In [27]:

```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
import seaborn as sns
import time
sns.set_style("darkgrid")
%matplotlib inline
```

In [2]:

```
from nba_py.team import TeamYearOverYearSplits, TeamList
team_list = TeamList().info().head(30)
```

In [51]:

```
rockets = TeamYearOverYearSplits(1610612745).by_year()
rockets.head(1)
```

Out[51]:

	GROUP_SET	GROUP_VALUE	GP	W	L	W_PCT	MIN	FGM	FGA	FG_PCT	...	TOV_RANK
0	By Year	2017-18	71	57	14	0.803	48.1	39.0	84.1	0.463	...	3

1 rows × 56 columns

In [3]:

```
season_team = {}
for team in team_list['TEAM_ID']:
    df = TeamYearOverYearSplits(team,season_type='Playoffs').by_year()
    for index, row in df.iterrows():
        season_data =  season_team.get(row['GROUP_VALUE'])
        if season_data:
            if team not in season_team[row['GROUP_VALUE']]:
                season_team[row['GROUP_VALUE']].append(team)
        else:
            season_team[row['GROUP_VALUE']] = [team]
    time.sleep(2)
```

In [5]:

```
print(season_team.keys())
```

```
dict_keys(['2016-17', '2015-16', '2014-15', '2013-14', '2012-13', '2011-1
2', '2010-11', '2009-10', '2008-09', '2007-08', '1998-99', '1997-98', '19
96-97', '2017-18', '2004-05', '2003-04', '2002-03', '2001-02', '2006-07',
'2005-06', '2000-01', '1999-00'])
```

In [5]:

```
def playoff_team(team_id, season):
    if team_id in season_team[season]:
        return 1
    return 0
```

In [24]:

```
all_team_data = pd.DataFrame()
for team in team_list['TEAM_ID']:
    team_data = TeamYearOverYearSplits(team,measure_type = 'Advanced').b
    team_data['PLAYOFFS'] = team_data.apply(lambda row: playoff_team(tea
    all_team_data = pd.concat([all_team_data,team_data])
    time.sleep(2)
```

In [14]:

```python
all_team_data = pd.DataFrame()
for team in team_list['TEAM_ID']:
    team_data = TeamYearOverYearSplits(team).by_year()
    team_data['PLAYOFFS'] = team_data.apply(lambda row: playoff_team(tea
    all_team_data = pd.concat([all_team_data,team_data])
    time.sleep(2)
```

In [6]:

```python
regular_stats = pd.read_csv('all_team_playoffs.csv')
advs_stats = pd.read_csv('all_team_playoffs_adv.csv')
```

In [7]:

```python
regular_features = regular_stats[['FGM', 'FGA', 'FG_PCT', 'FG3M', 'FG3A
       'FT_PCT', 'OREB', 'DREB', 'REB', 'AST', 'TOV', 'STL', 'BLK', 'BLK
       'PF', 'PFD', 'PTS', 'PLUS_MINUS']]
```

In [8]:

```python
advs_features = advs_stats[['NET_RATING', 'AST_PCT', 'AST_TO',
       'AST_RATIO', 'OREB_PCT', 'DREB_PCT', 'REB_PCT', 'TM_TOV_PCT', 'EF
       'TS_PCT', 'PACE', 'PIE']]
```

In [17]:

```python
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(regular_features, re
```

In [10]:

```python
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report
regular_model = LogisticRegression()
regular_model.fit(X_train, y_train)
predictions = regular_model.predict(X_test)
print(classification_report(y_test,predictions))
```

```
             precision    recall  f1-score   support

          0       0.86      0.85      0.86        60
          1       0.88      0.89      0.88        71

avg / total       0.87      0.87      0.87       131
```

In [11]:

```python
from sklearn.svm import LinearSVC
regular_svc_model = LinearSVC()
regular_svc_model.fit(X_train, y_train)
predictions = regular_svc_model.predict(X_test)
print(classification_report(y_test,predictions))
```

```
             precision    recall  f1-score   support

          0       1.00      0.47      0.64        60
          1       0.69      1.00      0.82        71

avg / total       0.83      0.76      0.73       131
```

In [12]:
```
from sklearn.ensemble import RandomForestClassifier
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
```

```
             precision    recall  f1-score   support

          0       0.88      0.83      0.85        60
          1       0.86      0.90      0.88        71

avg / total       0.87      0.87      0.87       131
```

