code

May 8, 2025

1 Making use of Playoff Game Logs

We're looking at historical NBA playoff series data, on a period by period level. I will go through how I pull the data using python's nba_api package. We will look at data from seasons `1996-97` through `2024-25`.

[1]:
```
import nba_api.stats.endpoints as nba
import pandas as pd
import time
from nba_api.stats.static import teams
```

Using `TeamGameLogs`, we can pull historical game logs from previous seasons.

[2]:
```
def get_game_log(season,measure_type="Base",stype = "Playoffs",location = None):
        df = nba.TeamGameLogs(season_nullable=season,location_nullable =␣
 ↪location,measure_type_player_game_logs_nullable=measure_type,season_type_nullable␣
 ↪= stype).get_data_frames()[0]
        df = df.rename(columns = {"SEASON_YEAR":"season","TEAM_ABBREVIATION":
 ↪"team","GAME_DATE":"date"})
        return df
```

[3]:
```
seasons = [str(i)+'-'+str(i+1)[2:] for i in range(1996,2025)]
season = seasons[0]
df = get_game_log(season)
for season in seasons[1:]:
        P = get_game_log(season)
        df = pd.concat([df,P])
        time.sleep(0.5)
```

Now that we've pulled from the api, we can have a cursory look at what the data looks like. Let's look at the important columns.

[4]:
```
df['date'] = pd.to_datetime(df['date'])
df = df.sort_values('date')
df.loc[:,['date','team','MATCHUP','WL','PTS','PLUS_MINUS']].set_index('date').
 ↪tail()
```

[4]:

date	team	MATCHUP	WL	PTS	PLUS_MINUS
2025-05-04	IND	IND @ CLE	W	121	9.0
2025-05-05	BOS	BOS vs. NYK	L	105	-3.0
2025-05-05	OKC	OKC vs. DEN	L	119	-2.0
2025-05-05	DEN	DEN @ OKC	W	121	2.0
2025-05-05	NYK	NYK @ BOS	W	108	3.0

We see that the last five rows in the dataset show that the Knicks lost by three, Wolves won by 7, Rockets won by 15, Lakers lost by 7, and Warriors lost by 15. Notice that there are **two rows per game**, one for the home team and one for the away team.

1.1 Wrangling until we have the right setup

Now, if we want want to look at different playoffs scenarios, we need to do some wrangling. I will create the following columns: - `opp` = Opponent Team abbreviation - `is_home` = **True** if game is at home, **False** if away - `game_no` = **1** for first game of the series, **2** for the second, etc.. - `round_no` = **1** (first round), **2** (conference semfinals), **3** (conference finals), and **4** (finals) - `series` - current series standing (e.g. **3-1** if the team is up **3-1** going into the game) - `total_games` - total number of games the series went to. - `has_home_court` - **True** if a team has home court in the series, **False** otherwise.

Note: The wrangling below only works if your original DataFrame is correctly sorted by date.

[5]:
```
# create 'is_home' and 'opp' columns
df['is_home'] = df['MATCHUP'].str.contains("vs.")
df['opp'] = df['MATCHUP'].apply(lambda x: x.split(' ')[-1])
```

[6]:
```
MIN = df[df['team'] == 'MIN']
MIN.loc[:,['date','team','opp','MATCHUP','WL']].set_index('date').tail(5)
```

[6]:

date	team	opp	MATCHUP	WL
2025-04-19	MIN	LAL	MIN @ LAL	W
2025-04-22	MIN	LAL	MIN @ LAL	L
2025-04-25	MIN	LAL	MIN vs. LAL	W
2025-04-27	MIN	LAL	MIN vs. LAL	W
2025-04-30	MIN	LAL	MIN @ LAL	W

To create the `game_no` column, I will use pandas's df.groupby meathod on `season`,`team` and `opp`, along with a temporary `counter` combined with pd.cumsum(). This is a very common/standard workflow in data cleaning.

