

# EUROPEAN CHAMPIONSHIPS SIMULATION

Geoff Kaniuk *geoff@kaniuk.co.uk*

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# 1 BACKGROUND AND PURPOSE

At the Annual General Meeting of the EGF held at the European Go Congress(EGC) in Tampere 2010, a proposal (by the British Go Association) for running the European Championship (EC) was accepted. The proposed system was designed to:

- Select a unique European Champion.
- Be easy to explain to press and sponsors.
- Exclude top European players from the main open tournament for as few rounds as possible.
- Create minimal interference in the games between Asian and top European players.

Other proposals under discussion at the meeting included features like: separating the European Championship from the European Open for the majority of games, or requiring extra games to determine qualifiers, or retaining the status quo. All these proposals were rejected in favour of the following knockout system as proposed by the BGA (and similarly proposed in 2009 by the Dutch Go Federation):

- At the end of round 7 choose the top 8 European players from the wall list.
- These play a three round knockout.
- Losers return to the main tournament.

It was agreed with the EGF President Martin Stiassny, that Geoff Kaniuk would produce some simulations of the new rules, examining past events to settle some of the finer details that are implied by the proposal.

The purpose of this report is to present the first such simulation (for EGC 2010) recently completed, and to lay the framework for the remaining simulations to come. This report presents a method for ranking the 8 players in the Championship, but does not consider how prizes or points should be awarded. Since only the top groups in the Open and Championship tournaments are affected, the simulation is restricted to produce information for the top 20 players.

## 2 METHODOLOGY

### 2.1 The 8 contenders

The MacMahon program is often used to pair the European Go Congress. Given the tournament file for the event it is possible to unwind the tournament back to round 7 to produce a wall list for that round.

We can then choose the top 8 European players from this list using the standard SOS tie-break if necessary. Should SOS fail to break the tie, then other tiebreaks will need to be applied and the following relevant tie-breaks will be investigated where needed:

- SOS-n.
- Rating at EGC.
- First difference in reverse rating history.

The motivation for SOS-n (SOS excluding the first n rounds) is an attempt to measure current strength from games played so far. If that fails to resolve the tie, then rating provides a measure of past strength. It is highly unlikely for two players to have exactly the same rating history, so the last tie-break is virtually guaranteed to provide a unique selection.

## 2.2 Pairing

The 8 players chosen are arranged in order of decreasing SOS and manually paired in the split-and-fold method i.e. 1 vs 8, 2 vs 7, etc. It may happen that this results in a repeat pairing in which case the next higher player from the lower group is chosen. If that still results in a repeat pairing then we revert to the first choice and the proper player in sequence is chosen.

Once the forced pairing is completed, the program pairs the remaining players in the usual *MacMahon* way. The pairing is exported as a text file.

## 2.3 Results

In order to simulate the result of each game, a program has been produced which carries out the following procedures:

1. Load a file specifying ratings for each player.
2. Load the pairing file.
3. For each pair, generate a result from the ratings of the players, and record the outcome in the result file.

The ratings after the EGC can be regarded as the best information we have about the strength of players, especially the unknown Asians. The ratings file was therefore generated from the final ratings at EGC 2010.

The results were manually entered into the MacMahon program for the first 50 boards. This is sufficient to ensure that complete information is captured for the top 20 players.

## 2.4 Generating a Result

The following procedure is used to generate a result between two given players with rating  $r, s$ :

1. Calculate  $P_{win}$ , the probability of win for Black from the ratings  $r, s$ .
2. Choose a uniform random number  $P$  lying between 0 and 1.
3. If  $P \leq P_{win}$  then Black has result 1 otherwise 0.

The probability of win is calculated from a model derived from the EGD published data for winning probabilities. A summary of details is provided in Appendix A.

## 3 SIMULATION RESULTS FOR 2010

### 3.1 Tables

The simulation results for 2010 are presented in tabular form in the spreadsheet *egc\_2010\_simulation* accompanying this document. For convenience, Excel and Open Office versions are provided.

The spreadsheet contains tables showing a variety of data, including the progress of the knockout, and a method for ranking the players in the EC. In the following sections the titles are the same as the tables in the spreadsheet.

