Determining Correlation between Chess Openings and Win/Loss Ratio

Provided by Lichess public API on lichess.org

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Introduction to Chess Openings

- A chess opening is a sequence of 2-7 opening moves either as black or white
- Some openings still used today go back as far as 1500 such as Caro-Kahn or Ruy Lopez
- In this database, Lichess only stores the most complex opening recorded in a game and records White's opening if they're equally as complex
- There are over 1400 openings grouped into 5 groups based on levels of aggression

Legend:
- White (49.86%)
- Black (45.4%)
- Draw (4.74%)
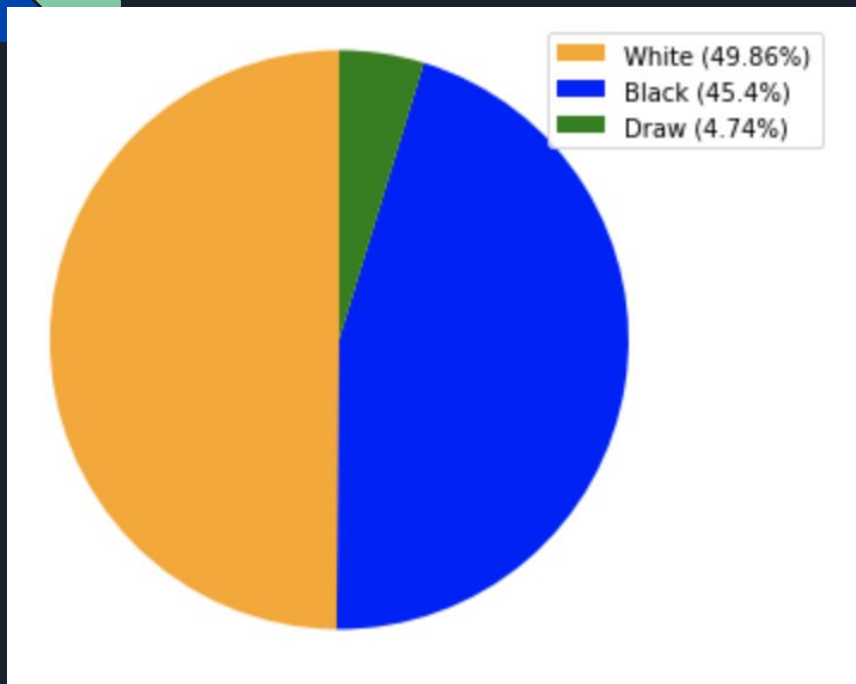
- Generally speaking White has an advantage due to going first, however many players decide to study more complex Black openings to level the playing field
- This dictates why there's a small discrepancy between White/Black wins

Common Predicament

Most beginners and even intermediates to chess discuss which chess opening is "better" to learn for their skill level. Although for centuries this debate has been settled with a brief reference to the Dunning-Kruger Effect, players still discuss it often so today I would like to set up a test to determine whether a particular opening group works any better than any of the other ones using a two proportion z-test.

The following graphs show how the overall important data forms a normal distributing leaning towards the statistical center of the "Elo" system
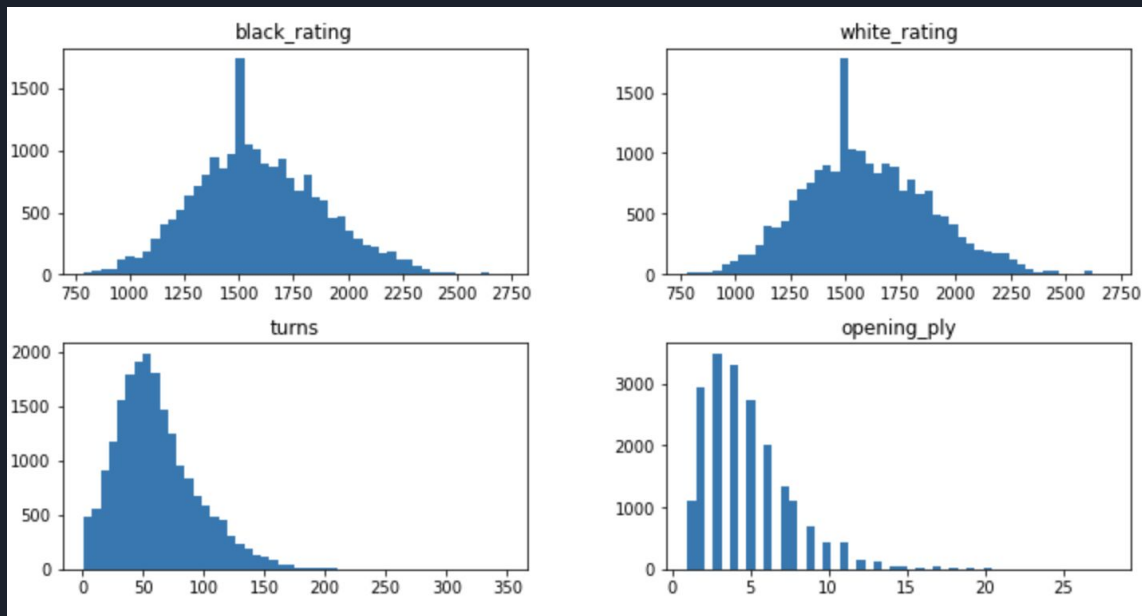
Notes on the data

- The average rating score of all players is approximately 1500, which make up ~45% of all data gathered by Lichess
- The average opening complexity is 3-4 moves which is only relevant to intermediate players

Main Hypothesis

I would like to hypothesize that there is a statistical significance in win/loss ratio between the 5 chess opening groups.

