Sheet

Assignment 2

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Abstract: These series of codes aim to analyze two datasets. The first illustrates the number of wins and losses for different countries in different types of matches in relation to both their home country and far away, which shows the importance of different variables to a team's performance. The second provides the numbers of covid cases in 202 and 2022 in different countries.

```
import pandas as pd
```

```
df=pd.read_csv("results.csv")
```

```
x=df['home_score']-df['away_score']
conditions = [
    (x<0),
    (x>0),
    (x==0)
    ]
```

```
values= ['win','lose','draw']
```

```
import numpy as np
df['result'] = np.select(conditions, values)
```

```
x=df['result'].value_counts()
```

```
df['country'].unique()
```

Assignment Part I

```
dfire=df[df['country']=='Ireland']
```

```
conditions = [
    (dfire['tournament']=='Friendly'),
    (dfire['tournament']!='Friendly')
    ]
values=['Friendly','Official']
dfire['typematch'] = np.select(conditions, values)
```

```
<ipython-input-114-99571b7b4e2f>:6: 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-
```

```
  dfire['typematch'] = np.select(conditions, values)
```

```
dfire['typematch'].value_counts()
```

```
x=pd.crosstab(dfire['typematch'],dfire['result'],margins=True)
x
```

result	draw	lose	win	All
typematch				
Friendly	1	0	1	2
Official	10	7	34	51
All	11	7	35	53

```
x=np.array(x)
x
```

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_irewin_friendly=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_irewin_friendly
```

```
(0.0, 1.0)
```

```
CI_irewin_official=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_irewin_official
```

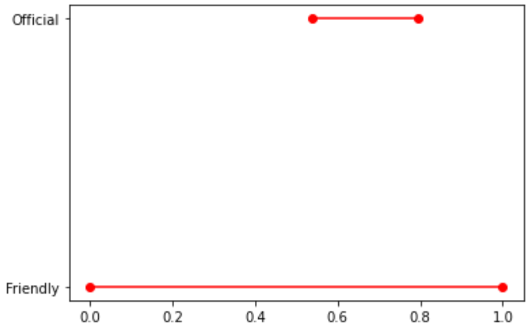
```
(0.5372897650923262, 0.7960435682410071)
```

```
ci_irewin = {}
ci_irewin['Typematch'] = ['Friendly','Official']
ci_irewin['lb'] = [CI_irewin_friendly[0],CI_irewin_official[0]]
ci_irewin['ub'] = [CI_irewin_friendly[1],CI_irewin_official[1]]
df_ci= pd.DataFrame(ci_irewin)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.00000	1.000000
1	Official	0.53729	0.796044

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7f8f6c812760>,
  <matplotlib.axis.YTick at 0x7f8f6c8d97f0>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



Since the margin of error for the friendly matches was very high, we can conclude that Ireland were more succesful during their official matches

```
dfire['home']=(dfwal['home_team']=='Ireland')
dfire['home'].value_counts()
```

```
<ipython-input-125-8478ae796e89>: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-
  dfire['home']=(dfwal['home_team']=='Ireland')
```

```
x=pd.crosstab(dfwal['home'],dfwal['result'],margins=True)
x
```

result	draw	lose	win	All
home				
False	0	14	6	20
True	84	123	112	319
All	84	137	118	339

```
x=np.array(x)
```

```
CI_irewin_home=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_irewin_home
```

```
(0.29871829353558793, 0.40347606383118323)
```

```
CI_irewin_away=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_irewin_away
```

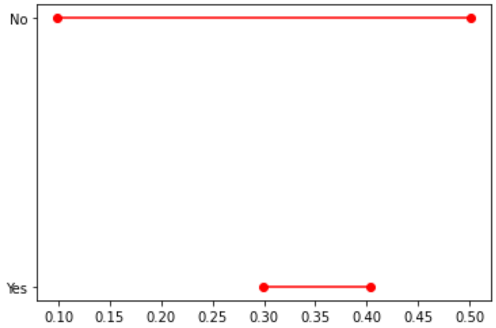
```
(0.09916345547364067, 0.5008365445263593)
```

```
ci_irewin = {}
ci_irewin['home'] = ['Yes','No']
ci_irewin['lb'] = [CI_irewin_home[0],CI_irewin_away[0]]
ci_irewin['ub'] = [CI_irewin_home[1],CI_irewin_away[1]]
df_ci= pd.DataFrame(ci_irewin)
df_ci
```

	home	lb	ub
0	Yes	0.298718	0.403476
1	No	0.099163	0.500837

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1fc8370>,
  <matplotlib.axis.YTick at 0x7fabf1fe2bb0>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



Ireland were more likely to win when playing in their home country, meaning the crowd cheers affected their performance positively

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_irelose_friendly=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_irelose_friendly
```

```
(0.4991634554736406, 0.9008365445263593)
```

```
CI_irelose_official=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_irelose_official
```

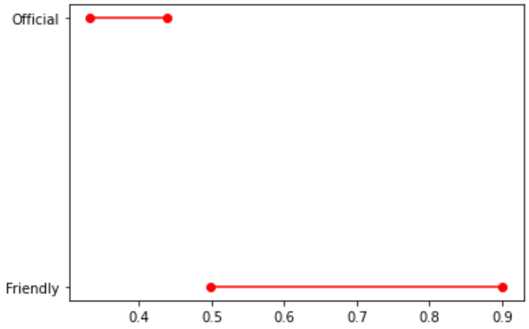
```
(0.3321674678039326, 0.4389924068042179)
```

```
ci_irelose = {}
ci_irelose['Typematch'] = ['Friendly','Official']
ci_irelose['lb'] = [CI_irelose_friendly[0],CI_irelose_official[0]]
ci_irelose['ub'] = [CI_irelose_friendly[1],CI_irelose_official[1]]
df_ci= pd.DataFrame(ci_irelose)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.499163	0.900837
1	Official	0.332167	0.438992

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7f8f66717a30>,
  <matplotlib.axis.YTick at 0x7f8f667172b0>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



Ireland are more likely to lose in friendly matches than official matches

```
x=np.array(x)
CI_irelose_home=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_irelose_home
```

```
(0.3321674678039326, 0.4389924068042179)
```

```
CI_irelose_away=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_irelose_away
```

