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How have board games changed over the last 20 years?

By: Max Browning & Zach Gibbs

Finish | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12

Why this topic is relevant.

- Indianapolis: GenCon
  - 70,000 visitors in 2019 from every state and 60+ countries
  - Results in local economic impact of nearly $70 million

- Board game sales up 4,000% in March 2020 due to pandemic

- Personal interest for both

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Data Source

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Board Game Atlas

Community-driven directory of board games.

Provides information on games and allows player ratings.

Questions Asked: Number One

✕

- Has the prevalence of one player games increased over time in the top 100 games of each year?

  - Null Hypothesis: If one player games have not become more prevalent over time, then the percentage of games allowing one player will not have increased over time.

  - Alternate Hypothesis: If one player games have become more prevalent over time, then the percentage of games allowing one player will have increased over time.

Questions Asked: Number Two

- Have game become more mechanically complex over time in the top 100 games of each year?

  - Null Hypothesis: If games have not become more mechanically complex over time, then the average number of mechanics per game will not increase year over year.

  - Alternate Hypothesis: If games have become more mechanically complex over time, then the average number of mechanics per game will increase year over year.

Has the prevalence of one player games increased over time in the top 100 games of each year?

Number of 1 Player games versus Time

$y = 2.06x + -4129.78$
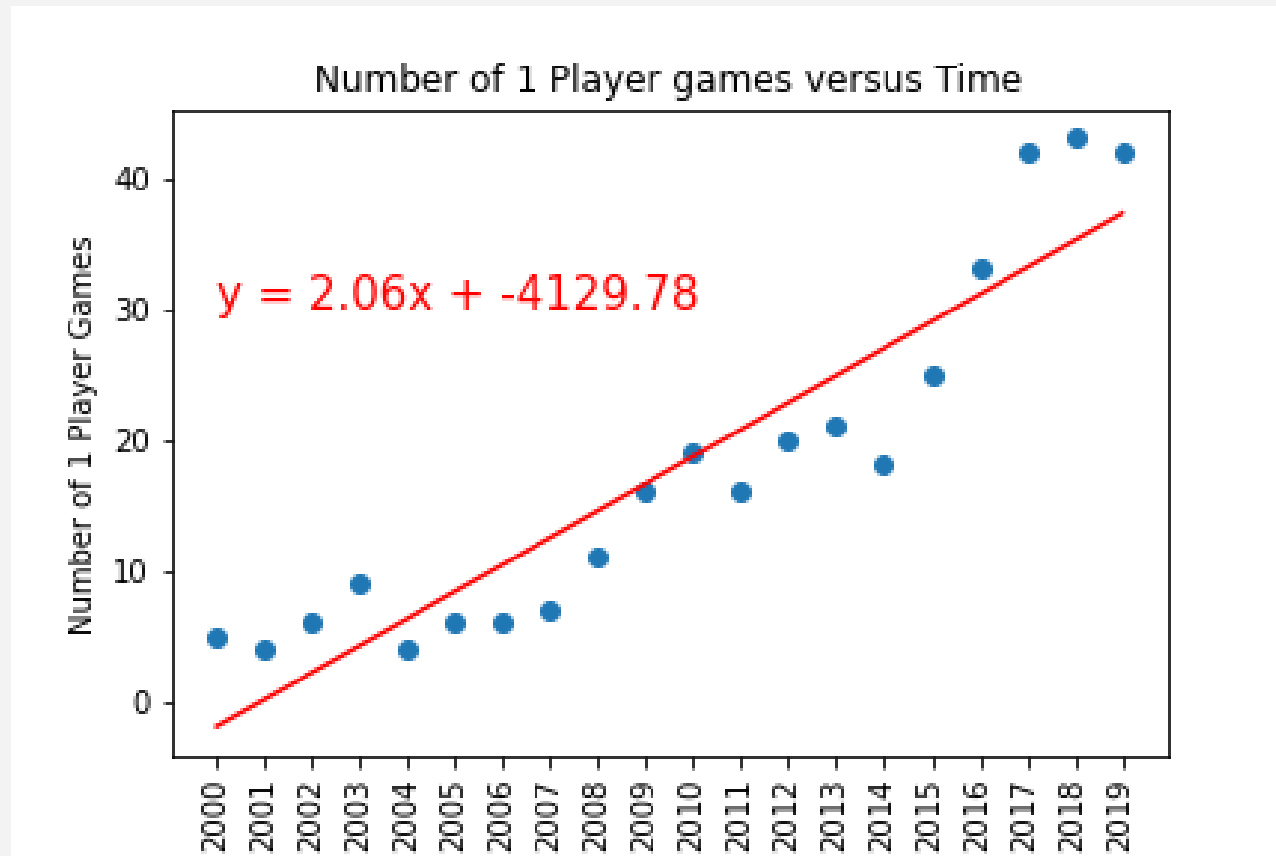
r-value = 0.92

Strong positive correlation

Has the prevalence of one player games increased over time in the top 100 games of each year?

One Player Game % versus Higher Player Counts
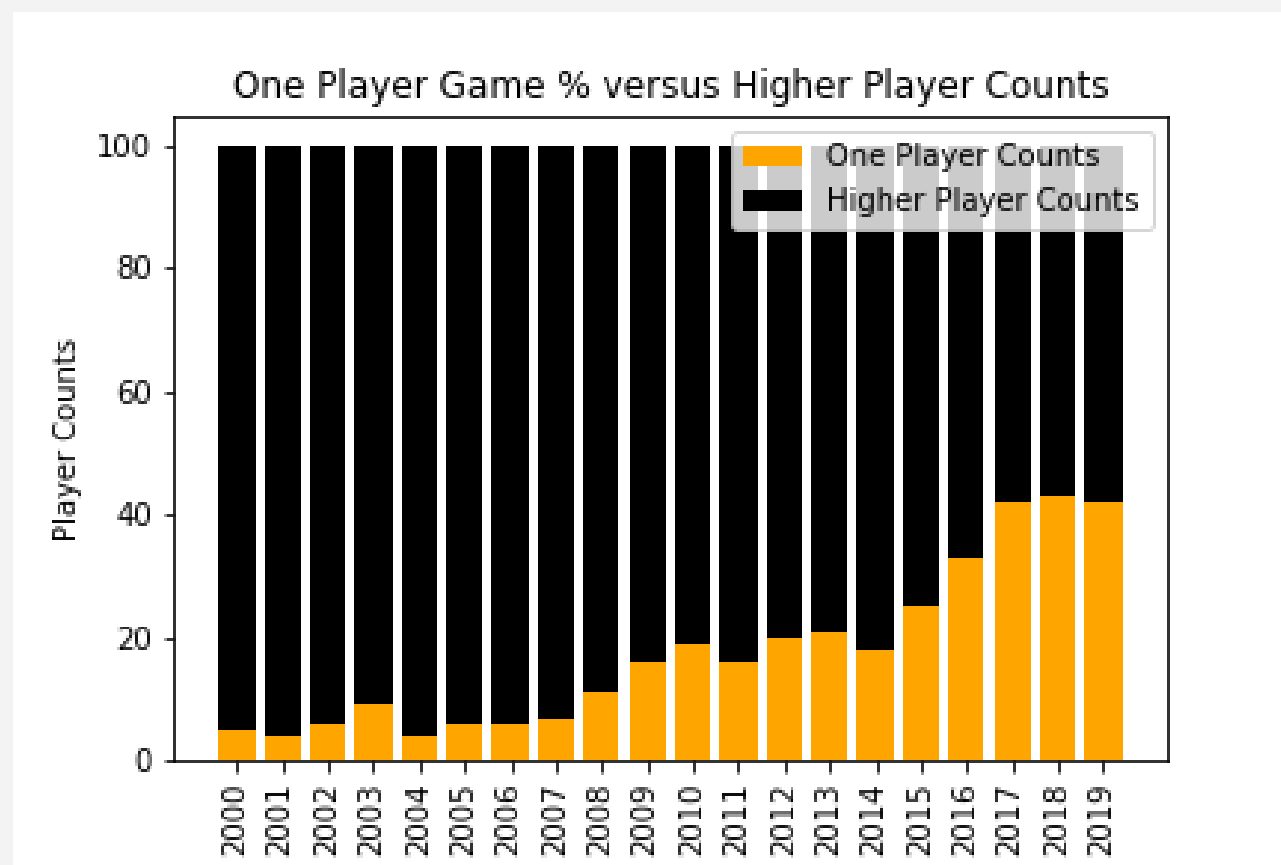
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Question One Findings

One player games have become more prevalent.

