In [7]:
```
import sqlite3
import numpy as np
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import seaborn as sns #Data Visualization
import matplotlib.pyplot as plt #Data Visualization
%matplotlib inline
connect = sqlite3.connect('database.sqlite')
```

In [8]:
```
tables = pd.read_sql("""SELECT *
                        FROM sqlite_master
                        WHERE type='table';""", connect)
tables
```

Out[8]:

	type	name	tbl_name	rootpage	sql
0	table	sqlite_sequence	sqlite_sequence	4	CREATE TABLE sqlite_sequence(name,seq)
1	table	Player_Attributes	Player_Attributes	11	CREATE TABLE "Player_Attributes" (\n\t"id"...
2	table	Player	Player	14	CREATE TABLE "Player" (\n\t"id"\tINTEGER PRIMA...
3	table	Match	Match	18	CREATE TABLE "Match" (\n\t"id"\tINTEGER PRIMA...
4	table	League	League	24	CREATE TABLE "League" (\n\t"id"\tINTEGER PRIMA...
5	table	Country	Country	26	CREATE TABLE "Country" (\n\t"id"\tINTEGER PRIM...
6	table	Team	Team	29	CREATE TABLE "Team" (\n\t"id"\tINTEGER PRIMARY...
7	table	Team_Attributes	Team_Attributes	2	CREATE TABLE "Team_Attributes" (\n\t"id"\tINTE...

In [29]:
```
#4 countries average goals wrt leagues by season

avg_goal_countries = pd.read_sql("""SELECT COUNTRY.name AS country_name,LEAGUE.name AS league_name,season,

                                    AVG(home_team_goal) AS avg_home_goal, AVG(away_team_goal) AS avg_away_goal,

                                    AVG(home_team_goal+away_team_goal) AS avg_goal,
                                    SUM(home_team_goal+away_team_goal) AS total_goal
                                    FROM Match
                                        JOIN Country ON country_id = Match.country_id
                                        JOIN League ON league_id = Match.country_id
                                        WHERE country_name IN ('England','Spain','Portugal','Italy')

                                        GROUP BY COUNTRY.NAME, LEAGUE.name, season

                                        ORDER BY COUNTRY.name,season""",conn)
conn
avg_goal_countries
```

Out[29]:

	country_name	league_name	season	avg_home_goal	avg_away_goal	avg_goal	total_goal
0	England	England Premier League	2008/2009	1.400000	1.078947	2.478947	942
1	England	England Premier League	2009/2010	1.697368	1.073684	2.771053	1053
2	England	England Premier League	2010/2011	1.623684	1.173684	2.797368	1063
3	England	England Premier League	2011/2012	1.599474	1.215789	2.815263	1066
4	England	England Premier League	2012/2013	1.557895	1.226474	2.797368	1063
5	England	England Premier League	2013/2014	1.573684	1.194737	2.768421	1052
6	England	England Premier League	2014/2015	1.473684	1.052105	2.525789	975
7	England	England Premier League	2015/2016	1.492105	1.207895	2.700000	1026
8	Italy	Italy Serie A	2008/2009	1.521053	1.078947	2.600000	988
9	Italy	Italy Serie A	2009/2010	1.542105	1.094737	2.636526	992
10	Italy	Italy Serie A	2010/2011	1.431579	1.065579	2.513158	955
11	Italy	Italy Serie A	2011/2012	1.511173	1.072626	2.583799	925
12	Italy	Italy Serie A	2012/2013	1.494737	1.144737	2.639474	1003
13	Italy	Italy Serie A	2013/2014	1.536842	1.136842	2.673684	1035
14	Italy	Italy Serie A	2014/2015	1.486811	1.197335	2.686016	1018
15	Italy	Italy Serie A	2015/2016	1.471053	1.105263	2.576316	979
16	Portugal	Portugal Liga ZON Sagres	2008/2009	1.233333	1.066667	2.300000	552
17	Portugal	Portugal Liga ZON Sagres	2009/2010	1.387500	1.116667	2.504167	601
18	Portugal	Portugal Liga ZON Sagres	2010/2011	1.312500	1.120833	2.433333	584
19	Portugal	Portugal Liga ZON Sagres	2011/2012	1.495833	1.145833	2.641667	634
20	Portugal	Portugal Liga ZON Sagres	2012/2013	1.504167	1.275000	2.779167	667
21	Portugal	Portugal Liga ZON Sagres	2013/2014	1.329167	1.041667	2.370833	569
22	Portugal	Portugal Liga ZON Sagres	2014/2015	1.400980	1.042484	2.459464	702
23	Portugal	Portugal Liga ZON Sagres	2015/2016	1.513072	1.202614	2.715686	831
24	Spain	Spain LIGA BBVA	2008/2009	1.600526	1.236842	2.897368	1101
25	Spain	Spain LIGA BBVA	2009/2010	1.600000	1.113158	2.713158	1031
26	Spain	Spain LIGA BBVA	2010/2011	1.638842	1.105263	2.742105	1042
27	Spain	Spain LIGA BBVA	2011/2012	1.678947	1.084211	2.763158	1050
28	Spain	Spain LIGA BBVA	2012/2013	1.668842	1.136211	2.871053	1091
29	Spain	Spain LIGA BBVA	2013/2014	1.631579	1.118421	2.750000	1045
30	Spain	Spain LIGA BBVA	2014/2015	1.536842	1.110421	2.695263	1099
31	Spain	Spain LIGA BBVA	2015/2016	1.618421	1.126316	2.744737	1043

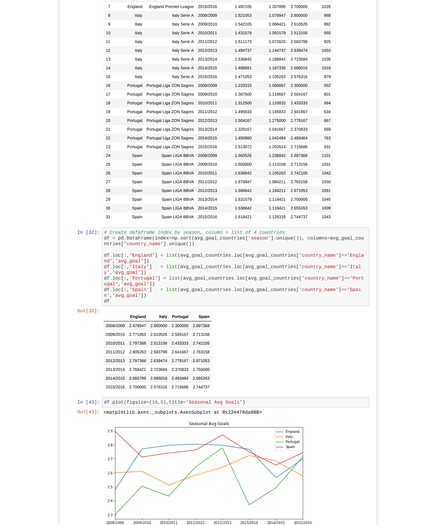
In [32]:
```
# Create dataframe index by season, column = list of 4 countries
df = pd.DataFrame(index=np.sort(avg_goal_countries['season'].unique()), columns=avg_goal_countries['country_name'].unique())

df.loc[:,'England'] = list(avg_goal_countries.loc[avg_goal_countries['country_name']=='England','avg_goal'])
df.loc[:,'Italy'] = list(avg_goal_countries.loc[avg_goal_countries['country_name']=='Italy','avg_goal'])
df.loc[:,'Portugal'] = list(avg_goal_countries.loc[avg_goal_countries['country_name']=='Portugal','avg_goal'])
df.loc[:,'Spain'] = list(avg_goal_countries.loc[avg_goal_countries['country_name']=='Spain','avg_goal'])
df
```

Out[32]:

	England	Italy	Portugal	Spain
2008/2009	2.478947	2.600000	2.300000	2.897368
2009/2010	2.771053	2.636526	2.504167	2.713158
2010/2011	2.797368	2.513158	2.433333	2.742105
2011/2012	2.815263	2.583799	2.641667	2.763158
2012/2013	2.797368	2.639474	2.779167	2.871053
2013/2014	2.768421	2.673684	2.370833	2.750000
2014/2015	2.525789	2.686016	2.459464	2.695263
2015/2016	2.700000	2.576316	2.715686	2.744737