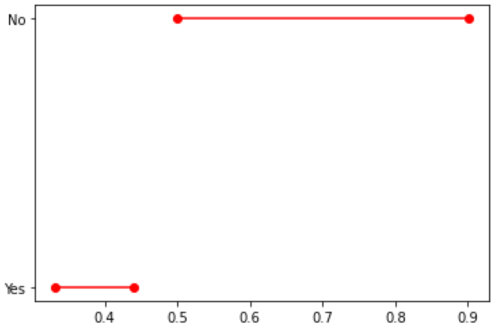
```
(0.4991634554736406, 0.9008365445263593)
```

```
ci_irelose = {}
ci_irelose['home'] = ['Yes','No']
ci_irelose['lb'] = [CI_irelose_home[0],CI_irelose_away[0]]
ci_irelose['ub'] = [CI_irelose_home[1],CI_irelose_away[1]]
df_ci= pd.DataFrame(ci_irelose)
df_ci
```

	home	lb	ub
0	Yes	0.332167	0.438992
1	No	0.499163	0.900837

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7f8f66d5f280>,
  <matplotlib.axis.YTick at 0x7f8f66d5e940>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



Ireland are more likely to lose in far away matches, meaning that the lack of crowd cheers affects them negatively

```
dfwal=df[df['country']=='Wales']
```

```
conditions = [
    (dfwal['tournament']=='Friendly'),
    (dfwal['tournament']!='Friendly')
    ]
```

```
values=['Friendly','Official']
```

```
import numpy as np
dfwal['typematch'] = np.select(conditions, values)
```

```
<ipython-input-11-0db6f9e305fa>:2: 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-
  dfwal['typematch'] = np.select(conditions, values)
```

```
dfwal['typematch'].value_counts()
```

```
import pandas as pd
x=pd.crosstab(dfwal['typematch'],dfwal['result'],margins=True)
x
```

result	draw	lose	win	All
typematch				
Friendly	21	26	24	71
Official	63	111	94	268
All	84	137	118	339

```
x=np.array(x)
x
```

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_walwin_friendly=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_walwin_friendly
```

```
(0.2279971543780736, 0.4480591836500954)
```

```
CI_walwin_official=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_walwin_official
```

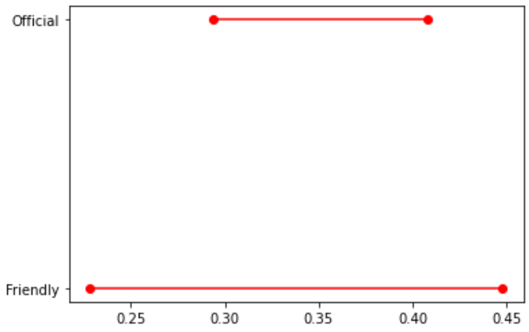
```
(0.29361360781866724, 0.4078789294947656)
```

```
ci_walwin = {}
ci_walwin['Typematch'] = ['Friendly','Official']
ci_walwin['lb'] = [CI_walwin_friendly[0],CI_walwin_official[0]]
ci_walwin['ub'] = [CI_walwin_friendly[1],CI_walwin_official[1]]
df_ci= pd.DataFrame(ci_walwin)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.227997	0.448059
1	Official	0.293614	0.407879

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7fabf24d77c0>,
  <matplotlib.axis.YTick at 0x7fabf1a23490>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



Wales are more likely to win in official matches

```
dfwal['home']=(dfwal['home_team']=='Wales')
```

```
<ipython-input-20-cb7deabfae77>: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-
  dfwal['home']=(dfwal['home_team']=='Wales')
```

```
dfwal['home']=(dfwal['home_team']=='Wales')
```

```
<ipython-input-21-cb7deabfae77>: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-
  dfwal['home']=(dfwal['home_team']=='Wales')
```

```
x=pd.crosstab(dfwal['home'],dfwal['result'],margins=True)
x
```

result	draw	lose	win	All
home				
False	0	14	6	20
True	84	123	112	319
All	84	137	118	339

```
x=np.array(x)
CI_walwin_home=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_walwin_home
```

```
(0.29871829353558793, 0.40347606383118323)
```

```
CI_walwin_away=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_walwin_away
```

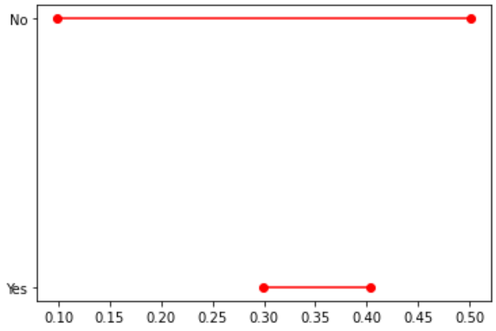
```
(0.09916345547364067, 0.5008365445263593)
```

```
ci_walwin = {}
ci_walwin['home'] = ['Yes','No']
ci_walwin['lb'] = [CI_walwin_home[0],CI_walwin_away[0]]
ci_walwin['ub'] = [CI_walwin_home[1],CI_walwin_away[1]]
df_ci= pd.DataFrame(ci_walwin)
df_ci
```

	home	lb	ub
0	Yes	0.298718	0.403476
1	No	0.099163	0.500837

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1c5d9d0>,
  <matplotlib.axis.YTick at 0x7fabf1c5d250>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



Wales are more likely to win in their home country, meaning the crowd cheers affect thier performance positively

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_wallose_friendly=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_wallose_friendly
```

```
(0.4991634554736406, 0.9008365445263593)
```

```
CI_wallose_official=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_wallose_official
```

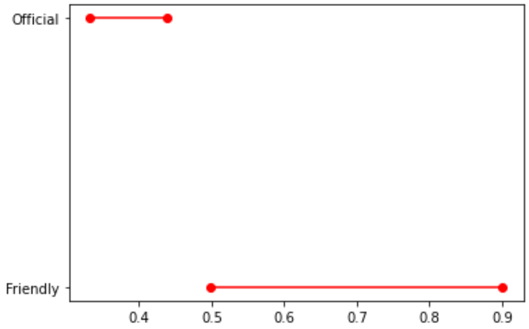
```
(0.3321674678039326, 0.4389924068042179)
```

```
ci_wallose = {}
ci_wallose['Typematch'] = ['Friendly','Official']
ci_wallose['lb'] = [CI_wallose_friendly[0],CI_wallose_official[0]]
ci_wallose['ub'] = [CI_wallose_friendly[1],CI_wallose_official[1]]
df_ci= pd.DataFrame(ci_wallose)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.499163	0.900837
1	Official	0.332167	0.438992

