Predictability of the Men's and Women's FIFA World Cup

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FIFA ELO Rankings History

FIFA/Coca-Cola World Rankings have been around since 1992 for Men and 2003 for Women. In 1992, FIFA created a ranking system in order to provide a metric of comparison for men's senior national soccer teams. Similarly, in 2003 FIFA expanded this metric with a model that provided a metric of comparison for women's senior national soccer teams.

- First Iteration (1993-1998):
  - In games sanctioned by FIFA, teams were given three points for a win, 1 point for a draw, and 0 points for a loss.

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- Second Iteration (1998-2006):
  - FIFA determined that the importance of a match should be considered in its rating system for games of higher importance or against stronger competition. They distinguished between friendlies (1.0), continental championship group stage or qualifying match and a FIFA World Cup qualifying match (1.50), Continental Finals match or a FIFA Confederation Cup match (1.75), and FIFA World Cup (2.0). The regional strength coefficients were UEFA (1), CONMEBOL (0.99), CONCACAF (0.94), AFC (0.93), and OFC (0.93) (FIFA, 2005).

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- Third Iteration (2006-2018):
  - This new system decreased the time for which results had an impact on the rankings from 8 years to 4 years and determined the regional strength coefficients as ever changings based on the governing bodies performance at the last three FIFA World Cups.

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- Fourth Iteration (2018-Present):
  - The formula for which FIFA used for their ELO rankings are

$$P = P_{before} + I(W - W_e)$$

    - P= total points
    - P_{before}= points before a particular game
    - Importance of the match
    - W= outcome of the match with win (1), draw (0.5), and loss (0)
    - W_e = win expectancy and uses a separate formula to calculate that (FIFA, 2018).

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- Women's Ranking (2003-Present):
  - The formula for which FIFA used for their ELO rankings are

$$WWR_{new} = WWR_{old} + (Actual - Predicted)$$

    - WWR_{new}=new senior national team Women's World Ranking
    - WWR_{old}=old senior national team Women's World Ranking
    - (Actual-Predicted)=match outcome, goal differential, goals scores, location of the match, importance of the match, and difference in their and their opponents points before a match (FIFA).

FIFA World Cup Tournament Layout

- Since there rankings have existed, there have been 8 Men's FIFA World Cups and 6 Women's FIFA World Cups.
- Different mathematical tests were done on Men's and Women's World Cups based on format changes and changes to the ranking procedure.
  - Men's FIFA/Coca-Cola World Ranking changes in 1993-1998, 1998-2006, 2006-2018, and 2018-Present.
  - Men's World Cup format changes after 1998 World Cup were not taken into account because the knockout rounds were not changed.
  - Women's FIFA World Cup format changed in 2015 when the World Cup was expanded from 16 to 24 teams and from Quarterfinals to a Round of 16. This was changed again in 2023 to 32 teams, but this change was not taken into account because the knockout rounds were not changed.
- Sought to model a test done by Suzuki & Ohmori titled *Effectiveness of FIFA/Coca-Cola World Ranking in predicting the results of FIFA World Cup finals* and bring this into the Women's game.

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Mathematical Tests

- Tests of Independence and Association
  - Chi-Square Test of Association
- Rules Based Testing on Correlation adapted from Suzuki & Ohmori
  - Pearson Correlation Coefficient
  - Fisher Transformation Hypothesis Test
  - Student's t-test

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Tests of Independence and Association

Table 1: Tests of Association				
Advancement from Group Stage in FIFA World Cup				
	Men's FIFA World Cup		Women's FIFA World Cup	
	Appearances in the Knockout Rounds	Results of Teams in the Top 16	Appearances in the Knockout Rounds	Results of Teams in the Top 12/16
Chi-Square P-value	0.810639	0.908694	0.005603	0.1296

Rules Analysis without β_0

Table 2: Rules Analysis without β_0				
	Men's FIFA World Cup		Women's FIFA World Cup	
	Method A	Method B	Method A	Method B
Pearson Correlation Coefficient (r)	0.8945	0.8675	0.906	0.905
Fisher Transformation score	22.602	20.7065	17.024	16.961
Student's t-test t-value	31.382	27.353	24.026	23.879
F test F	988.5	751.5	581.5	574.7