Reject null hypothesis

Fail to reject alternate hypothesis

Analysis

X

Have game become more mechanically complex over time in the top 100 games of each year?

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Data Cleaning

Board Game Atlas

Cleaning the mechanics of our data set.

SLIDESMANIA.COM

Data from API Pull

Convert API results to data frame

```
# Save dictionary as data frame & display summary
games_df = pd.DataFrame(games_list)
games_df.head()
```

	id	name	year_published	min_players	max_players	min_playtime	max_playtime	min_age	description	description_preview
0	oGVgRSAKwX	Carcassonne	2000	2.0	5.0	30.0	45.0	7.0	<p>Each game of Carcassonne reveals a...	Each game of Carcassonne reveals a unique e...
1	d7vHFjxM6M	Blokus	2000	2.0	4.0	20.0	20.0	5.0	Stake your claim and protect your territory wi...	Stake your claim and protect your territory wi...
2	uw69CrJFCL	Citadels: Classic	2000	2.0	8.0	30.0	60.0	10.0	<p>Preserved in its original form first publis...	Preserved in its original form first publishe...
3	PSVopYiYOv	Battle Line	2000	2.0	2.0	15.0	30.0	12.0	<p>Battle Line is a card game of capture the f...	Battle Line is a card game of capture the fla...
4	JyMsRC64I4	Go	2000	2.0	2.0	30.0	180.0	8.0	<p>Go originated in China more than 4000 years...	Go originated in China more than 4000 years a...

5 rows × 44 columns

Remove Unnecessary Columns

```python
# Show only the necessary columns of the data frame
games_condensed_df = games_df[['id',
                               'name',
                               'year_published',
                               'min_players',
                               'max_players',
                               'primary_publisher',
                               'mechanics',
                               'num_user_ratings',
                               'average_user_rating',
                               'rank']]

games_condensed_df.head()
```

	id	name	year_published	min_players	max_players	primary_publisher	mechanics	num_user_ratings	average_user_rating	rank
0	oGVgRSAKwX	Carcassonne	2000	2.0	5.0	Hans im Glück	[{'id': '8PN2HE86wg', 'url': 'https://www.boar...	548	3.436131	14
1	d7vHFjxM6M	Blokus	2000	2.0	4.0	Mattel Games	[{'id': '3te2oybNR4', 'url': 'https://www.boar...	161	3.049689	221
2	uw69CrJFCL	Citadels: Classic	2000	2.0	8.0	Hans im Glück	[{'id': 'ZX3hYcF9H7', 'url': 'https://www.boar...	133	3.308271	228
3	PSVopYiYOv	Battle Line	2000	2.0	2.0	GMT Games	[]	119	3.346800	246
4	JyMsRC64l4	Go	2000	2.0	2.0	John N. Hansen Co.	[{'id': '3te2oybNR4', 'url': 'https://www.boar...	82	3.329268	375

Add New Column: Number of Mechanics

```python
# Create column for number of mechanics
for i in games_condensed_df.iterrows():
    games_condensed_df['num_mechs'] = games_condensed_df['mechanics'].str.len()

games_condensed_df.head()
```

```
C:\Users\zachg\anaconda3\envs\PythonData\lib\site-packages\ipykernel_launcher.py:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ve
rsus-a-copy
  This is separate from the ipykernel package so we can avoid doing imports until
```

id	name	year_published	min_players	max_players	primary_publisher	mechanics	num_user_ratings	average_user_rating	rank	num_mechs
SAKwX	Carcassonne	2000	2.0	5.0	Hans im Glück	[{'id': '8PN2HE86wg', 'url': 'https://www.boar...	548	3.436131	14	2
FjxM6M	Blokus	2000	2.0	4.0	Mattel Games	[{'id': '3te2oybNR4', 'url': 'https://www.boar...	161	3.049689	221	3
CrJFCL	Citadels: Classic	2000	2.0	8.0	Hans im Glück	[{'id': 'ZX3hYcF9H7', 'url': 'https://www.boar...	133	3.308271	228	4
pYiYOv	Battle Line	2000	2.0	2.0	GMT Games	[]	119	3.346800	246	0
RC64I4	Go	2000	2.0	2.0	John N. Hansen Co.	[{'id': '3te2oybNR4', 'url': 'https://www.boar...	82	3.329268	375	1