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1507c70>,
  <matplotlib.axis.YTick at 0x7fabf15074f0>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



Wales are more likely to lose in friendly matches than official matches

```
x=np.array(x)
CI_wallose_home=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_wallose_home
```

```
(0.3321674678039326, 0.4389924068042179)
```

```
CI_wallose_away=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_wallose_away
```

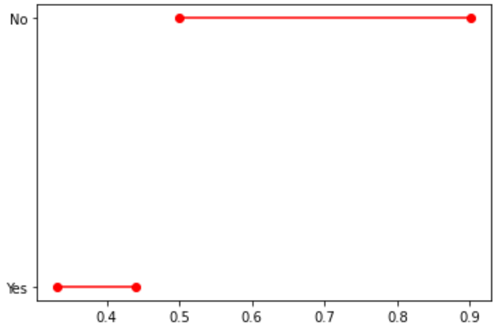
```
(0.4991634554736406, 0.9008365445263593)
```

```
ci_wallose = {}
ci_wallose['home'] = ['Yes','No']
ci_wallose['lb'] = [CI_wallose_home[0],CI_wallose_away[0]]
ci_wallose['ub'] = [CI_wallose_home[1],CI_wallose_away[1]]
df_ci= pd.DataFrame(ci_wallose)
df_ci
```

	home	lb	ub
0	Yes	0.332167	0.438992
1	No	0.499163	0.900837

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1e05580>,
  <matplotlib.axis.YTick at 0x7fabf1e02dc0>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



Wales are more likely to lose in far away matches, meaning that the lack of crowd cheers affects them negatively

```
dfscot=df[df['country']=='Scotland']
```

```
conditions = [
    (dfscot['tournament']=='Friendly'),
    (dfscot['tournament']!='Friendly')
    ]
values=['Friendly','Official']
dfscot['typematch'] = np.select(conditions, values)
dfscot['typematch'].value_counts()
```

```
<ipython-input-42-ba08f057aa84>:6: 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-
  dfscot['typematch'] = np.select(conditions, values)
```

```
x=pd.crosstab(dfscot['typematch'],dfscot['result'],margins=True)
x
```

result	draw	lose	win	All
typematch				
Friendly	19	54	34	107
Official	64	177	56	297
All	83	231	90	404

```
x=np.array(x)
CI_scotwin_friendly=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_scotwin_friendly
```

```
(0.22953573779233233, 0.4059782808992564)
```

```
CI_scotwin_official=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_scotwin_official
```

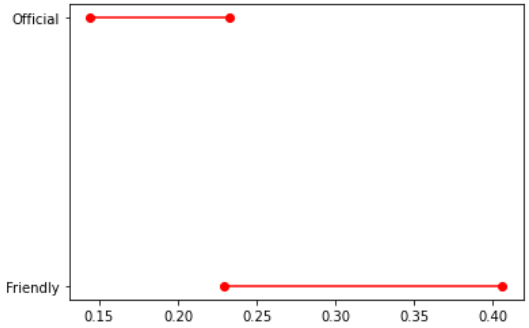
```
(0.1440669471299619, 0.2330374299744152)
```

```
ci_scotwin = {}
ci_scotwin['Typematch'] = ['Friendly','Official']
ci_scotwin['lb'] = [CI_scotwin_friendly[0],CI_scotwin_official[0]]
ci_scotwin['ub'] = [CI_scotwin_friendly[1],CI_scotwin_official[1]]
df_ci= pd.DataFrame(ci_scotwin)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.229536	0.405978
1	Official	0.144067	0.233037

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7f8f6cc928e0>,
  <matplotlib.axis.YTick at 0x7f8f6cc49970>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



Scotland are more likely to win friendly matches than in official matches

```
dfscot['home']=(dfscot['home_team']=='Scotland')
```

```
<ipython-input-48-28ef77a131ab>: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
  dfscot['home']=(dfscot['home_team']=='Scotland')
```

```
dfscot['home'].value_counts()
```

```
x=pd.crosstab(dfscot['home'],dfscot['result'],margins=True)
x
```

result	draw	lose	win	All
home				
False	6	14	8	28
True	77	217	82	376
All	83	231	90	404

```
x=np.array(x)
CI_scotwin_home=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_scotwin_home
```

```
(0.17634563783879345, 0.25982457492716404)
```

```
CI_scotwin_away=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_scotwin_away
```

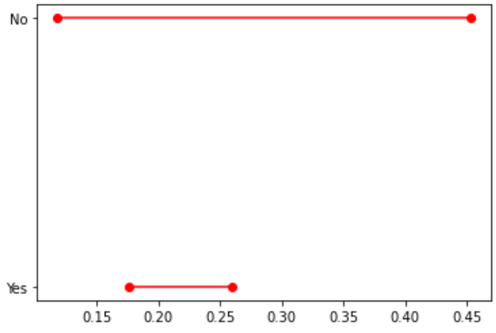
```
(0.11838535517233528, 0.4530432162562361)
```

```
ci_scotwin = {}
ci_scotwin['home'] = ['Yes','No']
ci_scotwin['lb'] = [CI_scotwin_home[0],CI_scotwin_away[0]]
ci_scotwin['ub'] = [CI_scotwin_home[1],CI_scotwin_away[1]]
df_ci= pd.DataFrame(ci_scotwin)
df_ci
```

	home	lb	ub
0	Yes	0.176346	0.259825
1	No	0.118385	0.453043

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7fabf14f26a0>,
  <matplotlib.axis.YTick at 0x7fabf14deee0>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



Scotland are more likely to win in home matches, meaning that the lack of crowd cheers affects them negatively

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_scotlose_friendly=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_scotlose_friendly
```

```
(0.31480081136656335, 0.6851991886334367)
```

```
CI_scotlose_official=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_scotlose_official
```

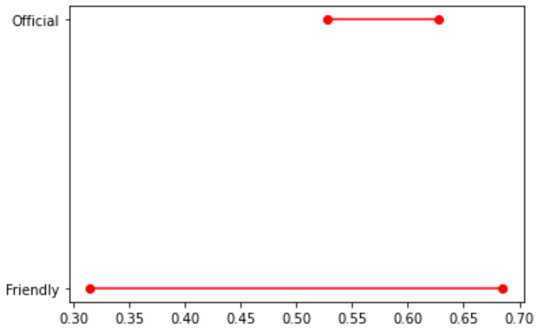
```
(0.5271938440225415, 0.6270614751263947)
```

```
ci_scotlose = {}
ci_scotlose['Typematch'] = ['Friendly','Official']
ci_scotlose['lb'] = [CI_scotlose_friendly[0],CI_scotlose_official[0]]
ci_scotlose['ub'] = [CI_scotlose_friendly[1],CI_scotlose_official[1]]
df_ci= pd.DataFrame(ci_scotlose)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.314801	0.685199
1	Official	0.527194	0.627061

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1a280d0>,
  <matplotlib.axis.YTick at 0x7fabf1a28b80>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



Scotland are more likely to lose in official matches than friendly matches

