Strongest color combination in Magic the Gathering Strixhaven draft

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Abstract

This article aims to determine which color-combination is the strongest among the five most prevalent ones in the Magic: The Gathering Draft format "Strixhaven: School of Mages". Our goal is to help players choose which color pair they want to keep an eye out for in a Tournament. We do this by analysing winrates, looking at the different ranks and more factors that can hint towards which two colors perform the best in conjunction. The results hint heavily towards the two colors Black and White working together most optimally.

1 Introduction

The card game „Magic: The Gathering“ (Magic in the following text) is a popular game with over millions of players. Both online and offline Tournaments are being played regularly for prize money. For competitive players it is important to know what decks are strong to maximize the number of wins and rewards.
Every card is unique and has different aspects to analyze. Determining the strongest deck can be very complex due those aspects.

There are five colors in Magic that will be coded as follows in this article:
{B = 'Black', U = 'Blue', R = 'Red',W = 'White', G = 'Green'}
When referring to color combinations we will name them after the colors present in it. As a case in point, a set of cards with the color combination "BW" contains black as well as white cards.

We will be looking at data from the draft format (from the set "Strixhaven", though this is not relevant for the understanding of this article) played over the online

client "Magic Arena" in the Premier Draft Tournament.
There, a deck is will be drafted (the draft process itself is not relevant for the understanding of this article but can be looked up under here [1]) and then plays games until it wins either seven times or loses three times.

When talking about outcomes of these tournaments we will describe a record of a deck as x:y if the deck scored x wins and y losses.

The question we want to answer is:
"Which color combination is the strongest in the Strixhaven draft format?"

2 Method

2.1 Data

With the launch of the Magic the Gathering online platform "Magic Arena" in 2018 came an impulse within the MTG community to collect game data. During the last three decades, in which Magic the Gathering was played, the players mostly relied on their intuition to decide on which cards they should play. The data used in this analysis is provided by "17lands", a platform established in 2020. All the data that is displayed on their web pages is donated by "Magic Arena" players. In order to have their data included in one of the data sets, the players also have to register on 17lands and download certain packages. 17lands then creates both data visualizations and raw data sets in csv format that are available for everyone.

In this analysis only the latter data representation was utilized. We used the data set "STX Premier Draft Game Data" [2] to get an insight into the game data from the data donators perspective. Each line of the data set represents a game that player was participating in. In the various columns is information about the game being played and the deck used.

2.2 Analysis Pipeline

We wanted to group the rows of the dataset (games), into the color the deck played.
For that we counted the number of Basic lands in the Deck using the respective Column and any Deck that uses more than 3 Basic lands of a given color, we classify as a deck of that color.
In the further analysis we only look at the following color combinations, since they have by far the highest playrate:
{BW,BG,WR,RU,UG}

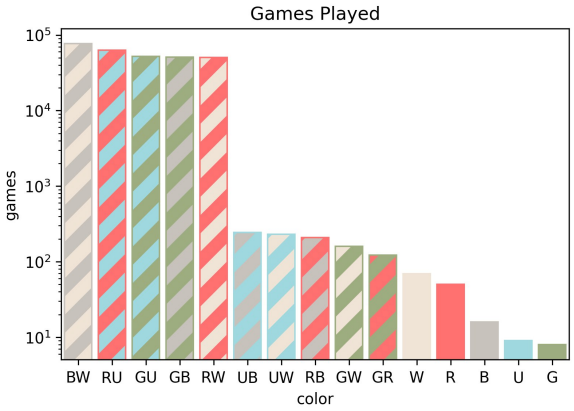

Figure 1: Color Playrates

[1] https://magic.wizards.com/en/game-info/gameplay/formats/booster-draft

[2] https://www.17lands.com/public_datasets

We differentiate between winrate by deck and winrate by games. The Winrate by Games is calculated by: $\frac{\#wins}{\#wins+\#losses}$
The winrate by Deck is calculated by calculating a winrate for each different Deck (multiple rows) and taking an average over all those winrates.
Those two winrates are different since a given deck can play a varying number of games based on performance.
We then also looked at the difference of those two winrates based on color.