In [43]:
```
df.plot(figsize=(10,5),title='Seasonal Avg Goals')
```

Out[43]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x22e476da98b8>
```



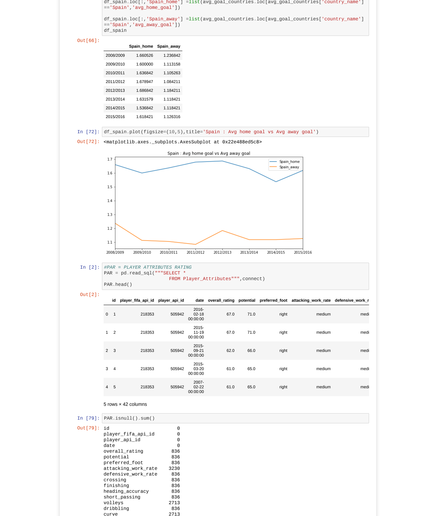
In [66]:
```
#Focus on Spain : home vs away
df_spain= pd.DataFrame(index=np.sort(avg_goal_countries['season'].unique()), columns=['Spain_home','Spain_away'])
df_spain.loc[:,'Spain_home'] =list(avg_goal_countries.loc[avg_goal_countries['country_name']=='Spain','avg_home_goal'])

df_spain.loc[:,'Spain_away'] =list(avg_goal_countries.loc[avg_goal_countries['country_name']=='Spain','avg_away_goal'])
df_spain
```

Out[66]:

	Spain_home	Spain_away
2008/2009	1.600526	1.236842
2009/2010	1.600000	1.113158
2010/2011	1.638842	1.105263
2011/2012	1.678947	1.084211
2012/2013	1.668842	1.136211
2013/2014	1.631579	1.118421
2014/2015	1.536842	1.110421
2015/2016	1.618421	1.126316

In [72]:
```
df_spain.plot(figsize=(10,5),title='Spain : Avg home goal vs Avg away goal')
```

Out[72]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x22e488e0bcf8>
```



In [2]:
```
#PAR = PLAYER ATTRIBUTES RATING
PAR = pd.read_sql("""SELECT *
                     FROM Player_Attributes""",connect)
PAR.head()
```

Out[2]:

	id	player_fifa_api_id	player_api_id	date	overall_rating	potential	preferred_foot	attacking_work_rate	defensive_work_r
0	1	218353	505942	2016-02-18 00:00:00	67.0	71.0	right	medium	medi
1	2	218353	505942	2015-11-19 00:00:00	67.0	71.0	right	medium	medi
2	3	218353	505942	2015-09-21 00:00:00	62.0	66.0	right	medium	medi
3	4	218353	505942	2015-03-20 00:00:00	61.0	65.0	right	medium	medi
4	5	218353	505942	2007-02-22 00:00:00	61.0	65.0	right	medium	medi

5 rows × 42 columns

In [79]:
```
PAR.isnull().sum()
```

Out[79]:
```
id                        0
player_fifa_api_id        0
player_api_id             0
date                      0
overall_rating          836
potential               836
preferred_foot          836
attacking_work_rate    3230
defensive_work_rate     836
crossing                836
finishing               836
heading_accuracy        836
short_passing           836
volleys                2713
dribbling               836
curve                  2713
free_kick_accuracy      836
long_passing            836
ball_control            836
acceleration            836
sprint_speed            836
agility                2713
reactions               836
balance                2713
shot_power              836
jumping                2713
stamina                 836
strength                836
long_shots              836
aggression              836
interceptions           836
positioning             836
vision                 2713
penalties               836
marking                 836
standing_tackle         836
sliding_tackle         2713
gk_diving               836
gk_handling             836
gk_kicking              836
gk_positioning          836
gk_reflexes             836
dtype: int64
```