Null Hypothesis = There is no difference in win rate between chess openings

Alt Hypothesis = There is a difference in win rate between openings
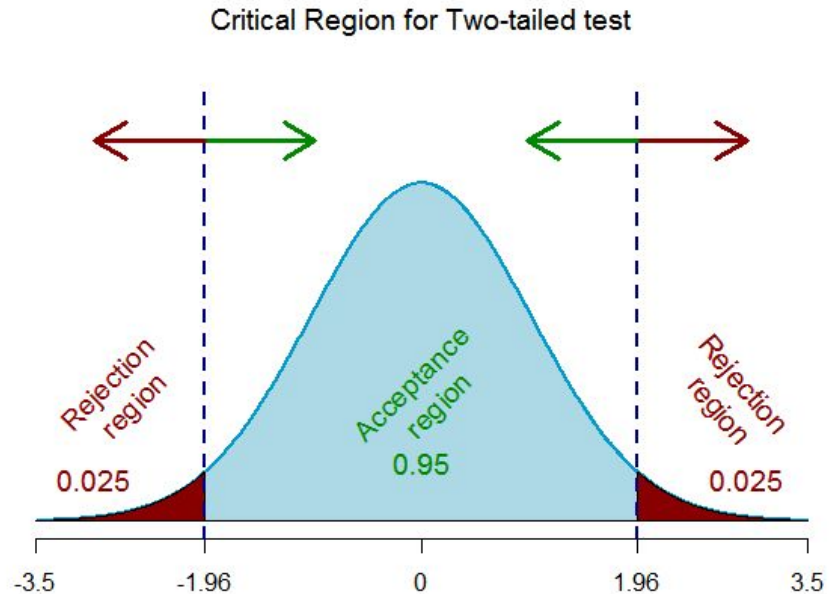
Individual Group Z Tests

Group A: z = -0.5827, p = 0.56192

Group B: z = -0.6423, p = 0.52218

Group C: z = 0.3021, p = 0.76418

Group D: z = 0.8205, p = 0.41222

Group E: z = 0.5601, p = 0.57495

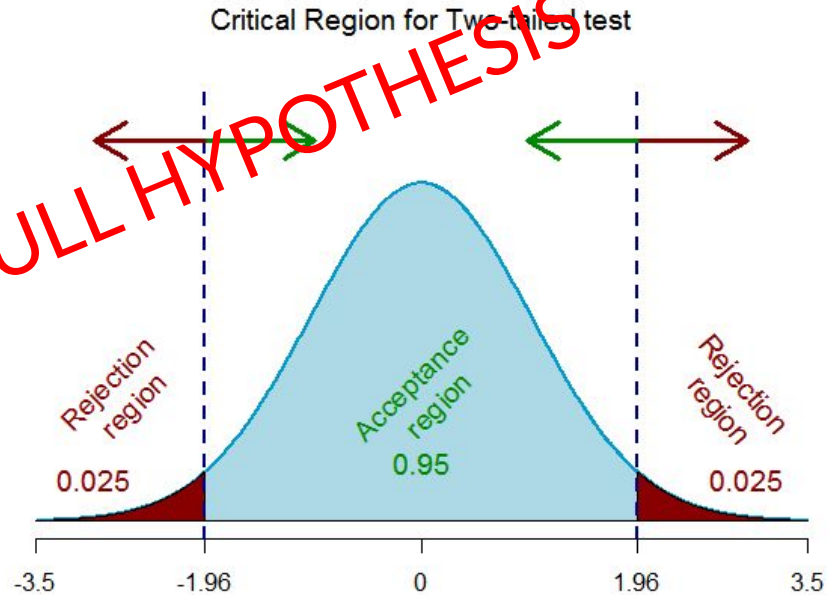# Individual Group Z Tests

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FAIL TO REJECT NULL HYPOTHESIS

Conclusion

After observing the 5 groups of chess openings from a dataset of 20,000 rated games from liches.org, I am unable to reject my null of hypothesis of there being no difference between chess openings.

Although common chess theory at the highest levels include 10+ memorized moves in an opening with thousands of variations, with the most notable ones including 22 moves (~1.5 million positions to memorize!), it is statistically impossible to rule out the idea that playing a different opening at an intermediate level would change your rating or strength by a significant amount.