```
x=np.array(x)
CI_scotlose_home=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_scotlose_home
```

```
(0.5271938440225415, 0.6270614751263947)
```

```
CI_scotlose_away=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_scotlose_away
```

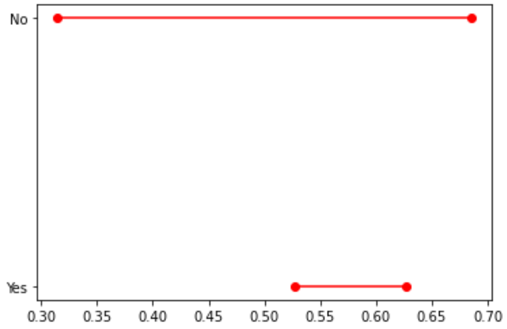
```
(0.31480081136656335, 0.6851991886334367)
```

```
ci_iscotlose = {}
ci_scotlose['home'] = ['Yes','No']
ci_scotlose['lb'] = [CI_scotlose_home[0],CI_scotlose_away[0]]
ci_scotlose['ub'] = [CI_scotlose_home[1],CI_scotlose_away[1]]
df_ci= pd.DataFrame(ci_scotlose)
df_ci
```

	Typematch	lb	ub	home
0	Friendly	0.527194	0.627061	Yes
1	Official	0.314801	0.685199	No

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1a0e160>,
  <matplotlib.axis.YTick at 0x7fabf1a062e0>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



Scotland are more likely to lose in home matches, meaning that the lack of crowd cheers does not affect them negatively

```
dfeng=df[df['country']=='England']
conditions = [
    (dfeng['tournament']=='Friendly'),
    (dfeng['tournament']!='Friendly')
    ]
values=['Friendly','Official']
dfeng['typematch'] = np.select(conditions, values)
dfeng['typematch'].value_counts()
```

```
<ipython-input-93-0b30e2c63d65>:7: 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-
  dfeng['typematch'] = np.select(conditions, values)
```

```
x=pd.crosstab(dfeng['typematch'],dfeng['result'],margins=True)
x
```

result	draw	lose	win	All
typematch				
Friendly	72	156	58	286
Official	84	259	88	431
All	156	415	146	717

```
x=np.array(x)
CI_engwin_friendly=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_engwin_friendly
```

```
(0.15619778812633506, 0.24939661746807051)
```

```
CI_engwin_official=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_engwin_official
```

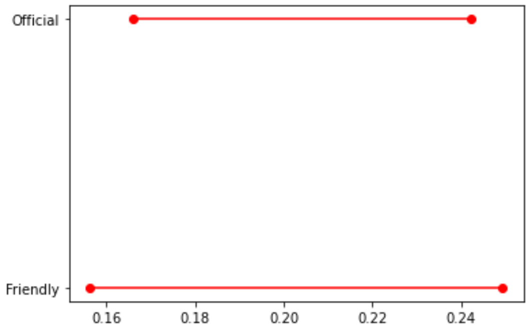
```
(0.1661205581281346, 0.24223211008532247)
```

```
ci_engwin = {}
ci_engwin['Typematch'] = ['Friendly','Official']
ci_engwin['lb'] = [CI_engwin_friendly[0],CI_engwin_official[0]]
ci_engwin['ub'] = [CI_engwin_friendly[1],CI_engwin_official[1]]
df_ci= pd.DataFrame(ci_engwin)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.156198	0.249397
1	Official	0.166121	0.242232

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1d3d730>,
  <matplotlib.axis.YTick at 0x7fabf1d70f70>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



Both intervals are similar which means that the location does not affect England's performance

```
dfeng['home']=(dfeng['home_team']=='England')
```

```
<ipython-input-82-ec6d22fd1ab4>: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-
  dfeng['home']=(dfeng['home_team']=='England')
```

```
dfeng['home'].value_counts()
```

```
x=pd.crosstab(dfeng['home'],dfeng['result'],margins=True)
x
```

result	draw	lose	win	All
home				
False	55	115	83	253
True	101	300	63	464
All	156	415	146	717

```
x=np.array(x)
CI_engwin_home=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_engwin_home
```

```
(0.10460752863595074, 0.1669441955019803)
```

```
CI_engwin_away=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_engwin_away
```

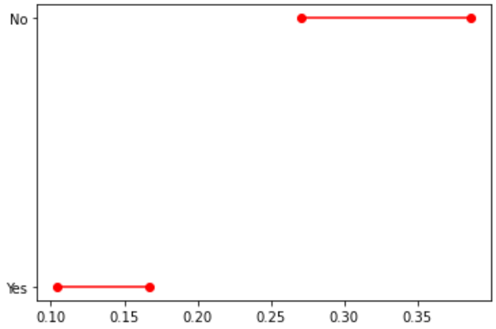
```
(0.27020958414722984, 0.3859168980662089)
```

```
ci_engwin = {}
ci_engwin['home'] = ['Yes','No']
ci_engwin['lb'] = [CI_engwin_home[0],CI_engwin_away[0]]
ci_engwin['ub'] = [CI_engwin_home[1],CI_engwin_away[1]]
df_ci= pd.DataFrame(ci_engwin)
df_ci
```

	home	lb	ub
0	Yes	0.104608	0.166944
1	No	0.270210	0.385917

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7f8f6cbf7e80>,
  <matplotlib.axis.YTick at 0x7f8f6c949910>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



England is more likely to win in far away countries, which means crowd cheers do not affect them negatively

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_englose_friendly=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_englose_friendly
```

```
(0.27020958414722984, 0.3859168980662089)
```

```
CI_englose_official=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_englose_official
```

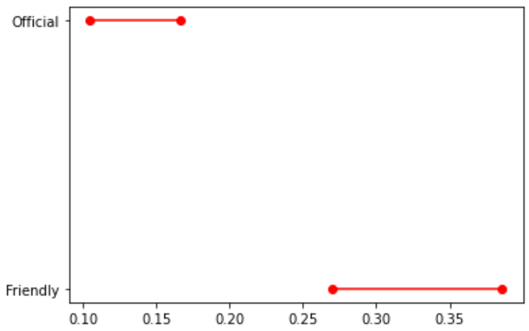
```
(0.10460752863595074, 0.1669441955019803)
```

