Std Dev	25%	Median	75%	Macao Slot	0.4172	0.0205	0.4165	0.4165	0.4172	0.4165	0.0205	0.4165	0.4165	0.4172	Ladbrokes	0.4168	0.0205	0.4170	0.4168	0.5014	0.4168	0.0205	0.4170	0.4168	0.5014	Victor Chandler	0.4162	0.0204	0.4171	0.4170	0.5005	0.4162	0.0204	0.4171	0.4170	0.5005	Fair Play	0.4168	0.0208	0.4173	0.4162	0.5071	0.4168	0.0208	0.4173	0.4162	0.5071	Faia	0.4168	0.0207	0.4174	0.4172	0.5077	0.4168	0.0207	0.4174	0.4172	0.5077	Bet365	0.4168	0.0209	0.4171	0.4170	0.5005	0.4168	0.0209	0.4171	0.4170	0.5005	Esport	0.4168	0.0201	0.4170	0.4165	0.5025	0.4168	0.0201	0.4170	0.4165	0.5025	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	AB International	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	SBIB8	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Asianbookie	0.4162	0.0208	0.4167	0.4162	0.5071	0.4162	0.0208	0.4167	0.4162	0.5071	Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Sinar	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	SBobet	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	BC365	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004	Heuging	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164
Over/Vin	Bookmakers					EM Model																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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Macao Slot	0.4172	0.0205	0.4165	0.4165	0.4172	0.4165	0.0205	0.4165	0.4165	0.4172																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Ladbrokes	0.4168	0.0205	0.4170	0.4168	0.5014	0.4168	0.0205	0.4170	0.4168	0.5014																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Victor Chandler	0.4162	0.0204	0.4171	0.4170	0.5005	0.4162	0.0204	0.4171	0.4170	0.5005																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Fair Play	0.4168	0.0208	0.4173	0.4162	0.5071	0.4168	0.0208	0.4173	0.4162	0.5071																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Faia	0.4168	0.0207	0.4174	0.4172	0.5077	0.4168	0.0207	0.4174	0.4172	0.5077																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Bet365	0.4168	0.0209	0.4171	0.4170	0.5005	0.4168	0.0209	0.4171	0.4170	0.5005																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Esport	0.4168	0.0201	0.4170	0.4165	0.5025	0.4168	0.0201	0.4170	0.4165	0.5025																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Marsson	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
Yongli	0.4161	0.0209	0.4170	0.4164	0.5004	0.4161	0.0209	0.4170	0.4164	0.5004																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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The image shows a screenshot of an Excel spreadsheet titled "Research OU (PureProb).xlsx [Read-Only] - Excel (Trial)". The spreadsheet is divided into four main sections: A) Bookmakers, B) Comparison Pure Probabilities, C) Book Odds, and D) Season 09/10. Each section contains columns for various statistical measures like Mean, Std Dev, 25%, Median, and 75% for different bookmakers. The data is organized into tables for "Over Win" and "Under Win" probabilities, comparing "Bookmakers" and "EM Model".

Above figure shows a comparison between the mean, standard deviation, quantile 25%, median, quantile 75% of Goal Line odds price without vigorish of total soccer matches in season 2009/10.

The screenshot shows an Excel spreadsheet with the following structure:

- Comparison (Data of Season 09/10) Pure Probabilities:** This section compares the EM model results with bookmaker odds. It includes a table with columns for 'Over Win' and 'Under Win' probabilities, and a 'Normal Vigorish' column. The data is organized into multiple tables for different match types and bookmakers.
- Comparison (Data of Season 09/10) Probabilities from Odds Prices:** This section compares the EM model results with bookmaker odds. It includes a table with columns for 'Over Win' and 'Under Win' probabilities, and a 'Normal Vigorish' column. The data is organized into multiple tables for different match types and bookmakers.

Above figure shows a comparison the mean, standard deviation, quantile 25%, median, quantile 75% of Goal Line odds price with vigorish of total soccer matches in season 2009/10.

4.2. Staking Model

As I mentioned in section [Book Enhancement](#) on the decay rates. In order to test the efficiency and the return of investment, I've taken both models in *algorithmic simulations*¹³. For the staking model, I just simply using the most simple staking model which from *Dixon & Coles 1996*.

Only \$1 One dollar placed on every level of edge from 1.00 until 4.00. Kindly refer to below sample table.