[7]:
```
# Create the 'game_no' column
df['counter'] = 1
df['game_no'] = df.groupby(['season','team','opp'])['counter'].cumsum()
df = df.drop(columns = ['counter'])
```

[8]:
```
MIN = df[df['team'] == 'MIN']
MIN.loc[:,['date','team','opp','game_no','WL']].set_index('date').tail(5)
```

[8]:

date	team	opp	game_no	WL
2025-04-19	MIN	LAL	1	W
2025-04-22	MIN	LAL	2	L
2025-04-25	MIN	LAL	3	W
2025-04-27	MIN	LAL	4	W
2025-04-30	MIN	LAL	5	W

Now to create the `series` column, I first create `series_wins` and `series_losses` columns. Then I will concatenate the two joined by a - in between.

[9]:
```
# get the current number of series wins
df['win'] = 0
df.loc[df['WL']=='W','win'] = 1
df['series_wins'] = df.groupby(['season','team','opp'])['win'].transform(lambda␣
 ↪x: x.cumsum().shift().fillna(0))
df['series_wins'] = df['series_wins'].astype(int)

#get the current number of series losses
df['loss'] = 0
df.loc[df['WL']=='L','loss'] = 1
df['series_losses'] = df.groupby(['season','team','opp'])['loss'].
 ↪transform(lambda x: x.cumsum().shift().fillna(0))
df['series_losses'] = df['series_losses'].astype(int)



# create a 'series' column (represents what the series is at going into the␣
 ↪game)
def do_series(s):
    w,l = s['series_wins'],s['series_losses']
    return str(w)+'-'+str(l)
df['series'] = df.apply(do_series,axis = 1)
```

[12]:
```
df[df['is_home']].loc[:
 ↪,['date','team','opp','series_wins','series_losses','series','PTS','PLUS_MINUS','win']].
 ↪set_index('date').tail(10)
```

[12]:

date	team	opp	series_wins	series_losses	series	PTS	PLUS_MINUS	win
2025-04-30	LAL	MIN	1	3	1-3	96	-7.0	0
2025-04-30	HOU	GSW	1	3	1-3	131	15.0	1
2025-05-01	LAC	DEN	2	3	2-3	111	6.0	1
2025-05-01	DET	NYK	2	3	2-3	113	-3.0	0

```
2025-05-02  GSW  HOU           3              2    3-2  107       -8.0    0
2025-05-03  DEN  LAC           3              3    3-3  120       19.0    1
2025-05-04  HOU  GSW           3              3    3-3   89      -14.0    0
2025-05-04  CLE  IND           0              0    0-0  112       -9.0    0
2025-05-05  BOS  NYK           0              0    0-0  105       -3.0    0
2025-05-05  OKC  DEN           0              0    0-0  119       -2.0    0
```

[13]:
```
MIN = df[df['team'] == 'MIN']
MIN.loc[:,['date','team','opp','game_no','series','WL']].set_index('date').
 ↪tail(5)
```

[13]:
```
            team  opp  game_no series WL
date
2025-04-19  MIN  LAL        1    0-0  W
2025-04-22  MIN  LAL        2    1-0  L
2025-04-25  MIN  LAL        3    1-1  W
2025-04-27  MIN  LAL        4    2-1  W
2025-04-30  MIN  LAL        5    3-1  W
```

Neat! . Just what I wanted to do: we see that the wolves won in 5. Coming into the game, they were up **3-1**, and this is reflected in the `series` column.

To create the `round_no` column, I first create a dataframe that contains all the opponents a team faced that year. Then I return the index for that team.