```
ci_englose = {}
ci_englose['Typematch'] = ['Friendly','Official']
ci_englose['lb'] = [CI_englose_friendly[0],CI_englose_official[0]]
ci_englose['ub'] = [CI_englose_friendly[1],CI_englose_official[1]]
df_ci= pd.DataFrame(ci_englose)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.270210	0.385917
1	Official	0.104608	0.166944

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1437280>,
  <matplotlib.axis.YTick at 0x7fabf1452ac0>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



England are more likely to lose in friendly matches than official matches

```
x=np.array(x)
CI_englose_home=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_englose_home
```

```
(0.5546956899682828, 0.6471604585235965)
```

```
CI_englose_away=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_englose_away
```

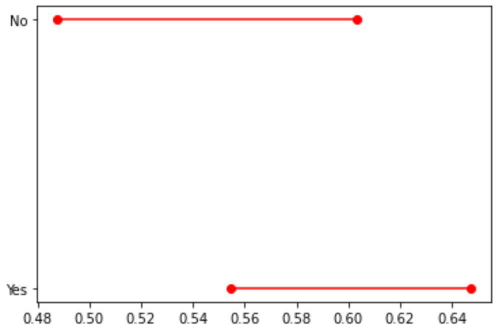
```
(0.48774694494485304, 0.6031621459642378)
```

```
ci_englose = {}
ci_englose['home'] = ['Yes','No']
ci_englose['lb'] = [CI_englose_home[0],CI_englose_away[0]]
ci_englose['ub'] = [CI_englose_home[1],CI_englose_away[1]]
df_ci= pd.DataFrame(ci_englose)
df_ci
```

	home	lb	ub
0	Yes	0.554696	0.647160
1	No	0.487747	0.603162

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7fabf1ef79a0>,
  <matplotlib.axis.YTick at 0x7fabf1ef7220>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



England are more likely to lose in home matches, meaning that the lack of crowd cheers does not affect them negatively

```
dfusa=df[df['country']=='United States']
conditions = [
    (dfusa['tournament']=='Friendly'),
    (dfusa['tournament']!='Friendly')
    ]
values=['Friendly','Official']
dfusa['typematch'] = np.select(conditions, values)
dfusa['typematch'].value_counts()
```

```
<ipython-input-116-e5dabae374db>:7: 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-
  dfusa['typematch'] = np.select(conditions, values)
```

```
x=pd.crosstab(dfusa['typematch'],dfusa['result'],margins=True)
x
```

result	draw	lose	win	All
typematch				
Friendly	180	247	226	653
Official	114	315	155	584
All	294	562	381	1237

```
x=np.array(x)
x
```

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_usawin_friendly=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_usawin_friendly
```

```
(0.3096072474351973, 0.38258264536725295)
```

```
CI_usawin_official=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_usawin_official
```

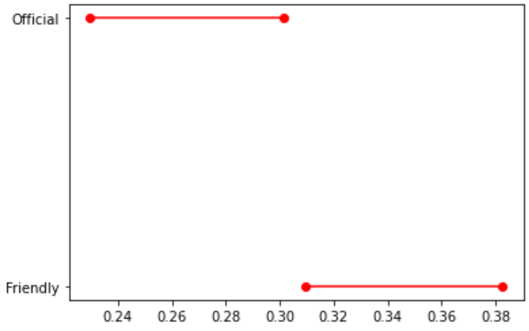
```
(0.22959939266607973, 0.30122252514213943)
```

```
ci_usawin = {}
ci_usawin['Typematch'] = ['Friendly','Official']
ci_usawin['lb'] = [CI_usawin_friendly[0],CI_usawin_official[0]]
ci_usawin['ub'] = [CI_usawin_friendly[1],CI_usawin_official[1]]
df_ci= pd.DataFrame(ci_usawin)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.309607	0.382583
1	Official	0.229599	0.301223

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7f8f6cbf4730>,
  <matplotlib.axis.YTick at 0x7f8f6cbf4c10>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



The United States are more likely to win friendly matches than in official matches

```
dfusa['home']=(dfusa['home_team']=='United States')
dfusa['home'].value_counts()
dfusa['home'].value_counts()
```

```
<ipython-input-139-5d86407ecc9e>: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-
  dfusa['home']=(dfusa['home_team']=='United States')
```

```
x=pd.crosstab(dfwal['home'],dfwal['result'],margins=True)
x
```

result	draw	lose	win	All
home				
False	0	14	6	20
True	84	123	112	319
All	84	137	118	339

```
x=np.array(x)
CI_usawin_home=proportion_confint(count=x[1,2],nobs=x[1,3],alpha=(1-.95))
CI_usawin_home
```

```
(0.29871829353558793, 0.40347606383118323)
```

```
CI_usawin_away=proportion_confint(count=x[0,2],nobs=x[0,3],alpha=(1-.95))
CI_usawin_away
```

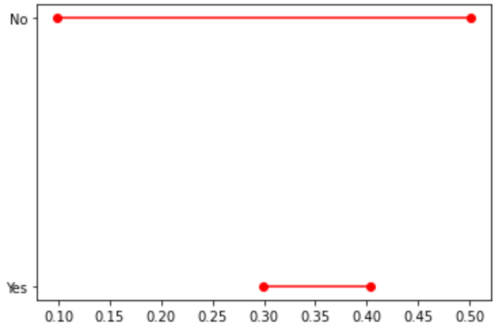
```
(0.09916345547364067, 0.5008365445263593)
```

```
ci_usawin = {}
ci_usawin['home'] = ['Yes','No']
ci_usawin['lb'] = [CI_usawin_home[0],CI_usawin_away[0]]
ci_usawin['ub'] = [CI_usawin_home[1],CI_usawin_away[1]]
df_ci= pd.DataFrame(ci_usawin)
df_ci
```

	home	lb	ub
0	Yes	0.298718	0.403476
1	No	0.099163	0.500837

```
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7f8f679d8fa0>,
  <matplotlib.axis.YTick at 0x7f8f9ee9c0a0>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



The United States are more likely to lose in home matches, meaning that the lack of crowd cheers does not affect them negatively