Below table is another sample breakdown table which showing the handicap breakdown and odds price breakdown in:-

- stake amount

¹³I tried to fit the constant decay rates, weekly dynamical decay rates and dynamical decay rates just right after finish a soccer match. It is my previous research saved in Rmodel.RData files prior to start this spreadsheet. Therefore this spreadsheet only taken the completed and converted odds price for staking and testing efficiency purpose.

Figure 7: A sample of edge value and staking breakdown table

- staking ratio
- profit & lose
- profit and lose ratio

Figure 8: A sample of staking breakdown table

4.3. Preview of Returns.

Below tables breakdown the stakes and return on every single edge point that overcame the overrounds.

Research AH (PureProb)

The screenshot displays the 'Research AH (OddsProb) (Read Only) Excel (Tab)' window. It features a standard spreadsheet interface with a menu bar (Home, Insert, Page Layout, Formulas, Data, Review, View, ACROBAT) and a toolbar. The main content area shows a summary for Season 2009/10, followed by a large data table. The table is organized into sections: 'Total returns in Season 2009/10', 'Total betting stakes placed in Season 2009/10', 'Net profits in Season 2009/10', and 'Profit Ratio (Net profit / Betting Stakes)'. Each section contains a table with columns for Match, Home, Away, Draw, and various betting odds (e.g., Home, Away, Draw, Over, Under, etc.). The data rows represent individual matches, with columns for Home and Away teams, and columns for various betting markets and their respective odds and results.

Above figure shows a staking breakdown on every single edge on Asian Handicap odds price without vigorish of total soccer matches in season 2009/10.

Research AH (OddsProb)

The screenshot displays the 'Research AH (OddsProb) (Read Only) Excel (Tab)' window. It features a standard spreadsheet interface with a menu bar (Home, Insert, Page Layout, Formulas, Data, Review, View, ACROBAT) and a toolbar. The main content area shows a summary for Season 2008/09 and Season 2009/10, followed by a large data table. The table is organized into sections: 'Total returns in Season 2008/09 and 2009/10', 'Total betting stakes placed in Season 2008/09 and 2009/10', 'Net profits in Season 2008/09 and 2009/10', and 'Profit Ratio (Net profit / Betting Stakes)'. Each section contains a table with columns for Match, Home, Away, Draw, and various betting odds (e.g., Home, Away, Draw, Over, Under, etc.). The data rows represent individual matches, with columns for Home and Away teams, and columns for various betting markets and their respective odds and results.

Above figure shows a staking breakdown on every single edge on Asian Handicap odds price with vigorish of total soccer matches in season 2008/09 and 2009/10.

The screenshot displays a complex spreadsheet with multiple columns representing different betting parameters and outcomes. The data is organized into sections: 'Total return in Season 2008/09', 'Total betting stakes placed in Season 2008/09', 'Net profits in Season 2008/09', and 'Profit Ratio (Net profit / Betting Stake)'. Each section contains a grid of data points for various matches, with values ranging from small integers to larger numbers, indicating the scale of the betting activity.

Above figure shows a staking breakdown on every single edge on Asian Handicap odds price with vigorish of total soccer matches in season 2008/09.

This screenshot is similar to the one above, showing a staking breakdown for the 2009/10 season. It features the same layout with columns for Match, Odds, Stake, and various betting outcomes. The data is presented in a grid format, showing the distribution of bets and the resulting returns for each match during that specific season.

Above figure shows a staking breakdown on every single edge on Asian Handicap odds price with vigorish of total soccer matches in season 2009/10.

The screenshot displays a complex Excel spreadsheet with multiple columns representing different betting markets and outcomes. The data is organized into sections for 'Total returns in Season 2008/09 and 2009/10', 'Total betting stakes placed in Season 2008/09 and 2009/10', and 'Net profits in Season 2008/09 and 2009/10'. Each section contains a grid of numerical values corresponding to specific match events and betting strategies.

Above figure shows a staking breakdown on every single edge on Goal Line odds price without vigorish of total soccer matches in season 2008/09 and 2009/10.

This screenshot shows a similar Excel spreadsheet to the one above, but specifically for the season 2008/09. It follows the same structure with columns for Match, Home, Away, Draw, and various betting options, detailing the staking breakdown and net profits for that specific season.