[14]:
```
# Create a 'round_no' column (1 = first round, 2 = second round, 3 = third␣
 ↪round, 4 = fourth round)
opponents_faced = df.groupby(['season','team'])['opp'].unique()
def get_round_number(s):
    season,team,opp = s['season'],s['team'],s['opp']
    k = (season,team)
    l = opponents_faced.loc[k].tolist()
    return l.index(opp)+1
df['round_no'] = df.apply(get_round_number,axis = 1)
```

Now to create the `total_games` column, I group by matchup and use the pandas' `.size()` method. This allows me to return the size of each group.

[15]:
```
# get the total number of games
totals = df.groupby(['season','team','opp']).size()
def get_num_games(s):
    season,team,matchup = s['season'],s['team'],s['opp']
    k = (season,team,matchup)
    return totals.loc[k]
df['total_games'] = df.apply(get_num_games,axis = 1)
```

To create the `has_home_court` column, I look at the first game of each series to determine who has home court advantage. Then, I use pandas pd.merge to add this column to our DataFrame.

[16]:
```
# Create the 'has_home_court' in series column
X = df.groupby(['season','team','opp']).first()['is_home']
X = X.reset_index()
X = X.rename(columns = {'is_home':'has_home_court'})
df = pd.merge(df,X, on = ['season','team','opp'], how = 'left')
```

[17]:
```
MIN = df[df['team'] == 'MIN']
MIN.loc[:
 ↪,['date','team','opp','game_no','round_no','has_home_court','series','WL']].
 ↪set_index('date').tail(5)
```

[17]:

date	team	opp	game_no	round_no	has_home_court	series	WL
2025-04-19	MIN	LAL	1	1	False	0-0	W
2025-04-22	MIN	LAL	2	1	False	1-0	L
2025-04-25	MIN	LAL	3	1	False	1-1	W
2025-04-27	MIN	LAL	4	1	False	2-1	W
2025-04-30	MIN	LAL	5	1	False	3-1	W

The TWolves were the 6 seed, the Lakers the 3 seed. So this is why the `has_home_court` is **False** for this series.

[20]:
```
df[df['is_home']].loc[:
 ↪,['date','team','opp','round_no','game_no','series','PTS','PLUS_MINUS','win']].
 ↪set_index('date').tail(5)
```

[20]:

date	team	opp	round_no	game_no	series	PTS	PLUS_MINUS	win
2025-05-03	DEN	LAC	1	7	3-3	120	19.0	1
2025-05-04	HOU	GSW	1	7	3-3	89	-14.0	0
2025-05-04	CLE	IND	2	1	0-0	112	-9.0	0
2025-05-05	BOS	NYK	2	1	0-0	105	-3.0	0
2025-05-05	OKC	DEN	2	1	0-0	119	-2.0	0

2 What can we do with our data?

Let's see what our added columns look like:

[21]:
```
df.loc[:
 ↪,['date','team','opp','is_home','has_home_court','game_no','round_no','series','WL']].
 ↪set_index('date').tail()
```

[21]:

date	team	opp	is_home	has_home_court	game_no	round_no	series	WL
2025-05-04	IND	CLE	False	False	1	2	0-0	W
2025-05-05	BOS	NYK	True	True	1	2	0-0	L
2025-05-05	OKC	DEN	True	True	1	2	0-0	L

```
2025-05-05  DEN  OKC    False          False        1         2    0-0  W
2025-05-05  NYK  BOS    False          False        1         2    0-0  W
```

As you can see above, the last rows in our data are up-to-date: the **Celtics** were home last night against the **Magic** (Apr 29, 2025), they have home court in the series, and the series was at **3-1** going into the game. Meanwhile, the **Clippers** went into **Denver** tied **2-2**, they don't have home court in the series, and they lost last night.