```
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
CI_usalose_friendly=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_usalose_friendly
```

```
(0.3410587617395715, 0.4154496609250533)
```

```
CI_usalose_official=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_usalose_official
```

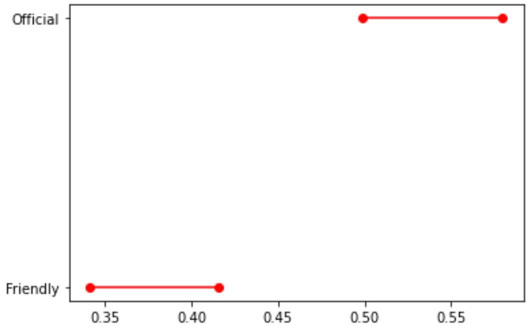
```
(0.4989576113893054, 0.5798095118983658)
```

```
ci_usalose = {}
ci_usalose['Typematch'] = ['Friendly','Official']
ci_usalose['lb'] = [CI_usalose_friendly[0],CI_usalose_official[0]]
ci_usalose['ub'] = [CI_usalose_friendly[1],CI_usalose_official[1]]
df_ci= pd.DataFrame(ci_usalose)
df_ci
```

	Typematch	lb	ub
0	Friendly	0.341059	0.41545
1	Official	0.498958	0.57981

```
import matplotlib.pyplot as plt
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['Typematch']))
```

```
([<matplotlib.axis.YTick at 0x7fabfea5bbb0>,
  <matplotlib.axis.YTick at 0x7fabfea5b430>],
 [Text(0, 0, 'Friendly'), Text(0, 1, 'Official')])
```



United States are more likely to lose in official matches than friendly matches

```
x=np.array(x)
CI_usalose_home=proportion_confint(count=x[1,1],nobs=x[1,3],alpha=(1-.95))
CI_usalose_home
```

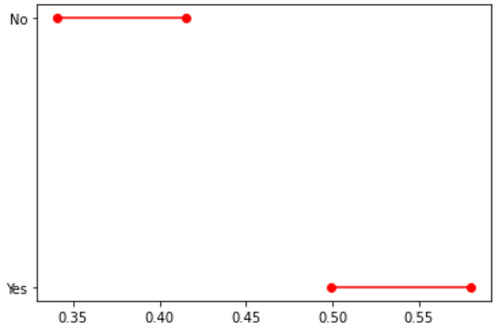
```
(0.4989576113893054, 0.5798095118983658)
```

```
CI_usalose_away=proportion_confint(count=x[0,1],nobs=x[0,3],alpha=(1-.95))
CI_usalose_away
```

```
(0.3410587617395715, 0.4154496609250533)
```

```
ci_usalose = {}
ci_usalose['home'] = ['Yes','No']
ci_usalose['lb'] = [CI_usalose_home[0],CI_usalose_away[0]]
ci_usalose['ub'] = [CI_usalose_home[1],CI_usalose_away[1]]
df_ci= pd.DataFrame(ci_usalose)
df_ci
for lb,ub,y in zip(df_ci['lb'],df_ci['ub'],range(len(df_ci))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(df_ci)),list(df_ci['home']))
```

```
([<matplotlib.axis.YTick at 0x7fabfe7e2400>,
  <matplotlib.axis.YTick at 0x7fabfe726cd0>],
 [Text(0, 0, 'Yes'), Text(0, 1, 'No')])
```



The United States is more likely to lose in home matches, meaning that the lack of crowd cheers does not affect them negatively

Conclusion: In most cases, crowd cheers did affect how the teams performed, but the relation between both variables was not the strongest so the analysis of other variables is needed as well.

Assignment Part II

```
import numpy as np
import pandas as pd
import scipy
import scipy.stats
from scipy.stats import norm,t
import statsmodels.api as sm
from statsmodels.stats.proportion import proportion_confint
import matplotlib.pyplot as plt
from pandas.api.types import CategoricalDtype
```

```
cvd=pd.read_csv('covid_data.csv',encoding='latin-1')
cvd.head()
```

	date	iso3c	country	income	region	continent	dcases	ddeaths	population	weekdays	month
0	2020-02-24	AFG	Afghanistan	Low income	South Asia	Asia	5	0	38041754	Mon	Feb
1	2020-02-25	AFG	Afghanistan	Low income	South Asia	Asia	0	0	38041754	Tue	Feb
2	2020-02-26	AFG	Afghanistan	Low income	South Asia	Asia	0	0	38041754	Wed	Feb
3	2020-02-27	AFG	Afghanistan	Low income	South Asia	Asia	0	0	38041754	Thu	Feb
4	2020-02-28	AFG	Afghanistan	Low income	South Asia	Asia	0	0	38041754	Fri	Feb

```
from pandas.api.types import CategoricalDtype
cats=['Jan', 'Feb', 'Mar','Apr','May','Jun','Jul','Aug','Sep','Oct','Nov','Dec']
cat_type = CategoricalDtype(categories=cats, ordered=True)
cvd['month'] = cvd['month'].astype(cat_type)
```

```
def get_ci_lb(x, alpha=0.05):
    sample_s=np.std(x)
    sample_mean=np.mean(x)
    sample_size=len(x)
    margin_of_error = t.ppf(1 - alpha/2,sample_size-1)*sample_s/np.sqrt(sample_size-1)
    return sample_mean - margin_of_error


def get_ci_ub(x, alpha=0.05):
    sample_s=np.std(x)
    sample_mean=np.mean(x)
    sample_size=len(x)
    margin_of_error = t.ppf(1 - alpha/2,sample_size-1)*sample_s/np.sqrt(sample_size-1)
    return sample_mean + margin_of_error
```

Number of total cases

```
import numpy as np
cases=cvd.groupby("weekdays").agg({"dcases":[np.mean, np.std, np.size, get_ci_ub, get_ci_ub]})
cases
```

	dcases				
	mean	std	size	get_ci_ub	get_ci_ub
weekdays					
Fri	2643.215039	13626.207863	17634	2844.345336	2844.345336
Mon	2116.600879	11700.105447	17521	2289.856936	2289.856936
Sat	2174.297447	10922.667935	17472	2336.267827	2336.267827
Sun	1852.340706	9559.968071	17496	1994.006564	1994.006564
Thu	2693.674338	14618.890740	17598	2909.677808	2909.677808
Tue	2388.510716	11756.420050	17544	2562.486516	2562.486516
Wed	2601.990272	12848.605924	17578	2791.944637	2791.944637

Number of total confirmed deaths