### 3.2 round 8, round 9, round 10, knockout

These four tables all have the same column headings as follows:

| COLUMN            | MEANING                                       |
|-------------------|---|
| <b>BOARD</b>      | Board number for reference.                   |
| <b>BLACK</b>      | Name of player with black stones.             |
| <b>WHITE</b>      | Name of player with white stones.             |
| <b>B STRENGTH</b> | Derived from GoR by $(GoR - 2100)/100$ .      |
| <b>W STRENGTH</b> | Derived from GoR by $(GoR - 2100)/100$ .      |
| <b>PWIN</b>       | Probability of win calculated from strengths. |
| <b>PSIM</b>       | Uniform random number chosen in range 0 to 1  |
| <b>RESULT</b>     | Black wins if $PSIM \leq PWIN$ .              |

The knockout table has the above column headings, but it shows the pairings and results for all three rounds of the knockout.

### 3.3 knockout ranking

The first four columns in this table have the usual meanings. The column labelled EC WINS records the number of wins in the European Championships, and TOTAL WINS is all the wins in the Open Championship plus any gained in the EC. The table shows that by sorting on EC WINS then TOTAL WINS, we provide a unique ranking for the top 5 players in the European Championship. The SOS column is shown for interest and is not needed for the top 5 places. The final column RATING is included along with a plot of rating vs position. This shows that ratings broadly increase as one moves up the ranks.

### 3.4 open ranking

This table shows how the usual (MMS, SOS) ranking system for the Open tournament performs in relation to the player's ratings. Like the knockout ranking there is a clear trend of increasing rating towards the higher rank positions.

For a comparison with the top 20 players in the real 2010 EGC see the table top 20 in the *egc\_2010\_real* spreadsheet. There we see a very similar plot for ratings vs rank position.

### 3.5 Asian games

It is useful to see how the new European Championships procedure affects the number of games against top Asian players in the European Open tournament. To this end the Asian games tables is constructed showing data for the top 20 players and for both the simulated and the real results:

| COLUMN      | MEANING                       |
|-------------|-------------------------------|
| NAME        | Player name.                  |
| COUNTRY     | Identify EU or Asia           |
| ASIAN GAMES | Games against Asian players.  |
| EU-ASIA     | Total European - Asian games. |
| ASIA-ASIA   | Total Asian - Asian games.    |

Clearly, for this one simulation in 2010, the knockout procedure has had very little effect on the EU-ASIAN Asian game density. As can be expected, there is an increase in the count of top Asian-Asian games to make up for some strong European players extracted for the EC.

### 3.6 wall list

This is a standard wall list with standard column headings. It can be used to rank the players in the European Open tournament. This list was used for the open ranking discussed above.

## 4 FURTHER SIMULATIONS

Simulations are planned for other past European Go Congresses this century. The following table shows the number of Asian players appearing in the top 20 positions in the wall list, from 2001 till 2010. These numbers were gathered manually so should be regarded as approximate.

| YEAR | JAPAN | KOREA | CHINA | TAIWAN |
|------|-------|-------|-------|--------|
| 2001 | 6     | 1     | -     | -      |
| 2002 | 3     | -     | -     | -      |
| 2003 | 1     | 10    | -     | -      |
| 2004 | 2     | 4     | -     | 1      |
| 2005 | 1     | 9     | -     | -      |
| 2006 | 4     | 3     | -     | -      |
| 2007 | 1     | 5     | 1     | -      |
| 2008 | 1     | 4     | -     | 1      |
| 2009 | -     | 4     | 1     | 1      |
| 2010 | 1     | 3     | -     | -      |
| 2011 | 5...  | 1...  | 1 ... | -      |

The counts for 2011 are simply the count of players stronger than 5d taken from the current registration list for this year's European Go Congress.

## 5 SUMMARY

- Exactly one simulation has been produced for the top 50 boards in rounds 8-10 of the 2010 European Go Congress in Tampere.
- The simulation uses a model for the probability of win to provide a plausible result in any game.
- The top 8 EC players in the simulation were uniquely chosen by SOS.
- There would have been 15 contenders for the 8th place if SOS was avoided.
- The final results of the Open simulation produced the same set of top 9 players as in the real tournament run under the old system. There was a change in the 10th place and one repeat game in the European Championships.
- The ranking method suggested for the EC gives a unique placement for the top 5 players in the European Championships. A plot of rating vs player rank shows a broadly increasing trend with increasing rank.
- The standard MMS, SOS ranking for the Open produces an increasing trend for rating vs player rank. This trend is very similar to the real ratings - rank trend.
- In the Open simulation, the number of European - Asian games changed minimally as compared to the real results.
- The next simulation will follow the same procedures as presented here and will examine the case where there were a large number of Asian players - as exposed in the table in Section 4.

