Chess Games Results Exploratory Analysis

Overview

In this project I will explore the **'First-move advantage in chess'** thesis.

First-move advantage in chess — there is a general consensus among chess players and theorists that the player who makes the first move (White) has an inherent advantage.

So, I'm going to check this statement based on the dataset from **Kaggle**.

I will use the following libraries:

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
#%matplotlib inline
```

Importing Data

In [2]:

```
df = pd.read_csv('games.csv')
```

In [3]:

```
df.columns
```

Out[3]:

```
Index(['id', 'rated', 'created_at', 'last_move_at', 'turns', 'victory_status',
       'winner', 'increment_code', 'white_id', 'white_rating', 'black_id',
       'black_rating', 'moves', 'opening_eco', 'opening_name', 'opening_ply'],
      dtype='object')
```

In [4]:

```
df.shape
```

Out[4]:

```
(20058, 16)
```

In [5]:

```
df.isna().sum()
```

Out[5]:

```
id                  0
rated               0
created_at          0
last_move_at        0
turns               0
victory_status      0
winner              0
increment_code      0
white_id            0
white_rating        0
black_id            0
black_rating        0
moves               0
opening_eco         0
opening_name        0
opening_ply         0
dtype: int64
```

Dataset is clean, no missing values

Analytics

Overall

Let's see the total results in our dataset

In [6]:

```
overall = df.groupby('winner', as_index=False).agg(wins= ('winner', 'count'))
overall['share,%'] = round(overall.wins / overall.wins.sum() * 100, 2)
overall
```

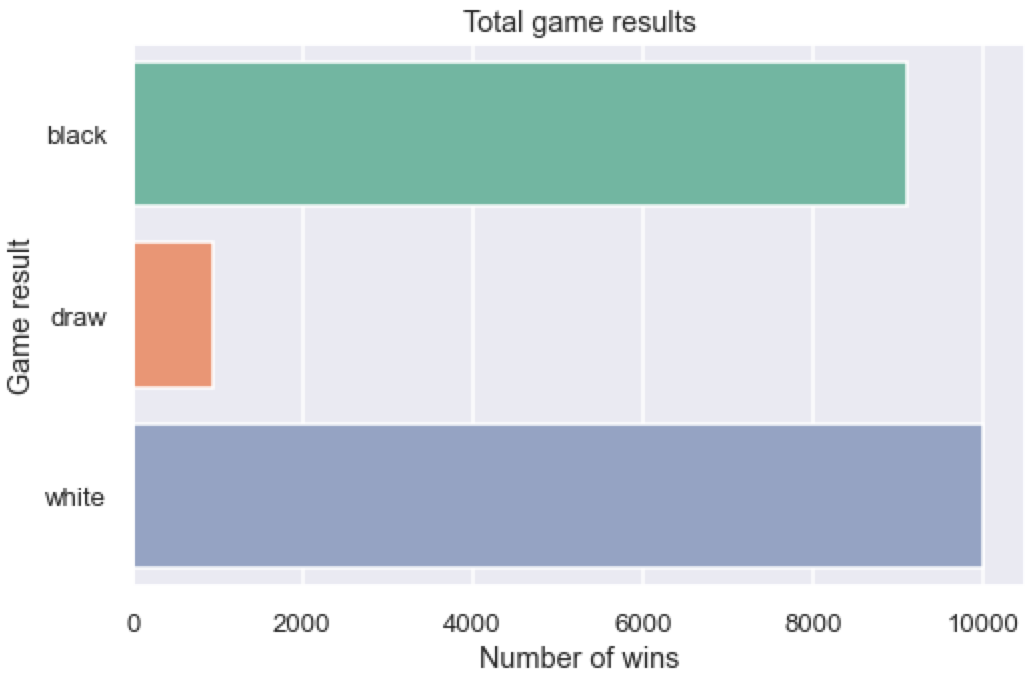
Out[6]:

	winner	wins	share,%
0	black	9107	45.40
1	draw	950	4.74
2	white	10001	49.86

Seems that indeed `White` win more often in general

In [7]:

```
plt.figure(figsize=(8, 5))
sns.set_theme(context='talk', style='darkgrid', palette= 'Set2', font='sans-serif', font
sns.barplot(x='wins', y='winner', data=overall).set(xlabel='Number of wins', ylabel='Gam
plt.savefig('gen.png')
plt.show()
```



By game type

The game type determines the time limit for the whole game (min) + time added after each move (sec). Let's group the data by the type of games (400 in the sample) and their number in descending order.

Top 10 most popular game types and their win percentage:

In [8]:

```
data_game_type = df.loc[:,['id','increment_code']].join(pd.get_dummies(df.winner))
data_game_type = data_game_type.groupby('increment_code') \
    .agg(Number_of_games=('id', 'count'),
         Black_won = ('black', 'sum'),
         White_won = ('white', 'sum'),
         Draw = ('draw', 'sum')) \
    .sort_values('Number_of_games', ascending=False)
```

In [9]:

```
# add some new columns, like percentage of `white won`, `black won` and `draw` results a
data_game_type = data_game_type.assign(black_won_perc = round(data_game_type.Black_won/d
                  white_won_perc = round(data_game_type.White_won/data_game_type.Number_
                  draw_perc = round(data_game_type.Draw/data_game_type.Number_of_games *
                  w_b_perc = round((data_game_type.White_won-data_game_type.Black_won)/d
    .sort_values('Number_of_games', ascending=False)
```

In [10]:

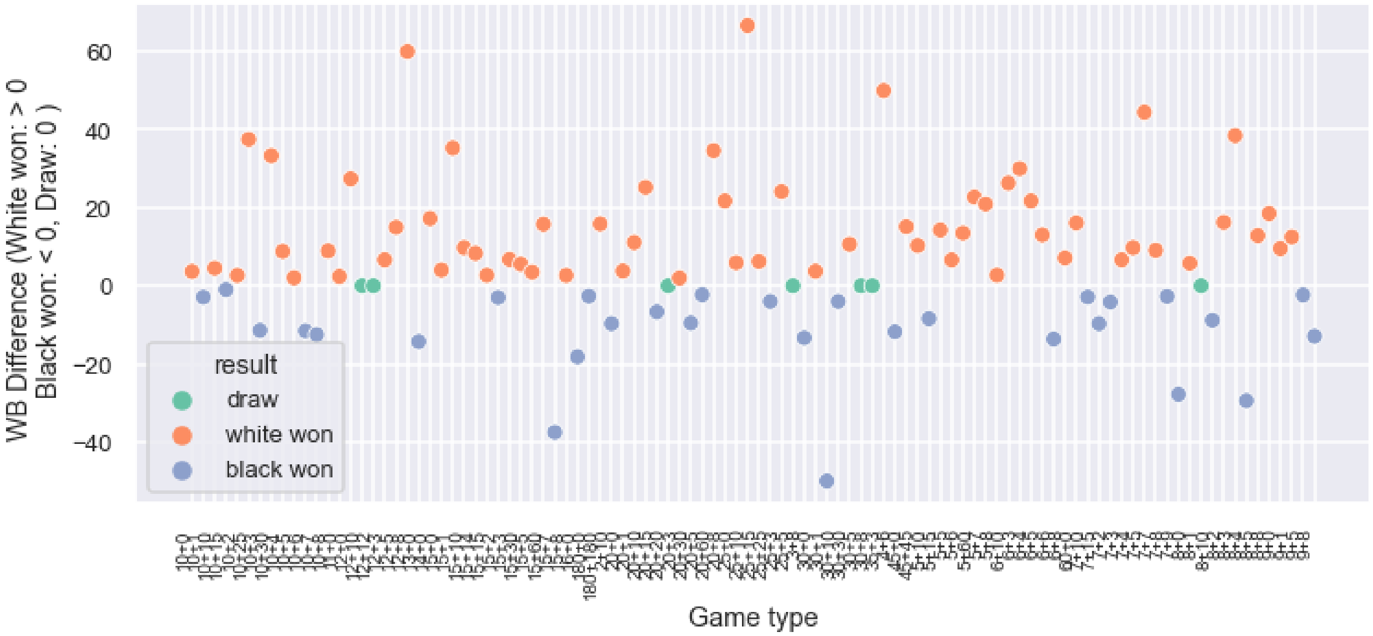
```
data_game_type.head(10)
```

Out[10]:

	Number_of_games	**Black_won**	**White_won**	**Draw**	**black_won_perc**	**white_won_perc**	**draw_perc**	**w**
increment_code								
10+0	7721	3561.0	3844.0	316.0	46.12	49.79	4.09	
15+0	1311	603.0	656.0	52.0	46.00	50.04	3.97	
15+15	850	394.0	417.0	39.0	46.35	49.06	4.59	
5+5	738	330.0	379.0	29.0	44.72	51.36	3.93	
5+8	697	327.0	346.0	24.0	46.92	49.64	3.44	
8+0	588	260.0	294.0	34.0	44.22	50.00	5.78	
10+5	579	273.0	285.0	21.0	47.15	49.22	3.63	
15+10	461	190.0	235.0	36.0	41.21	50.98	7.81	
20+0	448	206.0	223.0	19.0	45.98	49.78	4.24	
30+0	375	171.0	185.0	19.0	45.60	49.33	5.07	

In [11]:

```
result = data_game_type.w_b_perc.apply(lambda x: 'white won' if x>0 else 'black won' if
plt.figure(figsize=(12,5))
sns.scatterplot(x='increment_code', y='w_b_perc', data=data_game_type.head(100), hue=res
plt.xticks(
    rotation=90,
    horizontalalignment='right',
    fontweight='light',
    fontsize='x-small')
plt.show()
```



In [12]:
```
result.iloc[:100].value_counts()
```

Out[12]:
```
white won    63
black won    30
draw          7
Name: result, dtype: int64
```

So, white won more often in 63 game types out of 100

Black won more often in 30 game types out of 100

By debut type

Let's group games by the ECO code of the debut (total 365 in a dataset) and by their amount in descending order.

Top 10 game debuts and their results:

In [13]:
```
data_debut_type = df.loc[:,['id','opening_eco']].join(pd.get_dummies(df.winner)) \
    .groupby('opening_eco') \
    .agg(Number_of_games=('id', 'count'),
         Black_won = ('black', 'sum'),
         White_won = ('white', 'sum'),
         Draw = ('draw', 'sum')) \
    .sort_values('Number_of_games', ascending=False)
data_debut_type= data_debut_type.assign(black_won_perc = round(data_debut_type.Black_won
                   white_won_perc = round(data_debut_type.White_won/data_debut_type.Numbe
                   draw_perc = round(data_debut_type.Draw/data_debut_type.Number_of_games
                   w_b_perc = round((data_debut_type.White_won-data_debut_type.Black_won)
    .sort_values('Number_of_games', ascending=False)
```

In [14]:
```
data_debut_type.head(10)
```

Out[14]:

	Number_of_games	Black_won	White_won	Draw	black_won_perc	white_won_perc	draw_perc	w_b_
opening_eco								
A00	1007	570.0	398.0	39	56.60	39.52	3.87	-
C00	844	389.0	417.0	38	46.09	49.41	4.50	
D00	739	360.0	341.0	38	48.71	46.14	5.14	

B01	716	332.0	358.0	26	46.37	50.00	3.63
C41	691	267.0	396.0	28	38.64	57.31	4.05
C20	675	355.0	299.0	21	52.59	44.30	3.11
A40	618	261.0	338.0	19	42.23	54.69	3.07
B00	611	218.0	365.0	28	35.68	59.74	4.58
B20	567	320.0	223.0	24	56.44	39.33	4.23
C50	538	268.0	240.0	30	49.81	44.61	5.58

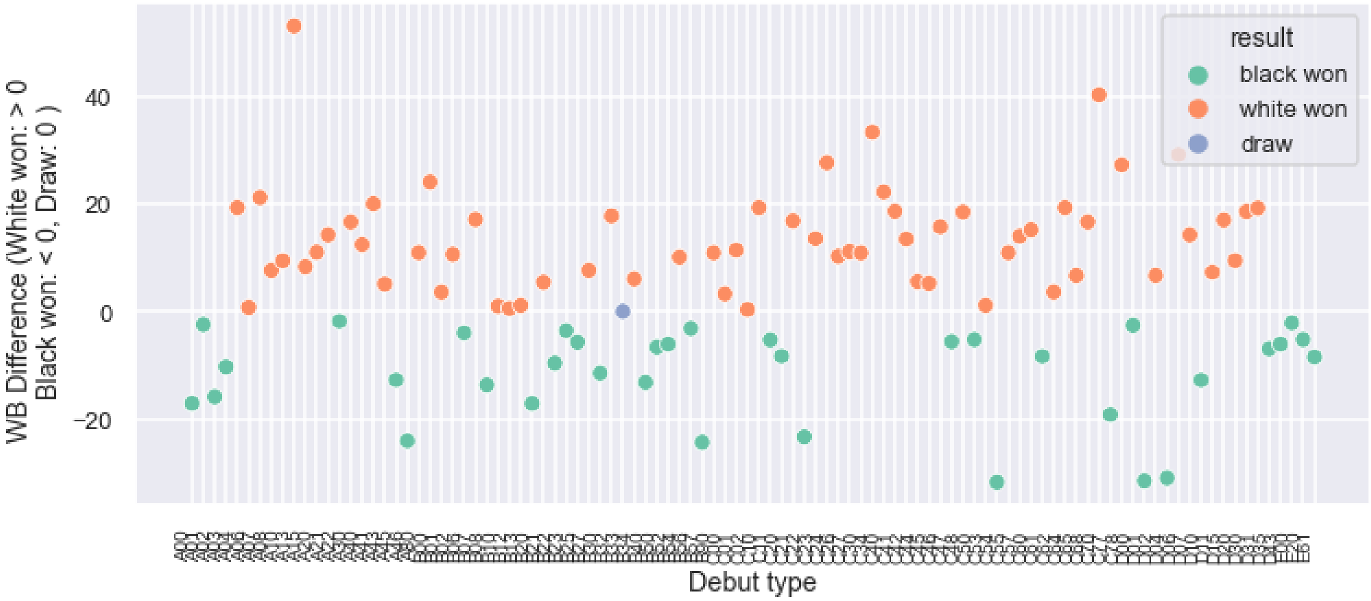
Top 100 debuts and their win percentage differences:

In [15]:

```
result = data_debut_type.w_b_perc.apply(lambda x: 'white won' if x>0 else 'black won' if
plt.figure(figsize=(12,5))

sns.scatterplot(x='opening_eco', y='w_b_perc', data=data_debut_type.iloc[:100], hue=resu
    .set(xlabel='Debut type', ylabel='WB Difference (White won: > 0 \n Black won: < 0, D

plt.xticks(
    rotation=90,
    horizontalalignment='right',
    fontweight='light',
    fontsize='x-small')
plt.show()
```



In [16]:

```
result.iloc[:100].value_counts()
```

Out[16]:

```
white won    63
black won    36
draw          1
Name: result, dtype: int64
```

So, white won more often in 63 openings out of 100

Black won more often in 36 openings out of 100

By player rating

Let's explore the rating of participants. We'll see the game results where the difference in players' rating is less than 40 points

In [17]:

```
data_rating = df[['white_rating', 'black_rating', 'winner']]
```

In [18]:

```
data_rating.head()
```

Out[18]:

	white_rating	black_rating	winner
0	1500	1191	white
1	1322	1261	black
2	1496	1500	white
3	1439	1454	white
4	1523	1469	white

Here we can see that the difference between `white` and `black` wins is quite small.

In [19]:

```
data_rating[abs(data_rating.white_rating - data_rating.black_rating) <= 40].groupby('win
```

Out[19]:

```
winner
black    2108
draw      237
white    2278
Name: winner, dtype: int64
```

In [20]:

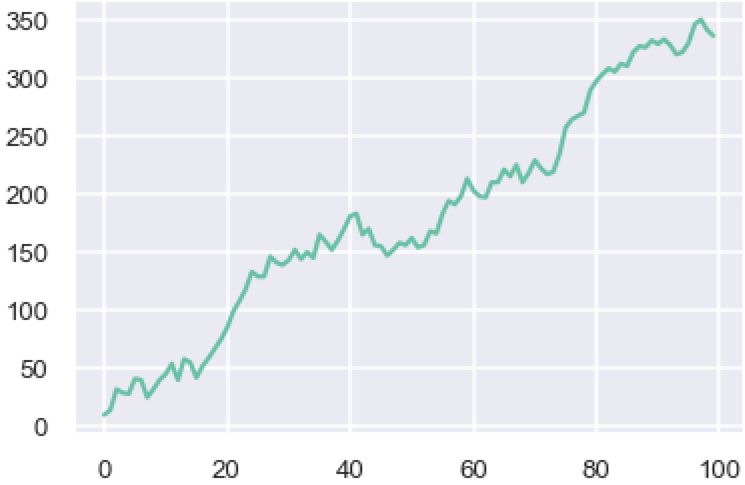
```
difference = []
for i in range(1, 101, 1):
    d = data_rating[abs(data_rating.white_rating - data_rating.black_rating) <= i].group
    difference.append(d[2] - d[0])
```

In [21]:

```
plt.plot(difference)
```

Out[21]:

```
[<matplotlib.lines.Line2D at 0x2c02523df70>]
```



Obviously, the bigger difference in points, the bigger difference in skill and experience, the bigger difference in `white` and `black` wins ratio.

Conclusion

Indeed, we saw that in general `white` win more often. However, based on this analysis we can't prove that this is because of the `first move advantage`. There may be other features that impact on the result - skill level (points), popularity of debuts, game type and maybe other factors that can't be found in this particular dataset