In [3]:
```
PAR=PAR.dropna()
```

In [81]:
```
PAR.isnull().sum()
```

Out[81]:
```
id                     0
player_fifa_api_id     0
player_api_id          0
date                   0
overall_rating         0
potential              0
preferred_foot         0
attacking_work_rate    0
defensive_work_rate    0
crossing               0
finishing              0
heading_accuracy       0
short_passing          0
volleys                0
dribbling              0
curve                  0
free_kick_accuracy     0
long_passing           0
ball_control           0
acceleration           0
sprint_speed           0
agility                0
reactions              0
balance                0
shot_power             0
jumping                0
stamina                0
strength               0
long_shots             0
aggression             0
interceptions          0
positioning            0
vision                 0
penalties              0
marking                0
standing_tackle        0
sliding_tackle         0
gk_diving              0
gk_handling            0
gk_kicking             0
gk_positioning         0
gk_reflexes            0
dtype: int64
```

In [86]:
```
PAR.columns
```

Out[86]:
```
Index(['id', 'player_fifa_api_id', 'player_api_id', 'date', 'overall_rating',
       'potential', 'preferred_foot', 'attacking_work_rate',
       'defensive_work_rate', 'crossing', 'finishing', 'heading_accuracy',
       'short_passing', 'volleys', 'dribbling', 'curve', 'free_kick_accuracy',
       'long_passing', 'ball_control', 'acceleration', 'sprint_speed',
       'agility', 'reactions', 'balance', 'shot_power', 'jumping', 'stamina',
       'strength', 'long_shots', 'aggression', 'interceptions', 'positioning',
       'vision', 'penalties', 'marking', 'standing_tackle', 'sliding_tackle',
       'gk_diving', 'gk_handling', 'gk_kicking', 'gk_positioning',
       'gk_reflexes'],
      dtype='object')
```

In [10]:
```
#remove any str types
columns = ['crossing', 'finishing', 'heading_accuracy',
       'short_passing', 'volleys', 'dribbling', 'curve', 'free_kick_accuracy',
       'long_passing', 'ball_control', 'acceleration', 'sprint_speed',
       'agility', 'reactions', 'balance', 'shot_power', 'jumping', 'stamina',
       'strength', 'long_shots', 'aggression', 'interceptions', 'positioning',
       'vision', 'penalties', 'marking', 'standing_tackle', 'sliding_tackle',
       'gk_diving', 'gk_handling', 'gk_kicking', 'gk_positioning',
       'gk_reflexes'];
```

In [11]:
```
correlations = [ PAR['overall_rating'].corr(PAR[i]) for i in columns ]
```

In [26]:
```
df_corr =pd.DataFrame(index=np.sort(columns), columns=['Correlations'])
df_corr.loc[:,'Correlations'] =list(correlations)

df_corr
```

Out[26]:

	Correlations
acceleration	0.765435
aggression	0.357320
agility	0.330079
balance	0.311024
ball_control	0.492043
crossing	0.361739
curve	0.354181
dribbling	0.357569
finishing	0.348800
free_kick_accuracy	0.434625
gk_diving	0.443901
gk_handling	0.243998
gk_kicking	0.252046
gk_positioning	0.239963
gk_reflexes	0.771956
heading_accuracy	0.180211
interceptions	0.428353
jumping	0.258878
long_passing	0.505606
long_shots	0.531684
marking	0.360068
penalties	0.332702
positioning	0.249094
potential	0.380979
reactions	0.431493
short_passing	0.392715
shot_power	0.532185
sliding_tackle	0.163986
sprint_speed	0.128054
stamina	0.027675
standing_tackle	0.004717
strength	0.025799
vision	0.308629
volleys	0.357004

In [18]:
```
fig = plt.figure(figsize=(10,5))

ax = sns.pointplot(x = df_corr.index , y = df_corr.loc[:,'Correlations'],
                   color='red',markers='o')

plt.xticks(rotation = 70)
plt.grid(True,alpha=.2)
plt.ylabel('Correlation')
plt.title('Correlation of different attributes')
```

Out[18]:
```
Text(0.5, 1.0, 'Correlation of different attributes')
```