Rules Analysis with β_0

Table 2: Rules Analysis with β_0				
	Men's FIFA World Cup		Women's FIFA World Cup	
	Method A	Method B	Method A	Method B
Pearson Correlation Coefficient (r)	0.42	0.438	0.6241	0.660
Fisher Transformation score	7.007	7.353	8.276	8.970
Student's t-test t-value	7.529	7.642	8.966	9.861
F test F	52.7	58.51	80.39	97.28

Men's Results Plot Method A

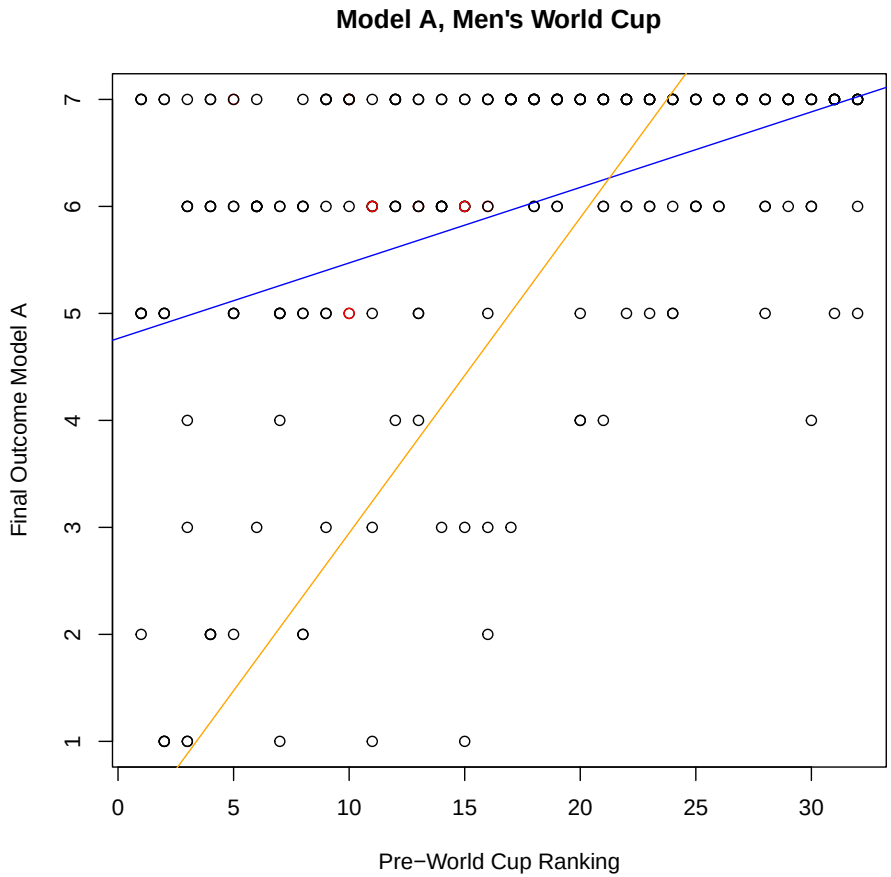

Figure: The orange line represents the regression model with an intercept value of 0 and a correlation value of 0.894. The blue line represents the regression model with an intercept value of 11.96020 and a correlation value of 0.438.