In [21]:
```
regular_rf.predict_proba(X_test)
```

Out[21]:
```
array([[ 0.62,  0.38],
       [ 0.98,  0.02],
       [ 0.13,  0.87],
       [ 0.73,  0.27],
       [ 0.22,  0.78],
       [ 0.22,  0.78],
       [ 0.39,  0.61],
       [ 0.85,  0.15],
       [ 0.04,  0.96],
       [ 0.39,  0.61],
       [ 0.16,  0.84],
       [ 0.41,  0.59],
       [ 0.05,  0.95],
       [ 0.79,  0.21],
       [ 0.89,  0.11],
       [ 0.35,  0.65],
       [ 0.66,  0.34],
       [ 0.35,  0.65],
       [ 0.1 ,  0.9 ],
```

In [20]:
```
predict_log_proba
```

Out[20]:
```
array([ 0.02610344,  0.03909278,  0.06409123,  0.02525342,  0.02537872,
        0.03521168,  0.02868007,  0.03343106,  0.01782621,  0.01773699,
        0.031882  ,  0.02688703,  0.03044183,  0.0347543 ,  0.03396836,
        0.02048325,  0.04116697,  0.01845484,  0.01581007,  0.02919107,
        0.40415468])
```

In [16]:
```
X_train, X_test, y_train, y_test = train_test_split(advs_features, advs_
```

In [14]:

```
adv_model = LogisticRegression()
adv_model.fit(X_train, y_train)
predictions = adv_model.predict(X_test)
print(classification_report(y_test,predictions))
```

```
             precision    recall  f1-score   support

          0       0.91      0.96      0.93        70
          1       0.95      0.89      0.92        61

avg / total       0.92      0.92      0.92       131
```

In [15]:

```
adv_rf = RandomForestClassifier(n_estimators=100)
adv_rf.fit(X_train,y_train)
predictions = adv_rf.predict(X_test)
print(classification_report(y_test,predictions))
```

```
             precision    recall  f1-score   support

          0       0.93      0.91      0.92        70
          1       0.90      0.92      0.91        61

avg / total       0.92      0.92      0.92       131
```

In [14]:

```
current_predictions_norm = {}
current_predictions_adv = {}
for index, row in team_list.iterrows():
    current = TeamYearOverYearSplits(row['TEAM_ID']).by_year()[['FGM',
        'FT_PCT', 'OREB', 'DREB', 'REB', 'AST', 'TOV', 'STL', 'BLK', 'BLI
        'PF', 'PFD', 'PTS', 'PLUS_MINUS']]
    current_adv = TeamYearOverYearSplits(row['TEAM_ID'],measure_type =
        'AST_RATIO', 'OREB_PCT', 'DREB_PCT', 'REB_PCT', 'TM_TOV_PCT', 'EI
        'TS_PCT', 'PACE', 'PIE']]
    current_predictions_norm[row['ABBREVIATION']] = regular_model.predic
    current_predictions_adv[row['ABBREVIATION']] = adv_model.predict(cu
```

In [18]:

```
r_features = ['FGM', 'FGA', 'FG_PCT', 'FG3M', 'FG3A', 'FG3_PCT', 'FTM',
        'FT_PCT', 'OREB', 'DREB', 'REB', 'AST', 'TOV', 'STL', 'BLK', 'BLI
        'PF', 'PFD', 'PTS', 'PLUS_MINUS']
r_features_no_plusminus = ['FGM', 'FGA', 'FG_PCT', 'FG3M', 'FG3A', 'FG3_
        'FT_PCT', 'OREB', 'DREB', 'REB', 'AST', 'TOV', 'STL', 'BLK', 'BLI
        'PF', 'PFD', 'PTS']
a_features = ['NET_RATING', 'AST_PCT', 'AST_TO',
        'AST_RATIO', 'OREB_PCT', 'DREB_PCT', 'REB_PCT', 'TM_TOV_PCT', 'EI
        'TS_PCT', 'PACE', 'PIE']
```

In [20]:

```
playoff_reg_east = pd.read_csv('playoff_reg_east.csv')
playoff_reg_west = pd.read_csv('playoff_reg_west.csv')

playoff_reg_east_features = playoff_reg_east[r_features]
playoff_reg_west_features = playoff_reg_west[r_features]
```

In [21]:

```
playoff_adv_east = pd.read_csv('playoff_adv_east.csv')
playoff_adv_west = pd.read_csv('playoff_adv_west.csv')

playoff_adv_east_features = playoff_adv_east[a_features]
playoff_adv_west_features = playoff_adv_west[a_features]
```