```
import numpy as np
deaths=cvd.groupby("weekdays").agg({"ddeaths":[np.mean, np.std, np.size, get_ci_ub, get_ci_ub]})
deaths
```

	ddeaths				
	mean	std	size	get_ci_ub	get_ci_ub
weekdays					
Fri	47.990756	208.404740	17634	51.066925	51.066925
Mon	37.954968	155.752300	17521	40.261360	40.261360
Sat	40.258413	177.949619	17472	42.897198	42.897198
Sun	31.856367	139.320870	17496	33.920915	33.920915
Thu	49.695534	224.874945	17598	53.018205	53.018205
Tue	50.840002	230.863861	17544	54.256410	54.256410
Wed	51.346968	226.105877	17578	54.689727	54.689727

Fatality rate of covid cases by comparing the cases to the deaths

```
fatrate=cvd['totcases']=cvd.groupby(['iso3c'])['dcases'].cumsum()
fatrate
```

```
cvd['date'][0]

cvd['date'] = pd. to_datetime(cvd['date'],format='%Y-%m-%d')

cvd['date'][0]

cvd['year'] = pd. DatetimeIndex(cvd['date']). year

cvd['year'][0]
```

```
2020
```

Comparison of the cases in 2020 and 2021 in terms of:

```
ratio=cvd['dcases']/cvd['ddeaths']

cvd['ratio']=ratio

cvd = cvd.replace([np.inf, -np.inf], np.nan).dropna(axis=0)

cvd
```

	date	iso3c	country	income	region	continent	dcases	ddeaths	population	weekdays	month	year	ratio
28	2020-03-23	AFG	Afghanistan	Low income	South Asia	Asia	6	1	38041754	Mon	Mar	2020	6.000000
31	2020-03-26	AFG	Afghanistan	Low income	South Asia	Asia	6	1	38041754	Thu	Mar	2020	6.000000
34	2020-03-29	AFG	Afghanistan	Low income	South Asia	Asia	8	2	38041754	Sun	Mar	2020	4.000000
39	2020-04-03	AFG	Afghanistan	Low income	South Asia	Asia	34	1	38041754	Fri	Apr	2020	34.000000
41	2020-04-05	AFG	Afghanistan	Low income	South Asia	Asia	29	2	38041754	Sun	Apr	2020	14.500000
...	...	...	...	...	...	...	...	...	...	...	...	...	...
122837	2021-12-26	ZWE	Zimbabwe	Lower middle income	Sub-Saharan Africa	Africa	605	6	14645468	Sun	Dec	2021	100.833333
122838	2021-12-27	ZWE	Zimbabwe	Lower middle income	Sub-Saharan Africa	Africa	1098	17	14645468	Mon	Dec	2021	64.588235
122839	2021-12-28	ZWE	Zimbabwe	Lower middle income	Sub-Saharan Africa	Africa	2099	32	14645468	Tue	Dec	2021	65.593750
122841	2021-12-30	ZWE	Zimbabwe	Lower middle income	Sub-Saharan Africa	Africa	4180	57	14645468	Thu	Dec	2021	73.333333
122842	2021-12-31	ZWE	Zimbabwe	Lower middle income	Sub-Saharan Africa	Africa	1530	7	14645468	Fri	Dec	2021	218.571429

67773 rows × 13 columns

Continent

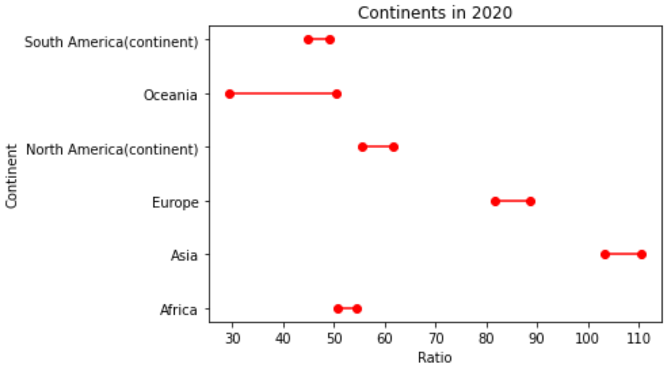
```
conty=cvd.groupby(['continent','year']).agg({"ratio": [np.mean, np.std, np.size,get_ci_lb,get_ci_ub]})

conty=conty.reset_index()

conty= pd.DataFrame(conty)
```

```
conty20=conty[(conty['year']==2020)]
conty21=conty[(conty['year']==2021)]
```

```
conty20.columns
conty20.columns=['continent','year','mean','std','size','get_ci_lb','get_ci_ub']
conty21.columns
conty21.columns=['continent','year','mean','std','size','get_ci_lb','get_ci_ub']
```

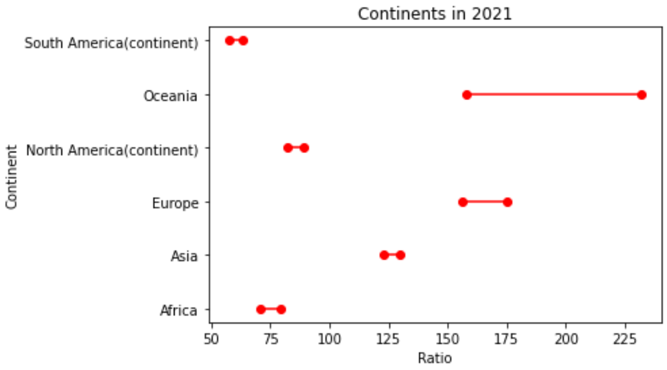
```
import matplotlib.pyplot as plt
for lb,ub,y in zip(conty20['get_ci_lb'],conty20['get_ci_ub'],range(len(conty))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(conty20)),list(conty20['continent']))
plt.xlabel("Ratio")
plt.ylabel("Continent")
plt.title("Continents in 2020")
```

```
Text(0.5, 1.0, 'Continents in 2020')
```



```
import matplotlib.pyplot as plt
for lb,ub,y in zip(conty21['get_ci_lb'],conty21['get_ci_ub'],range(len(conty))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(conty21)),list(conty21['continent']))
plt.xlabel("Ratio")
plt.ylabel("Continent")
plt.title("Continents in 2021")
```