Men's Results Plot Method B

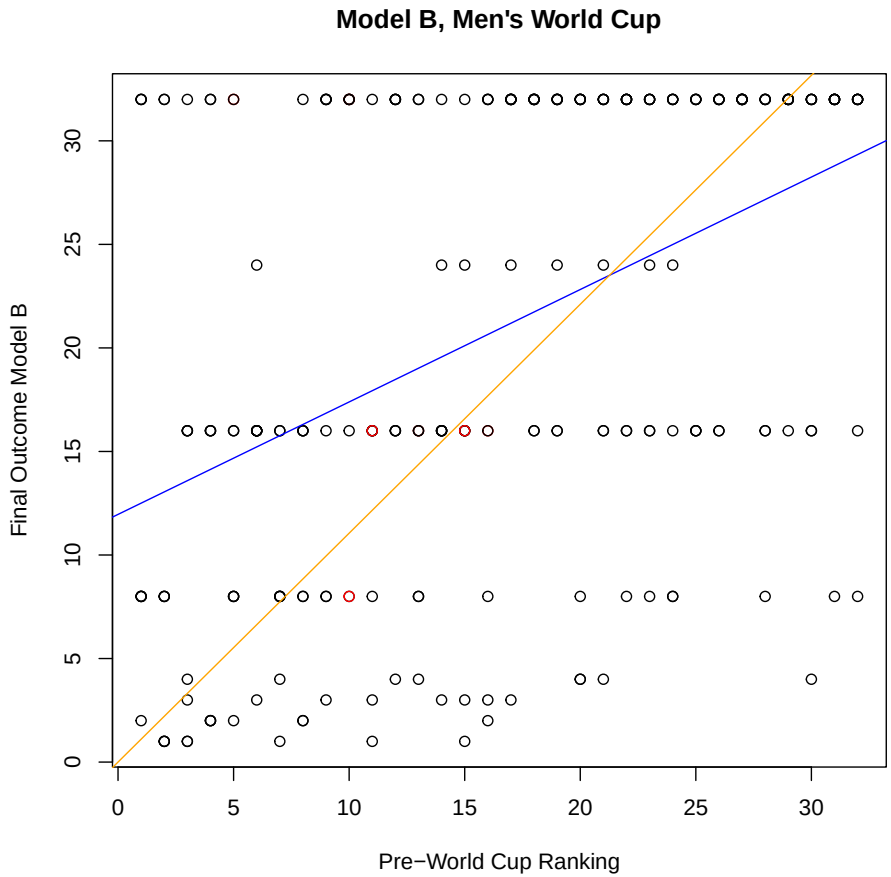

Figure: The orange line represents the regression model with an intercept value of 0 and a correlation value of 0.8675. The blue line represents the regression model with an intercept value of 4.765768 and a correlation value of 0.42.

Women's Results Plot Method A

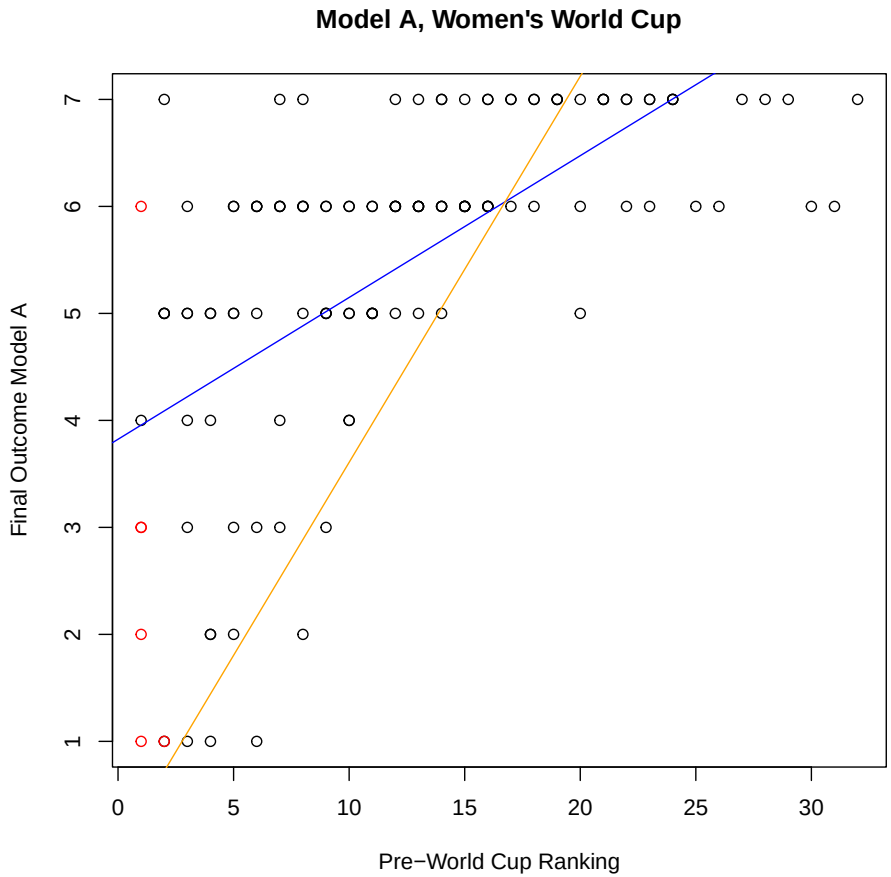

Figure: The orange line represents the regression model with an intercept value of 0 and a correlation value of 0.9059. The blue line represents the regression model with an intercept value of 3.82360 and a correlation value of 0.624.