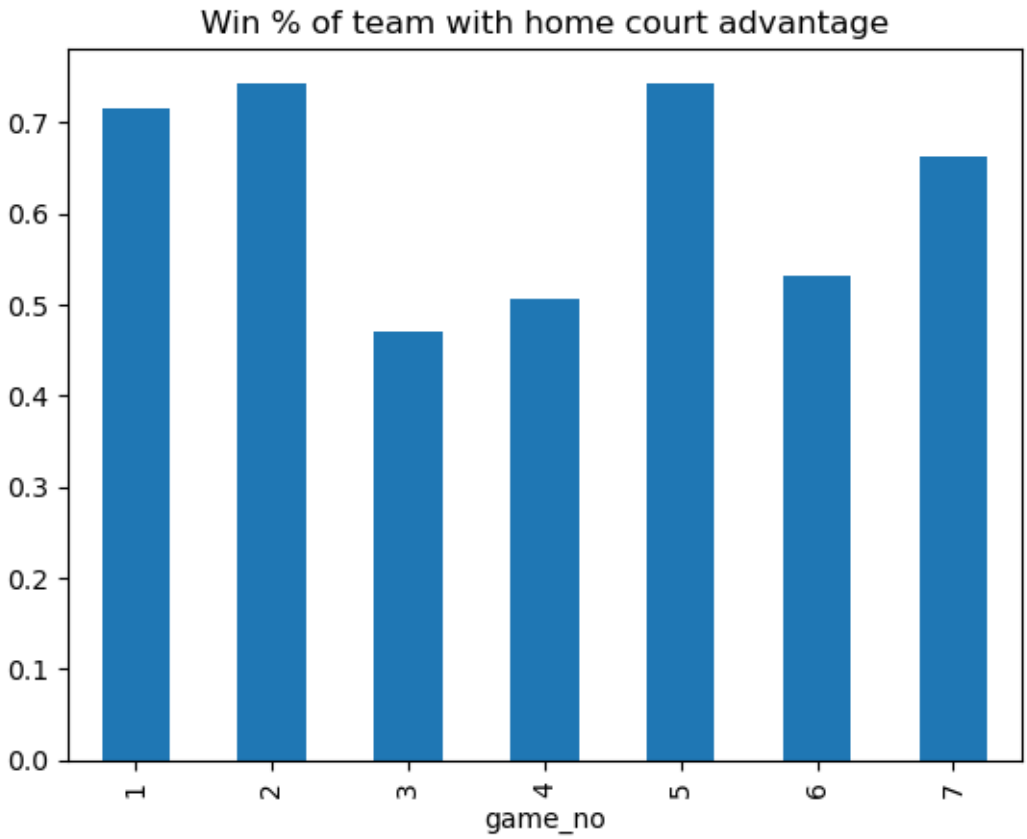
2.1 How do higher seeded teams perform by game number?

Let's look at how the team with home court advantage fares depending on the game number.

[22]:
```
FILTER = df['has_home_court']
WINNING_PCTS = df.loc[FILTER].groupby(['game_no'])['win'].mean()
WINNING_PCTS = WINNING_PCTS.apply(lambda x: round(x,3))
WINNING_PCTS
```

[22]:
```
game_no
1    0.715
2    0.743
3    0.470
4    0.506
5    0.742
6    0.532
7    0.662
Name: win, dtype: float64
```

[23]:
```
PLOT = WINNING_PCTS.plot.bar(title = 'Win % of team with home court advantage')
```



There is a noticeable drop in game 7 win percentage. I would allocate this to the fact that if an opponent takes a team to a seventh game, they are probably a good team, so they win more often!

Let's cut the data in half (pre-2011 and 2011+) to see if these trends continue.