We use the column "rank" to compare winrates based on player skill.

All code can be found at `https://git.tu-berlin.de/jcoulin/datsci2021`.

3 Results

The winrate by deck, winrate by game as well as the difference are seen in the following three plots:

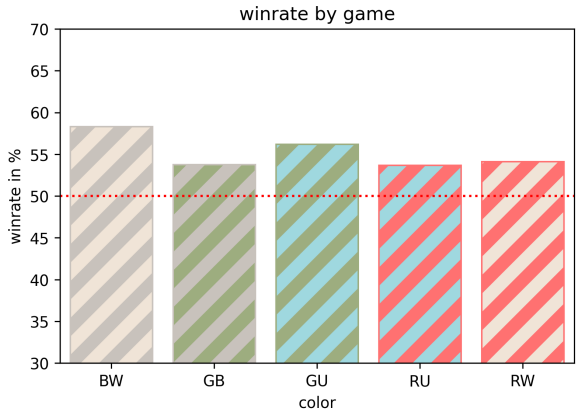

Figure 2: Winrate by Game

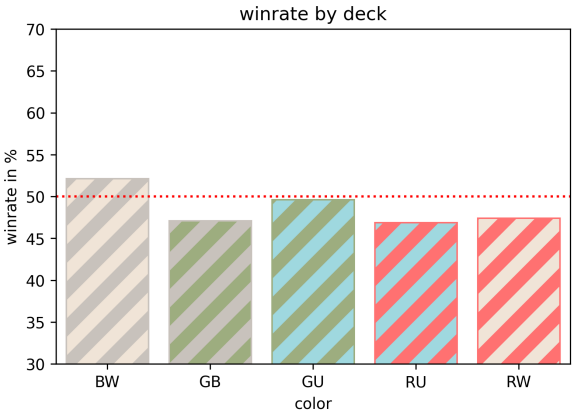

Figure 3: Winrate by Deck

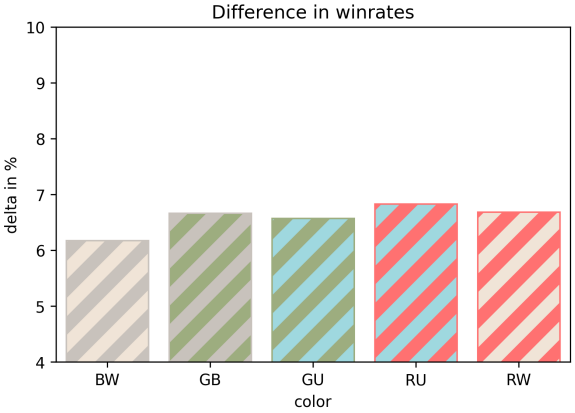

Figure 4: Winrate Delta

The color combination "BW" has the highest winrate by game as well as by deck and seems to be the strongest color combination by winrate alone.
The Winrate Delta is at its lowest for "BW" which we will discuss further in the discussion section.

The Winrates by player skill can be seen in Figures 6 - 11 under "Additional Figures"
Interesting is here, that "BW" seems to win consistently in each skill level.

4 Discussion

To answer our research question, the first measure is to look at the winrate each color combination achieves.
There "BW" wins clearly over all the other colors.
This would not neccessarily mean though, that picking this color combination is the best choice, so we looked at two different metrics to factor into our evaluation:

1. player skill
2. variance

It should be noted that this is by no means a comprehensive list of factors that should decide which color combination is the strongest, but rather a list of factors that we managed to analyse given the scope of our project.
We will use these two metrics to check our preliminary hypothesis that "BW" performs the best.

4.1 Player Skill

Given the Figures 6-11 it is clear that "BW" performs still the strongest across all player skill levels though to varying degrees.