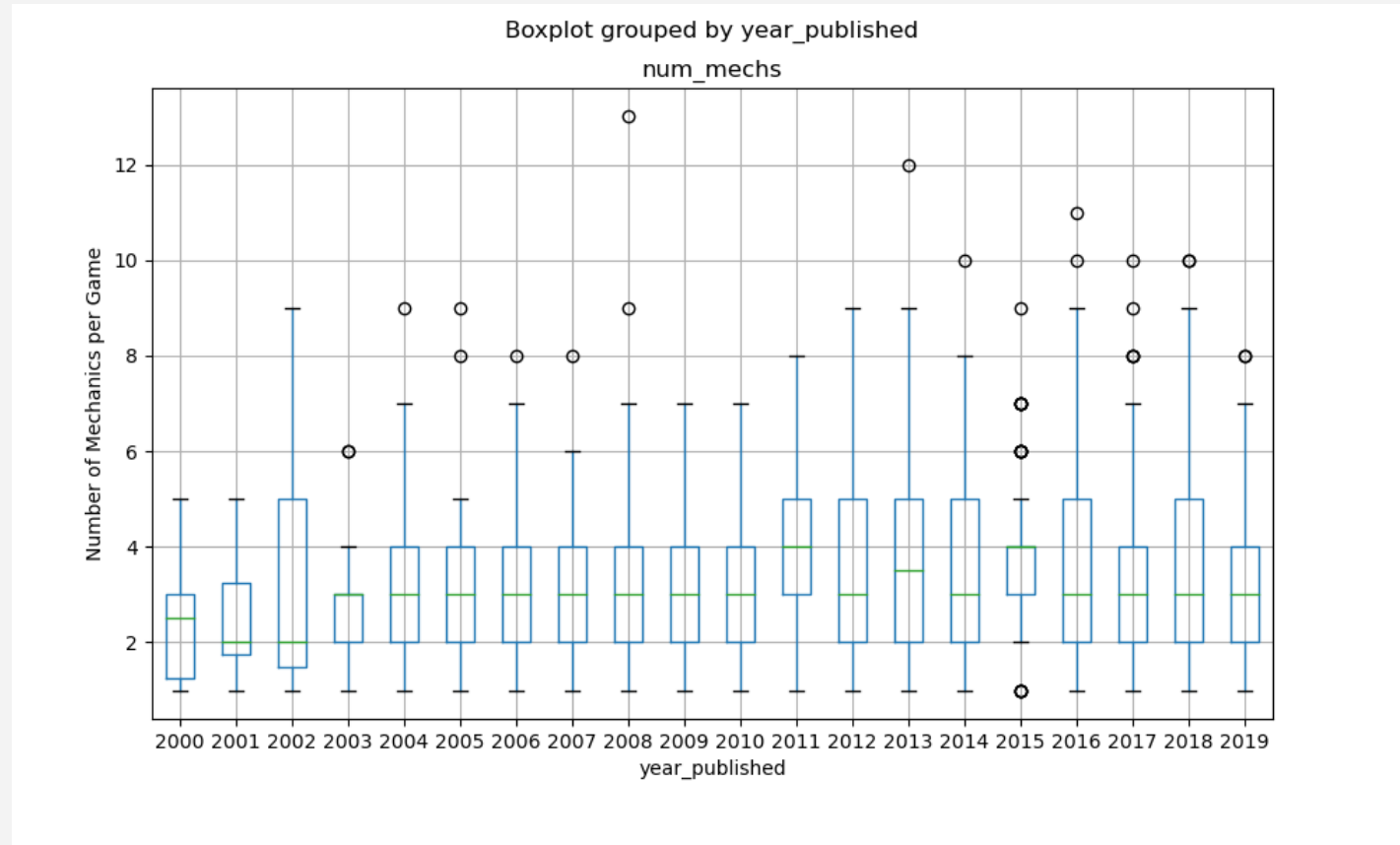# Has the prevalence of one player games increased over