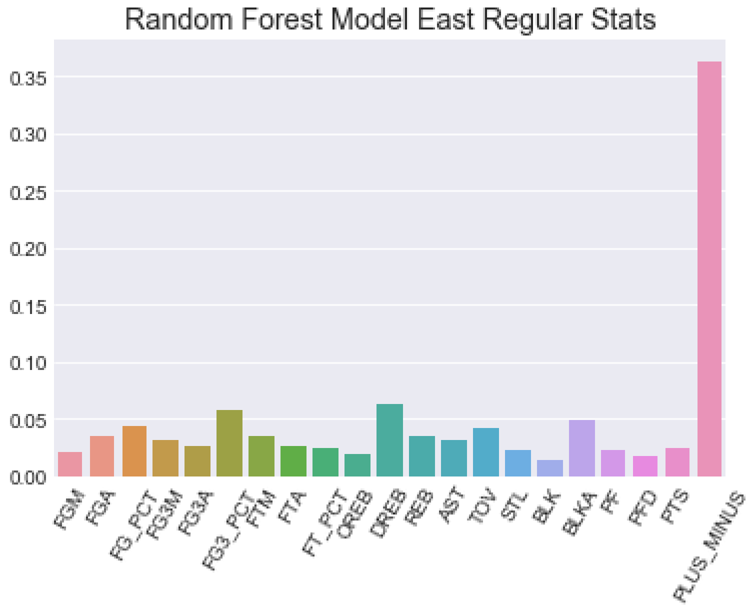
In [22]:

```
X_train, X_test, y_train, y_test = train_test_split(playoff_reg_east_fea
```

In [28]:

```
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report

X_train, X_test, y_train, y_test = train_test_split(playoff_reg_east_fea
print("Logistic Model East Regular Stats ")
logistic_model = LogisticRegression()
logistic_model.fit(X_train, y_train)
predictions = logistic_model.predict(X_test)
print(classification_report(y_test,predictions))

print("Random Forest Model East Regular Stats ")
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
ax = plt.axes()
feature_weights = regular_rf.feature_importances_
bar_plot = sns.barplot(x=r_features,y=feature_weights)
ax.set_title('Random Forest Model East Regular Stats')
ticks = plt.xticks(rotation=60)
```

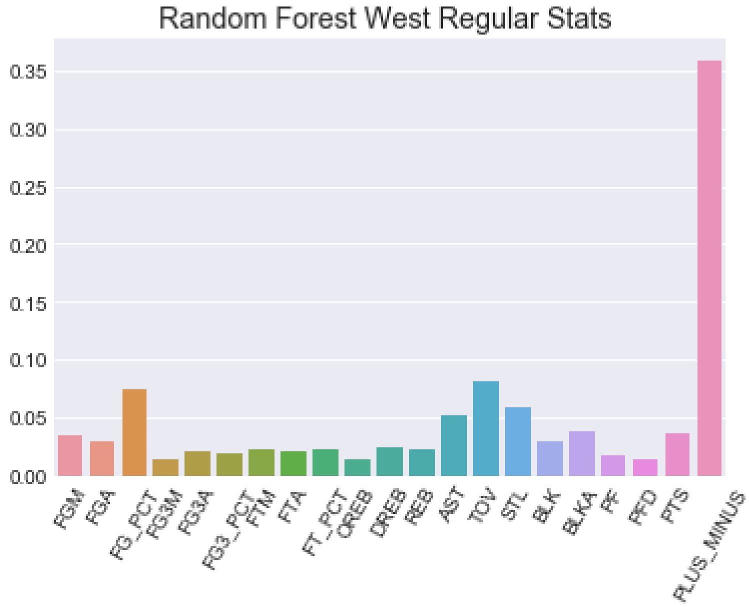
```
Logistic Model East Regular Stats
             precision    recall  f1-score   support

          0       0.83      0.94      0.88        48
          1       0.93      0.82      0.87        51

avg / total       0.88      0.88      0.88        99

Random Forest Model East Regular Stats
             precision    recall  f1-score   support

          0       0.85      0.94      0.89        48
          1       0.93      0.84      0.89        51

avg / total       0.89      0.89      0.89        99
```



In [29]:

```
X_train, X_test, y_train, y_test = train_test_split(playoff_reg_west_fea
print("Logistic Model West Regular Stats ")
logistic_model = LogisticRegression()
logistic_model.fit(X_train, y_train)
predictions = logistic_model.predict(X_test)
print(classification_report(y_test,predictions))

print("Random Forest West Regular Stats ")
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
ax = plt.axes()
feature_weights = regular_rf.feature_importances_
bar_plot = sns.barplot(x=r_features,y=feature_weights)
ax.set_title('Random Forest West Regular Stats ')
ticks = plt.xticks(rotation=60)
```