4.2 Variance

Our hypothesis is, that a higher difference between the winrate by deck and winrate by game as shown in Figure 4 increases the variance of the color combination.
We will illustrate that intuition with a small example:

A hypothetical color "A" that could only go 7:0 or 3:0 with equal chances (maybe that deck is very dependent upon a singular card), would have a winrate by games of 70% since it wins 7 out of 10 games.
The winrate by decks would be 50% since half the decks have a 0% winrate and the other half a 100% winrate.
Therefore the delta for "A" would be 20%.
Another hypothetical color "B" can only go 3:3 and therefore has a game winrate of 50 % as well as a deck winrate of 50 % therefore having a delta of 0%.
It seems obvious that color "B" has less variance then color "A" and that the winrate difference delta exists because of extremes which are caused by high variance.
This is no complete proof though and some statistical work would be needed to prove that idea.

We also started to analyse this further by simulating the Tournament with unfair coinflips, meaning if a color combination has a 56% winrate, we simulated 56% winning coinflips until it either reaches 7 wins or 3 losses.
We then looked at the observed records versus the simulated ones to see if some have a higher variance then expected.
Here is an example for "BW"

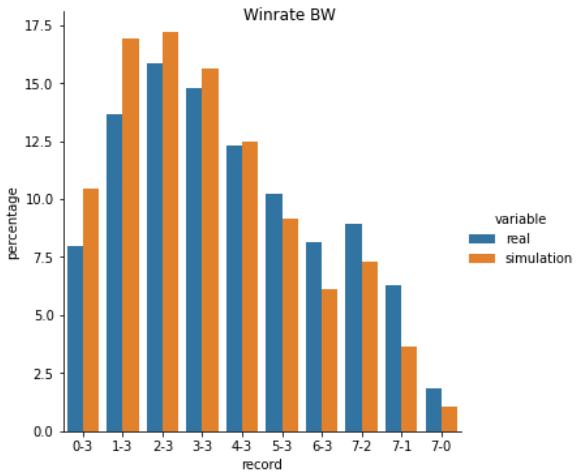

Figure 5: Simulated vs Observed

Though there are no completely obvious outliers, which confirms our hypothesis that "BW" is the strongest color, we could not analyse these simulations further in the scope of this project.

The code for the simulations, for generating the plots, as well as the plots for all the colors themselves can be found in the git repository for further research.

4.3 Conclusion

Using the two metrics of player skill and variance to test our hypothesis of "BW" being the strongest color combination, we found our hypothesis confirmed.
This is by no means comprehensive and it might well be the case that upon checking other metrics, the strongest color changes.
From the research we have done though we conclude that "BW" is most likely the strongest color combination to pick in the strixhaven draft format.
This means that when sitting down to play, be it with friends or in a big tourmanet, "BW" is what you want to look out for when choosing which deck to opt in to.