time in the top 100 games of each year?
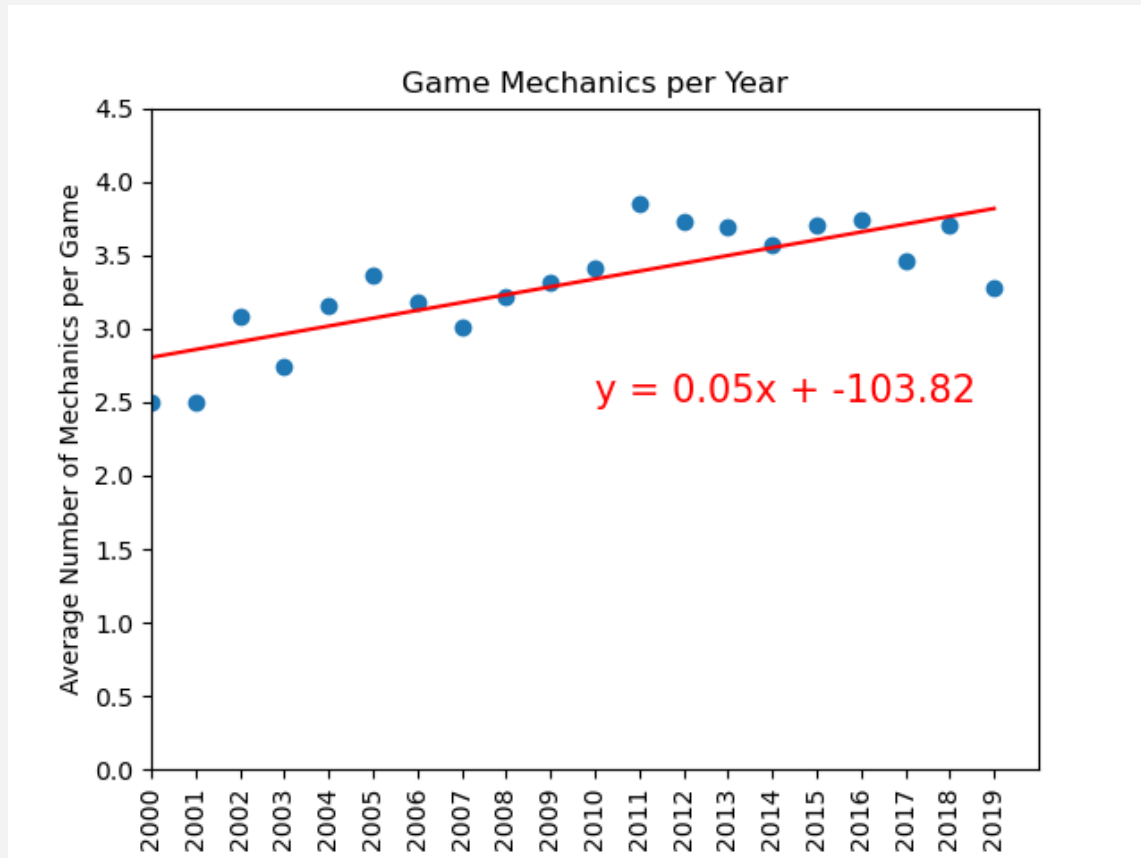
r-value = 0.79