[24]:
```
df['post-10'] = df['season'].isin(seasons[15:])
```

[25]:
```
FILTER = df['has_home_court']
WINNING_PCTS = df.loc[FILTER].groupby(['post-10','game_no'])['win'].mean()
WINNING_PCTS = WINNING_PCTS.apply(lambda x: round(x,3))
WINNING_PCTS = WINNING_PCTS.reset_index()
WINNING_PCTS
```

[25]:

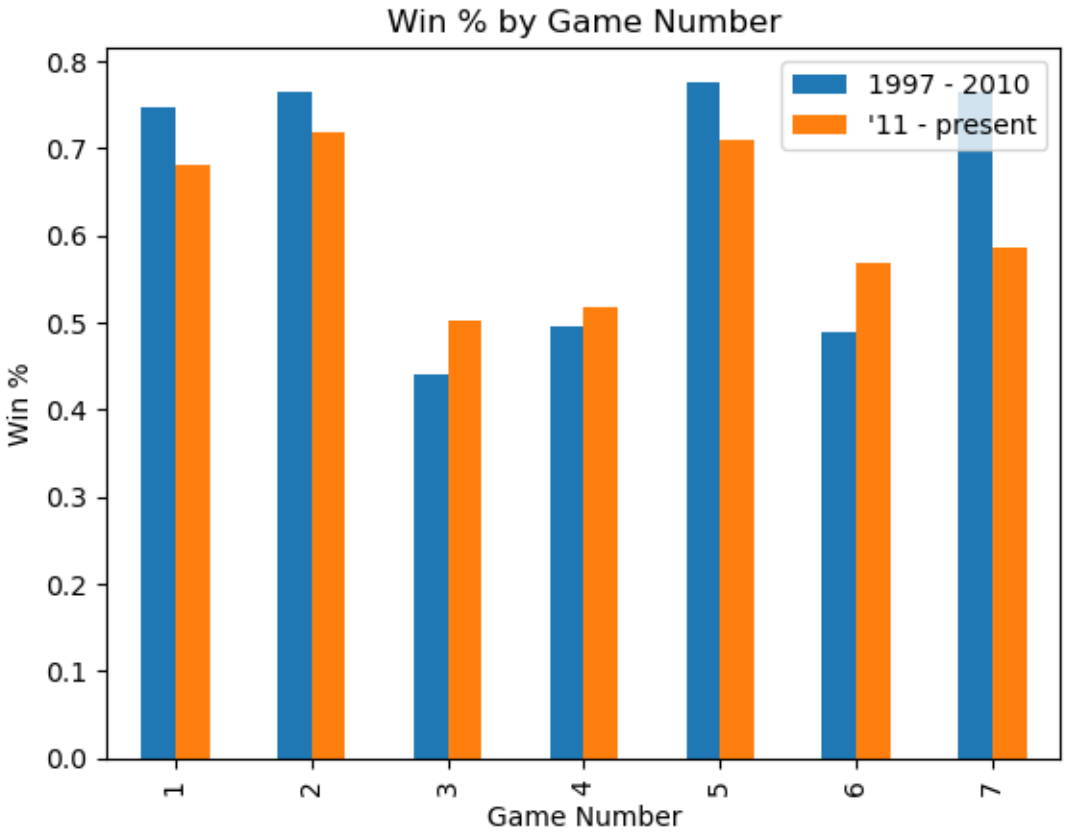
	post-10	game_no	win
0	False	1	0.747
1	False	2	0.764
2	False	3	0.440
3	False	4	0.495
4	False	5	0.776
5	False	6	0.490
6	False	7	0.765

```
7       True         1  0.680
8       True         2  0.719
9       True         3  0.502
10      True         4  0.517
11      True         5  0.709
12      True         6  0.569
13      True         7  0.587
```

[26]:
```
# Pivot for side-by-side bar plot
pivot_df = WINNING_PCTS.pivot(index='game_no', columns='post-10', values='win')

# Rename columns for clarity
pivot_df.columns = ["1997 - 2010", "'11 - present"]  # False comes first, True
 ↪second

# Plot
PLOT = pivot_df.plot(kind='bar', ylabel='Win %', xlabel='Game Number',
 ↪title='Win % by Game Number')
```



What I notice most is the drop in Game 7 win percentages for the home team. In *recent history*

(2011 and later), game sevens have been won by the road team more frequently. However, game sevens are somewhat rare, so we are dealing with a small sample size in both cases. What is interesting, however, is that home teams seem to perform slightly less well in *recent history*.