5 Additional Figures

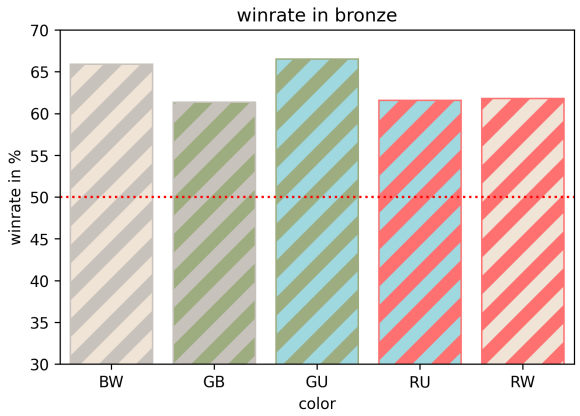

Figure 6: Winrate in Bronze

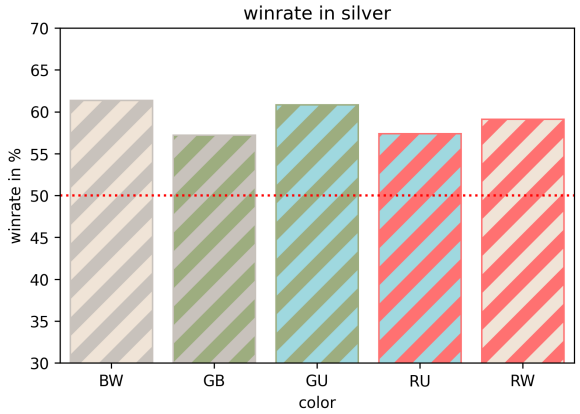

Figure 7: Winrate in Silver

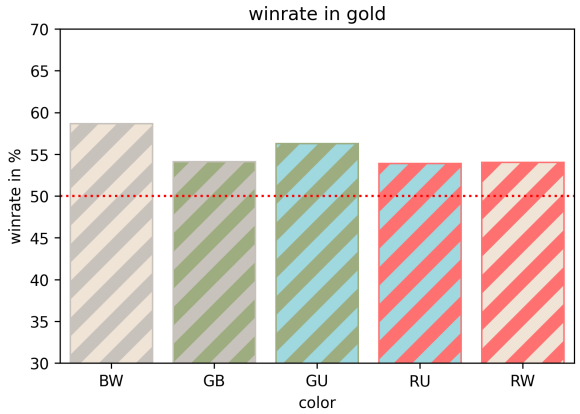

Figure 8: Winrate in Gold

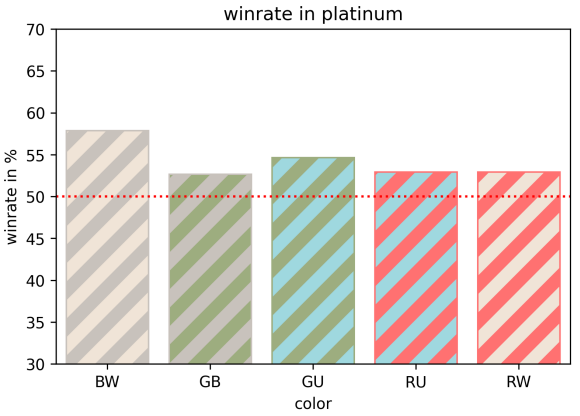

Figure 9: Winrate in Platinum

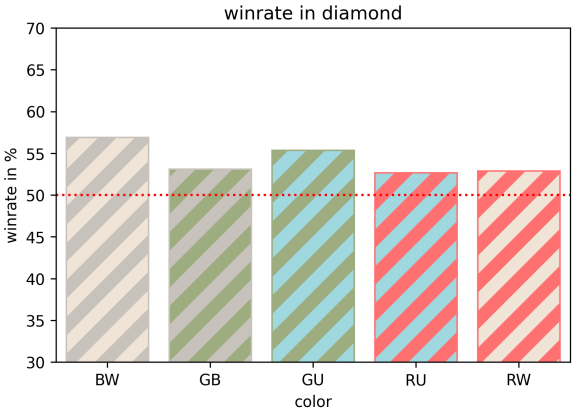

Figure 10: Winrate in Diamond

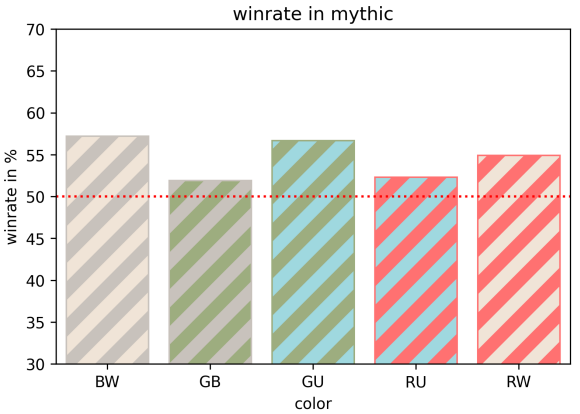

Figure 11: Winrate in Mythic