Strong positive correlation

Has the prevalence of one player games increased over time in the top 100 games of each year?

Boxplot grouped by year_published
num_mechs

p-value = 0.004

f-statistic = 2.08

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Analysis

Question Two Findings

Linear regression shows that the number of mechanics per game are increasing over time.

ANOVA test shows that the change is significant.

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Implications

Games are more mechanically complex.

However, games are more often available as a one player option.

In a pandemic world, having the option to play a board game on your own is important. While virtual options are available for many games, the tradition of a physical board and tactile movements is comforting in a volatile world.

These changes were happening long before the pandemic, and they have paid off now more than ever.

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Post Mortem

1) How have other game characteristics changed over time (i.e. cost, themes, and player age)?

2) How do you de-encode the mechanics in the API data?

Mechanics Column is Currently Unusable

```python
# Show only the necessary columns of the data frame
games_condensed_df = games_df[['id',
                               'name',
                               'year_published',
                               'min_players',
                               'max_players',
                               'primary_publisher',
                               'mechanics',
                               'num_user_ratings',
                               'average_user_rating',
                               'rank']]

games_condensed_df.head()
```

	id	name	year_published	min_players	max_players	primary_publisher	mechanics	num_user_ratings	average_user_rating	rank
0	oGVgRSAKwX	Carcassonne	2000	2.0	5.0	Hans im Glück	[{'id': '8PN2HE86wg', 'url': 'https://www.boar...	548	3.436131	14
1	d7vHFjxM6M	Blokus	2000	2.0	4.0	Mattel Games	[{'id': '3te2oybNR4', 'url': 'https://www.boar...	161	3.049689	221
2	uw69CrJFCL	Citadels: Classic	2000	2.0	8.0	Hans im Glück	[{'id': 'ZX3hYcF9H7', 'url': 'https://www.boar...	133	3.308271	228
3	PSVopYiYOv	Battle Line	2000	2.0	2.0	GMT Games	[]	119	3.346800	246
4	JyMsRC64I4	Go	2000	2.0	2.0	John N. Hansen Co.	[{'id': '3te2oybNR4', 'url': 'https://www.boar...	82	3.329268	375

Create translation dictionary for mechanics

```python
# Set URL for api search call
mechanics_url = f"https://api.boardgameatlas.com/api/game/mechanics?client_id={api_key}"
```

```python
# Pull mechanics api
mechanics = requests.get(mechanics_url).json()
print(json.dumps(mechanics, indent=2, sort_keys=True))
```

```json
{
  "mechanics": [
    {
      "id": "n1GtBt35Rd",
      "name": "Acting",
      "url": "https://www.boardgameatlas.com/mechanic/n1GtBt35Rd/acting"
    },
    {
      "id": "PGjmKGi26h",
      "name": "Action / Movement Programming",
      "url": "https://www.boardgameatlas.com/mechanic/PGjmKGi26h/action--movement-programming"
    },
    {
      "id": "oeg6wN9Eoc",
      "name": "Action Point Allowance System",
      "url": "https://www.boardgameatlas.com/mechanic/oeg6wN9Eoc/action-point-allowance-system"
    },
    {
      "id": "ckCp1oTVMy",
```

```python
# Create dictionary of mechanic id and names
mechanics_dictionary = {}

for i in mechanics['mechanics']:
    mechanics_dictionary[i['id']] = i['name']
```

Translate Mechanics Column

Translate mechanics columns for all games

```python
# Create a list containing lists of dictionaries for mechanics and URL for each game
game_mechanics_messy = []

for index, row in has_mechs.iterrows():
    mechanic = row['mechanics']
    game_mechanics_messy.append(mechanic)
```

```python
# Remove URL from all dictionaries
# Save as list of mechanics per game
game_mechanics_only_list = []

for i in range(len(game_mechanics_messy)):
    try:
        game_mechanics_only_list.append([mechanics_dictionary[d['id']] for d in game_mechanics_messy[i]])
    except KeyError:
        game_mechanics_only_list.append("List could not be pulled.")
```

Add clean mechanics list to data frame

```python
has_mechs["mechanics"] = game_mechanics_only_list
has_mechs.head()
```

C:\Users\Max Browning\anaconda3\envs\PythonData\lib\site-packages\ipykernel_launcher.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  """Entry point for launching an IPython kernel.

	id	name	year_published	min_players	max_players	primary_publisher	mechanics	num_user_ratings	average_user_rating	rank	num_
0	oGVgRSAKwX	Carcassonne	2000	2.0	5.0	Hans im Glück	[Tile Placement, Worker Placement]	548	3.436131	14	
1	d7vHFjxM6M	Blokus	2000	2.0	4.0	Mattel Games	[Area Enclosure, Hand Management, Tile Placement]	162	3.055556	221	
2	uw69CrJFCL	Citadels: Classic	2000	2.0	8.0	Hans im Glück	[Bluffing, Engine Building, Social Deduction, ...	133	3.308271	228	
4	JyMsRC64I4	Go	2000	2.0	2.0	John N. Hansen Co.	[Area Enclosure]	82	3.329268	375	
6	YD2fbRwJdz	Princes of Florence	2000	2.0	5.0	Rio Grande Games	[Tile Placement]	64	3.253385	487	