2.1.1 Why didn't I just use an LLM?

I don't know about you, but when I use an LLM to write my code, I get paranoid. Plus, I started working with data *before* LLMs. I simply feel more comfortable cleaning the data manually myself than having a back and forth an AI until the software understands what I am trying to do.

Now that we just witnessed three straight road victories in game 1, let's see how common this has been.

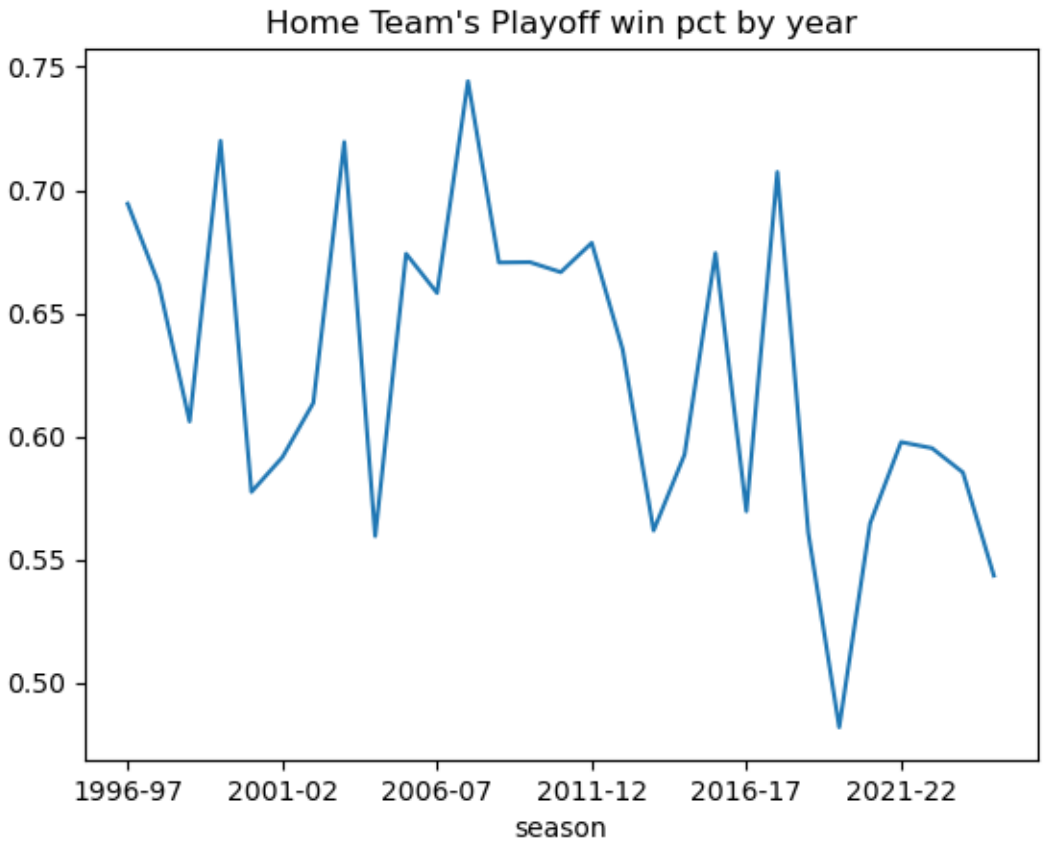
[29]:
```
A = ~df['has_home_court'].astype(bool)
B = df['game_no'] == 1
FILTER = A&B
dftemp = df.loc[FILTER].groupby('round_no')[['win','PLUS_MINUS']].
 ↪agg(['count','mean'])
dftemp.apply(lambda x: round(x,2))
```

[29]:

	win		PLUS_MINUS	
	count	mean	count	mean
round_no				
1	232	0.27	232	-7.57
2	115	0.31	115	-6.33
3	56	0.36	56	-5.25
4	28	0.14	28	-9.18