Above figure shows a staking breakdown on every single edge on Goal Line odds price without vigorish of total soccer matches in season 2008/09.

The screenshot displays a complex spreadsheet with multiple data tables. The top table, 'Total interest in Season 2009/10', lists various betting markets and their corresponding odds and stake volumes. Below it, 'Total betting stakes placed in Season 2009/10' provides a breakdown of the total stakes placed across different categories. The 'Net profits in Season 2009/10' table shows the profit or loss for each market. Finally, the 'Profit Ratio' table calculates the profit relative to the total stakes for each market. The spreadsheet uses a color-coded system to highlight different sections and includes a sidebar with navigation options.

Above figure shows a staking breakdown on every single edge on Goal Line odds price without vigorish of total soccer matches in season 2009/10.

Research OU (OddsProb)

This screenshot shows a similar spreadsheet structure to the one above, but for the seasons 2008/09 and 2009/10. The tables follow the same layout: 'Total interest in Season 2008/09 and 2009/10', 'Total betting stakes placed in Season 2008/09 and 2009/10', 'Net profits in Season 2008/09 and 2009/10', and 'Profit Ratio (Net profit / Betting Stakes)'. The data represents the betting activity and outcomes for these two seasons, allowing for comparison with the 2009/10 season data.

Above figure shows a staking breakdown on every single edge on Goal Line odds price with vigorish of total soccer matches in season 2008/09 and 2009/10.

The screenshot displays an Excel spreadsheet titled 'Research On Odds/Handicap Odds (Read Only) - Excel (Print)'. The spreadsheet is organized into several sections:

- Home**: Contains a navigation menu with options like 'Home', 'Insert', 'Page Layout', 'Formulas', 'Data', 'Review', 'View', and 'ACROBAT'.
- Summary**: A brief overview of the data, including a note about the spreadsheet's efficiency and a formula for calculating the EM model: $EM = (1 + \text{Odds} \times \text{Stake}) - \text{Odds} \times \text{Stake}$.
- Total returns in Season 2008/09**: A large table with columns for Match, Market, Label, Odds, Stake, Profit, and various bookmaker odds (Bet365, Betfair, etc.).
- Total betting stakes placed in Season 2008/09**: A table showing the total stakes placed for each match and market.
- Net profits in Season 2008/09**: A table showing the net profits for each match and market.
- Profit Ratio (Net profit / Betting Stake)**: A table showing the profit ratio for each match and market.

Above figure shows a staking breakdown on every single edge on Goal Line odds price with vigorish of total soccer matches in season 2008/09.

The screenshot displays an Excel spreadsheet titled 'Research On Odds/Handicap Odds (Read Only) - Excel (Print)'. The spreadsheet is organized into several sections:

- Home**: Contains a navigation menu with options like 'Home', 'Insert', 'Page Layout', 'Formulas', 'Data', 'Review', 'View', and 'ACROBAT'.
- Summary**: A brief overview of the data, including a note about the spreadsheet's efficiency and a formula for calculating the EM model: $EM = (1 + \text{Odds} \times \text{Stake}) - \text{Odds} \times \text{Stake}$.
- Total returns in Season 2009/10**: A large table with columns for Match, Market, Label, Odds, Stake, Profit, and various bookmaker odds (Bet365, Betfair, etc.).
- Total betting stakes placed in Season 2009/10**: A table showing the total stakes placed for each match and market.
- Net profits in Season 2009/10**: A table showing the net profits for each match and market.
- Profit Ratio (Net profit / Betting Stake)**: A table showing the profit ratio for each match and market.

Above figure shows a staking breakdown on every single edge on Goal Line odds price with vigorish of total soccer matches in season 2009/10.

5. Conclusion

5.1. Conclusion

This spreadsheet test the efficiency of Asian Handicap odds prices of 29 bookmakers with a scientific betting strategy based on a EM model (Expectation Maximization) Firstly, get the English soccer matches data, then compile odds price based on EM model,

based on that model simply placed bets on only when “EM model / Bookmaker’s Prob > Ratio”.

From the result of this research on 2 Seasons English Soccer Leagues, we conclude the below points:

- proof that nowadays we are hard to make profit from 29 bookmakers based on simple betting strategy (EMProb / BKProb).
 - there are no Asian Handicap betting models in academics research industry, someone sophisticated betting model needed.
 - furthermore, some matches have no odds prices may caused the betting made a lose result.
 - the most importance point is that bookmakers take a very high advantages which is higher than normal virogish (refer to application of Malay odds, and also Ryo handicap.xlsx spreadsheet to know the calculation of real vigorish).