## A PROBABILITY OF WIN

The EGD site [www.europeangodatabase.eu/EGD/](http://www.europeangodatabase.eu/EGD/) provides data via the Winning statistics link on its Home page. Probability of win data was collected for the period 01/01/2000 till 31/12/2009. The statistics for win probability are shown in the file *pr0009\_raw\_prob* accompanying this document.

A functional model fitting the measured data has been developed, and has the form:

$$P_{win} = P(r, d) = (1 - \text{erf}(\Lambda(r, d)))/2$$

Here  $r$  is the rating of the weaker player measured in *zero shodan units*. The stronger player has rating  $r + d$ , so  $d \geq 0$ , and  $P_{win}$  measures the probability that the weaker player beats the stronger.

The function  $\Lambda$  is a geometric series of exponentials in rating:

$$\Lambda(r, d) = \sum_{n=0}^3 H_n(d) e^{nkr}$$

Each coefficient  $H_n(d)$  is a cubic in  $d$ :

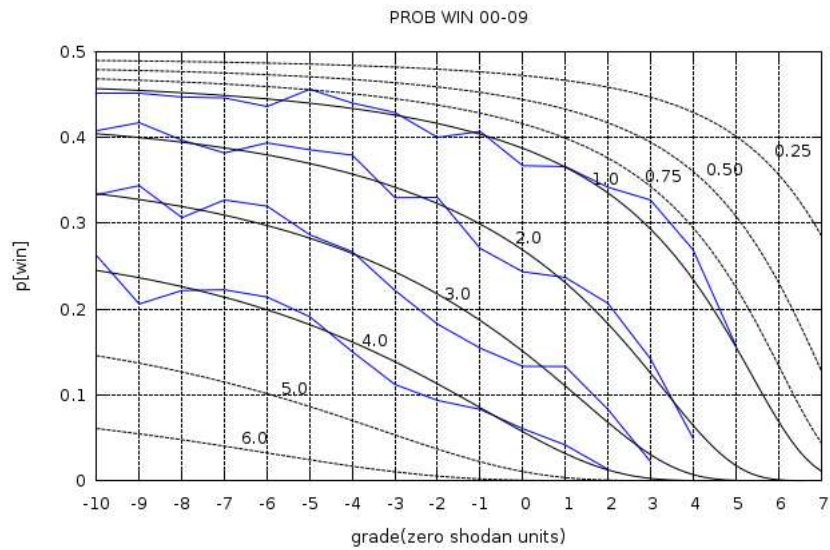
$$H_n(d) = u_n d + v_n d^3$$

The least squares fit of the above model to the measured values of  $P_{win}$  yielded the value  $k = 0.204062$ , and the following values for the coefficients  $u_n, v_n$ :

| <b>n</b> | $u_n$     | $v_n$      |
|----------|-----------|------------|
| 0        | 0.0571865 | 0.00271373 |
| 1        | 0.1263370 | 0.00239026 |
| 2        | 0.0       | 0.0        |
| 3        | 0.0139085 | 0.00000399 |

The model is plotted on the following graph for values of  $d = 0.25, 0.5, 0.75, 1, 2, 3, 4, 5, 6$ . The measure data only covers the values  $d = 1, 2, 3, 4$ , and the curves extrapolated from the model are shown dotted.





The data fits well over the range 10 kyu to 7 dan, but below 15 kyu the raw data is too wild for a sensible model. Please observe that the scales on this graph are much exaggerated. At 6d the probability of win against a player half a stone stronger is about 30% and drops rapidly as the opponent's strength increases.

## B RESOURCES

This document must be read in conjunction with the following files contained in the accompanying archive *egc\_simulation\_2010\_ods.zip* for Open Office spreadsheets, or *egc\_simulation\_2010\_xls.zip* for Excel spreadsheets:

1. *egc\_2010\_real.[ods|xls]* the wall list for both weeks of the european.
2. *egc\_2010\_r7.[ods|xls]* the wall list at the end of round 7.
3. *egc\_2010\_simulation.[ods|xls]* the tables of simulation results.
4. *gor.txt* the ratings file.
5. *pr0009\_raw\_prob* winning statistics gathered by EDG.