Women's Results Plot Method B

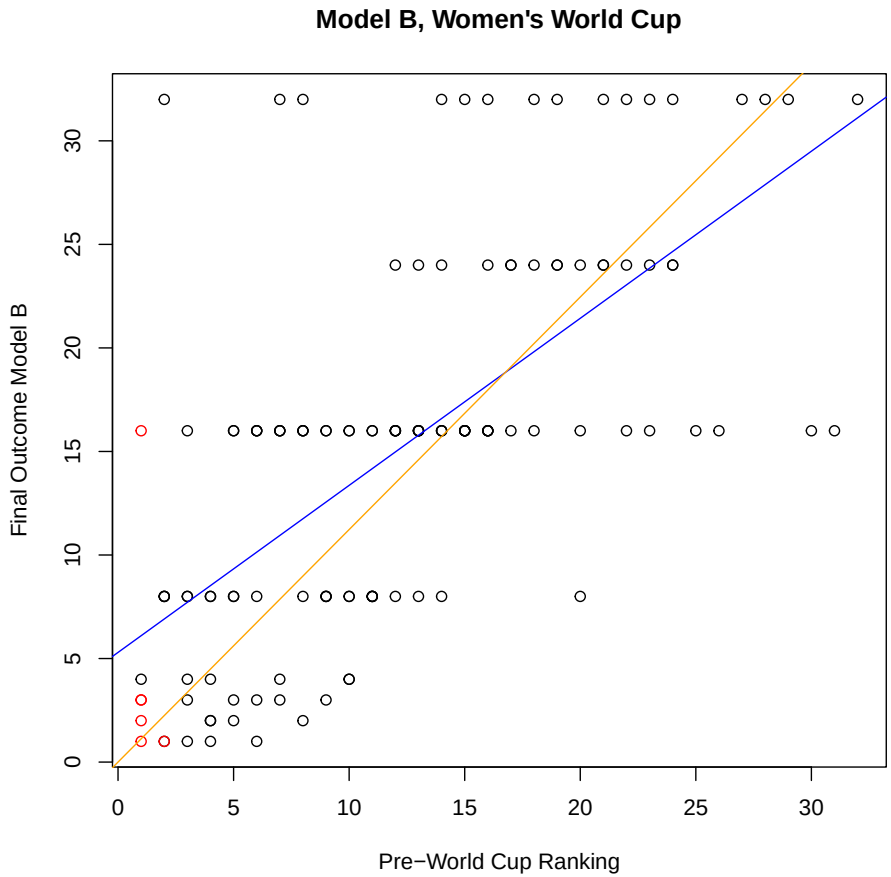

Figure: The orange line represents the regression model with an intercept value of 0 and a correlation value of 0.905. The blue line represents the regression model with an intercept value of 5.29564 and a correlation value of 0.66.

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Conclusions

- Similar results to Suzuki & Ohmori, but used different tests.
- Method B is more accurate than Method A when β_0 is used
- FIFA/Coca-Cola World Rankings predict the FIFA World Cups, but aren't 100% accurate
- More parity in the FIFA Men's World Cup
- Due to a higher test value, the FIFA Women's World Cup is more predictable than the FIFA Men's World Cup, but is becoming less predictable.

Implications

- Betting wise, it may be easier to predict the FIFA Women's World Cup based on the FIFA/Coca-Cola World Rankings.
- This could be in part due to differences between the Men's and Women's World Cups.
    - Less prize money, potential to play on artificial turf, different qualifying formats, and differences in accommodations for the Women's World Cup.

Further Thoughts

- Weaknesses
  - Qualifying structures and formats were not taken into account. Major injuries and rules changes were not taken into account.
  - No test compared Men's World Cups to Women's World Cup results.
- Strengths
  - The methods for rules used have been used by at least two previous studies.
  - Mathematical testing models were verified and applicable.
  - Teams were reranked prior to a World Cup starting so that the Pre-Tournament Rankings were as accurate as possible.
- Further Research
  - Do FIFA rule changes make an impact on what teams win the World Cup?
  - What is the strongest World Cup of all-time based on FIFA/Coca Cola World Rankings?
  - Are the qualifying procedures fair and does it reflect the FIFA/Coca-Cola World Rankings?

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