```
Text(0.5, 1.0, 'Continents in 2021')
```



Region

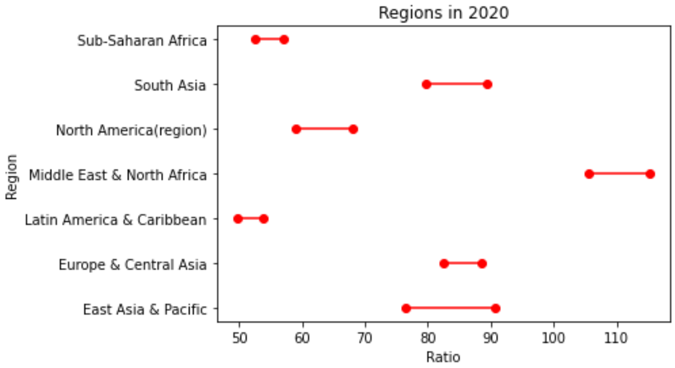
```
regy=cvd.groupby(['region','year']).agg({"ratio": [np.mean, np.std, np.size,get_ci_lb,get_ci_ub]})

regy=regy.reset_index()

regy= pd.DataFrame(regy)
```

```
regy20=regy[(regy['year']==2020)]
regy21=regy[(regy['year']==2021)]
```

```
regy20.columns
regy20.columns=['continent','year','mean','std','size','get_ci_lb','get_ci_ub']
regy21.columns
regy21.columns=['continent','year','mean','std','size','get_ci_lb','get_ci_ub']
```

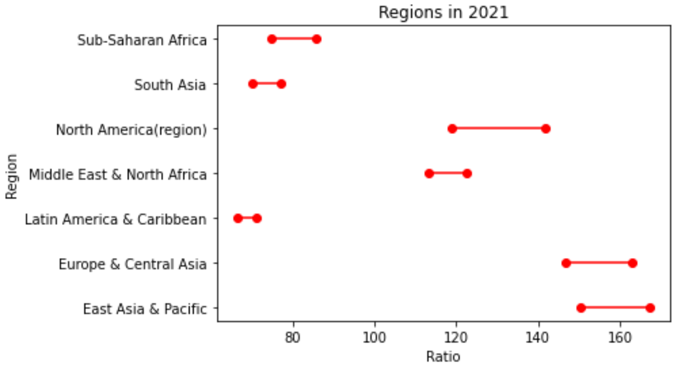
```
import matplotlib.pyplot as plt
for lb,ub,y in zip(regy20['get_ci_lb'],regy20['get_ci_ub'],range(len(regy20))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(regy20)),list(regy20['continent']))
plt.xlabel("Ratio")
plt.ylabel("Region")
plt.title("Regions in 2020")
```

```
Text(0.5, 1.0, 'Regions in 2020')
```



```
import matplotlib.pyplot as plt
for lb,ub,y in zip(regy21['get_ci_lb'],regy21['get_ci_ub'],range(len(regy21))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(regy21)),list(regy21['continent']))
plt.xlabel("Ratio")
plt.ylabel("Region")
plt.title("Regions in 2021")
```

```
Text(0.5, 1.0, 'Regions in 2021')
```



```
Income
```

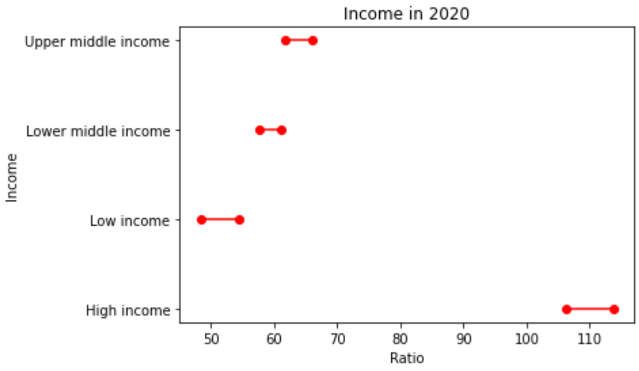
```
incy=cvd.groupby(['income','year']).agg({"ratio": [np.mean, np.std, np.size,get_ci_lb,get_ci_ub]})

incy=incy.reset_index()

incy= pd.DataFrame(incy)
```

```
incy20=incy[(incy['year']==2020)]
incy21=incy[(incy['year']==2021)]
```

```
incy20.columns
incy20.columns=['continent','year','mean','std','size','get_ci_lb','get_ci_ub']
incy21.columns
incy21.columns=['continent','year','mean','std','size','get_ci_lb','get_ci_ub']
```

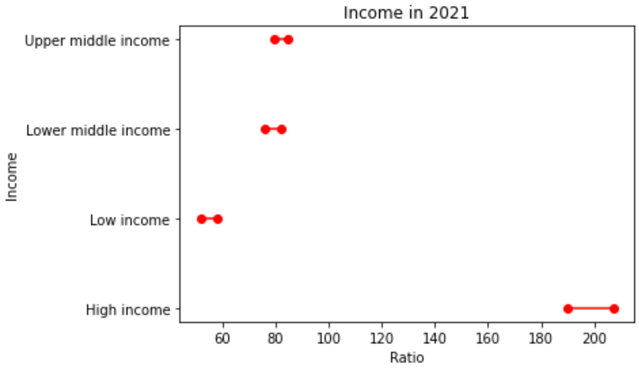
```
import matplotlib.pyplot as plt
for lb,ub,y in zip(incy20['get_ci_lb'],incy20['get_ci_ub'],range(len(incy20))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(incy20)),list(incy20['continent']))
plt.xlabel("Ratio")
plt.ylabel("Income")
plt.title("Income in 2020")
```

```
Text(0.5, 1.0, 'Income in 2020')
```



```
import matplotlib.pyplot as plt
for lb,ub,y in zip(incy21['get_ci_lb'],incy21['get_ci_ub'],range(len(incy21))):
    plt.plot((lb,ub),(y,y),'ro-')
plt.yticks(range(len(incy21)),list(incy21['continent']))
plt.xlabel("Ratio")
plt.ylabel("Income")
plt.title("Income in 2021")
```

```
Text(0.5, 1.0, 'Income in 2021')
```



```
couny20=popy[(couny['year']==2020)]
couny21=popy[(couny['year']==2021)]
```

```
couny20.columns
couny20.columns=['country','year','mean','std','size','get_ci_lb','get_ci_ub']
couny21.columns
couny21.columns=['country','year','mean','std','size','get_ci_lb','get_ci_ub']
```

Conclusion: I used this dataset to show the fatality rate of Covid in both years, and the difference of death in both 2020 and 2021 in reference to income, regions, and continents.

```
import nbconvert
```