5.2. Future Works

I applied **Kelly model**¹⁴ next to this research which generated profit (positive return of investment) more than 30% every year.

While now I am using dataset from European famous sportsbook consultancy firm to test thier staking model and efficiency. Wher I need to modify existing Kelly model to be half, quarter etc to control the risk similar with *Moya 2012*.

There has a weakness in this paper which is gathered dataset are history odds price while I am learning to build a real time trading system now. However a profit return from my few years research and put my all time and effort in this sportbook research is worthwhile, happier and stimulated to be more aggressive to continue my journey to setup own hedge fund company **Scibrokes**.

6. Appendices

6.1. Documenting File Creation

It’s useful to record some information about how your file was created.

- File creation date: 2016-05-06
- R version 3.2.3 (2015-12-10)
- R version (short form): 3.2.3
- **rticles** package version: 0.2
- File version: 1.0.0
- File latest updated date: 2016-05-05

¹⁴Refer to [Testing Inefficiency of Sports-Bookmakers by Kelly Model](#)

- Author Profile: [@yo, Eng Lian Hu](#)
- GitHub: [Source Code](#)
- Additional session information

```
[1] "2016-05-05 21:21:34 EDT" setting value
version R version 3.2.3 (2015-12-10) system x86_64, linux-gnu
ui X11
language (EN)
collate en_US.UTF-8
tz America/New_York
date 2016-05-05
sysname release "Linux" "3.10.0-229.20.1.el7.x86_64" version nodename "#1 SMP Tue Nov 3
19:10:07 UTC 2015" "scibrokes" machine login "x86_64" "unknown" user effective_user "ryoeng"
"ryoeng"
```

6.2. Speech and Blooper

Firstly I do appreciate those who shade me a light on my research. Meanwhile I do happy and learn from the research. I do appreciated to take some spared time to write this thesis where the research has start from 2008 and finish in 2012. Infact I've finished my research on 2010 before I wrote a proposal to acquire the [Ladbrokes](#)¹⁵ trading and hedge fund project in Scicom (MSC) Bhd and extended dataset soccer matches until 2012. Unfortunately the project has closed but I keep up learning journey to run my own company [Scibrokes](#)¹⁶ some other days. I'll started work as customer service executive but in somewhere else next week, I am currently studying distance course data science at [Coursera.org](#). You are feel free to browse over my CV at [@yo Eng Lian Hu](#).

I started my research journey when I decided to resign from Caspo Inc. to be an customer service operator in Scicom (MSC) Bhd. I've search, collected and read through thousands of research papers to get the applicable model in our real life investment. Fortunately I found and know a person [Boffins -vs- Bookies \(The Man Who Broke the World Leading Bookmakers\)](#) and start my learning from an outsider which don't know any statistical tools for modelling until successfully completed the research in year 2012. Kindly refer to [My personal WordPress blog](#) for more experience and bloopers.

Now I would like to share some bloopers during process this thesis.

- **Remarks** : Due to the mathematical LaTeX formula and greek letters unable use in [rticles package](#). Here I forced to use some image for substitution.
- Due to the Microsoft Excel file inside my previous project [dataset](#) for **Odds Modelling and Testing Inefficiency of Sports-Bookmakers 2008-2010** by [@yo Eng Lian Hu](#) is very huge in xlsx format and set with a struture frame. Therefore I just omit to apply `openxlsx` to read the data for further process.

¹⁵Ladbrokes is a world leader in the betting and gaming industry with over 2,700 betting outlets in the UK, Ireland, Belgium and Spain and over 800,000 active online customers. British public listed company which in the Fortune 500 and over hundred years business group.

¹⁶A registered company but not yet in operation. A prospective statistical hedge fund company.

- I tried to convert the xlsx files to pdf format and attached as appendices but system keep endless processing there but no outcome. Secondly, huge dataset make it trouble to read into RStudio and summarise and plotting some d3 graphs.
- The embed figures always not align in order, some figures will always align to other topic after knit.

6.3. Reference

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URL: <https://github.com/scibrokes/owner>

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