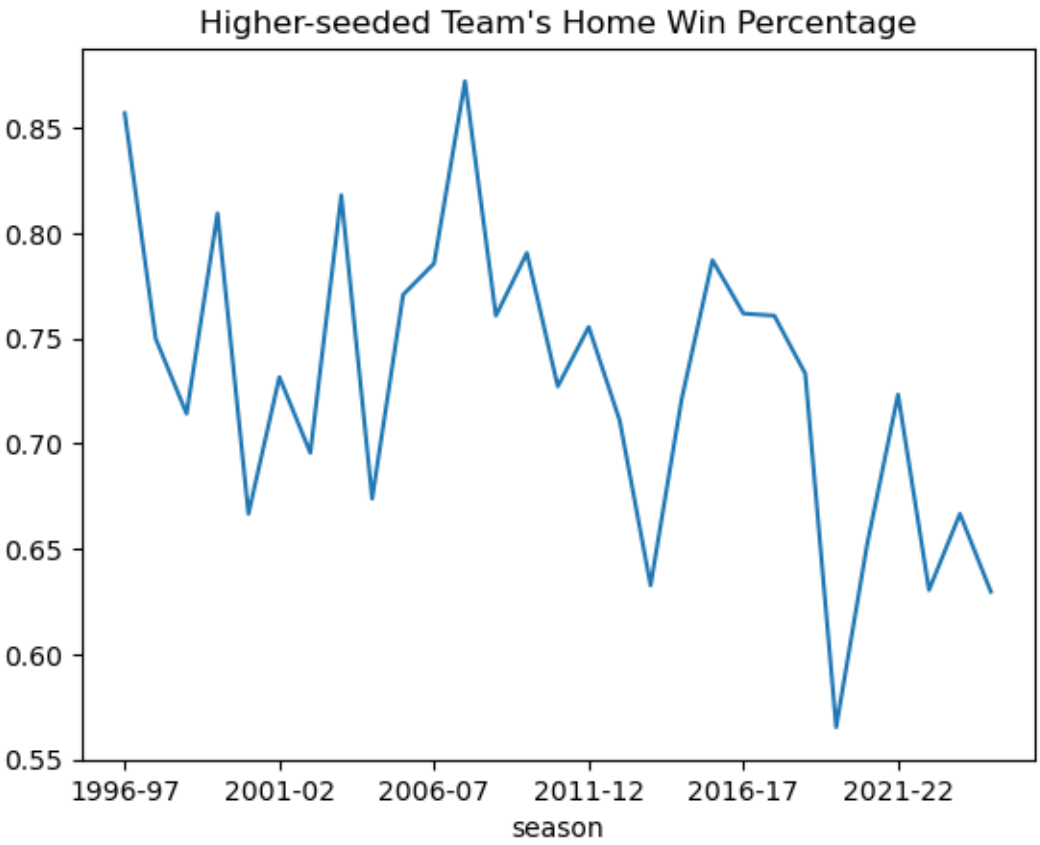
[36]:
```
DATA = df[df['is_home']].groupby('season')['win'].mean()
DATA.plot(title = "Home Team's Playoff win pct by year")
```

[36]:
```
<Axes: title={'center': "Home Team's Playoff win pct by year"}, xlabel='season'>
```



[45]:
```
FILTER = (df['is_home']) & (df['has_home_court'])
DATA = df.loc[FILTER].groupby('season')['win'].mean()
DATA.plot(title = "Higher-seeded Team's Home Win Percentage")
```

[45]:
```
<Axes: title={'center': "Higher-seeded Team's Home Win Percentage"},
xlabel='season'>
```


Higher-seeded Team's Home Win Percentage
0.85
0.80
0.75
0.70
0.65
0.60
0.55
1996-97
2001-02
2006-07
2011-12
2016-17
2021-22
season