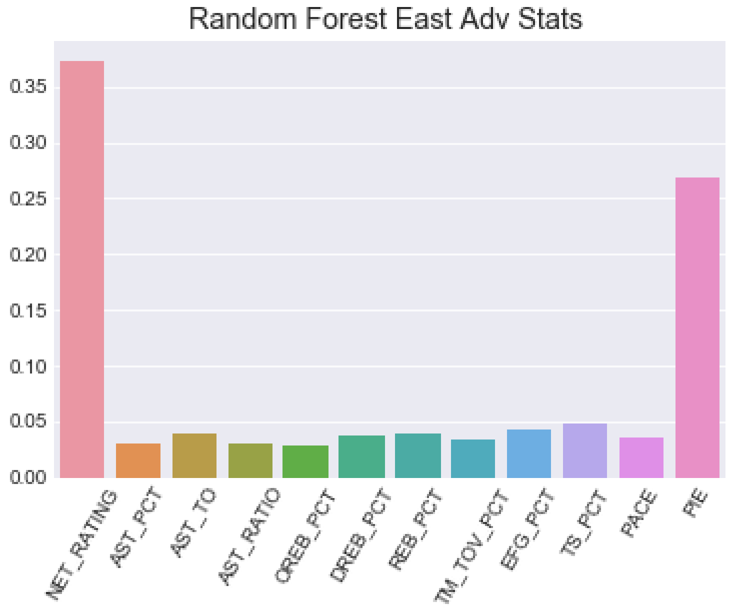
```
Logistic Model West Regular Stats
             precision    recall  f1-score   support

          0       0.90      0.84      0.87        44
          1       0.88      0.93      0.90        54

avg / total       0.89      0.89      0.89        98

Random Forest West Regular Stats
             precision    recall  f1-score   support

          0       0.95      0.86      0.90        44
          1       0.90      0.96      0.93        54

avg / total       0.92      0.92      0.92        98
```



In [31]:

```
X_train, X_test, y_train, y_test = train_test_split(playoff_adv_east_fea
print("Logistic Model East Adv Stats ")
logistic_model = LogisticRegression()
logistic_model.fit(X_train, y_train)
predictions = logistic_model.predict(X_test)
print(classification_report(y_test,predictions))

print("Random Forest East Adv Stats ")
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
ax = plt.axes()
feature_weights = regular_rf.feature_importances_
bar_plot = sns.barplot(x=a_features,y=feature_weights)
ax.set_title('Random Forest East Adv Stats ')
ticks = plt.xticks(rotation=60)
```

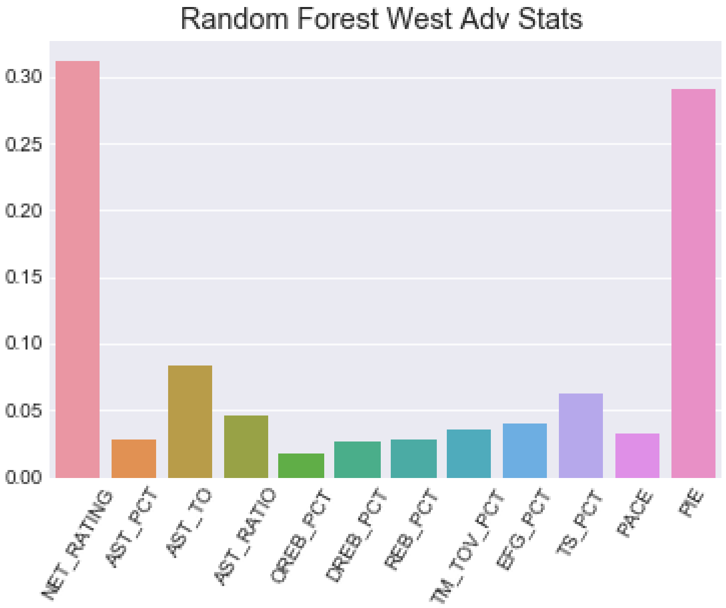
```
Logistic Model East Adv Stats
             precision    recall  f1-score   support

          0       0.87      0.96      0.91        48
          1       0.96      0.86      0.91        51

avg / total       0.91      0.91      0.91        99

Random Forest East Adv Stats
             precision    recall  f1-score   support

          0       0.87      0.96      0.91        48
          1       0.96      0.86      0.91        51

avg / total       0.91      0.91      0.91        99
```



In [32]:

```
X_train, X_test, y_train, y_test = train_test_split(playoff_adv_west_fea
print("Logistic Model West Adv Stats ")
logistic_model = LogisticRegression()
logistic_model.fit(X_train, y_train)
predictions = logistic_model.predict(X_test)
print(classification_report(y_test,predictions))

print("Random Forest West Adv Stats ")
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
ax = plt.axes()
feature_weights = regular_rf.feature_importances_
bar_plot = sns.barplot(x=a_features,y=feature_weights)
ax.set_title('Random Forest West Adv Stats ')
ticks = plt.xticks(rotation=60)
```

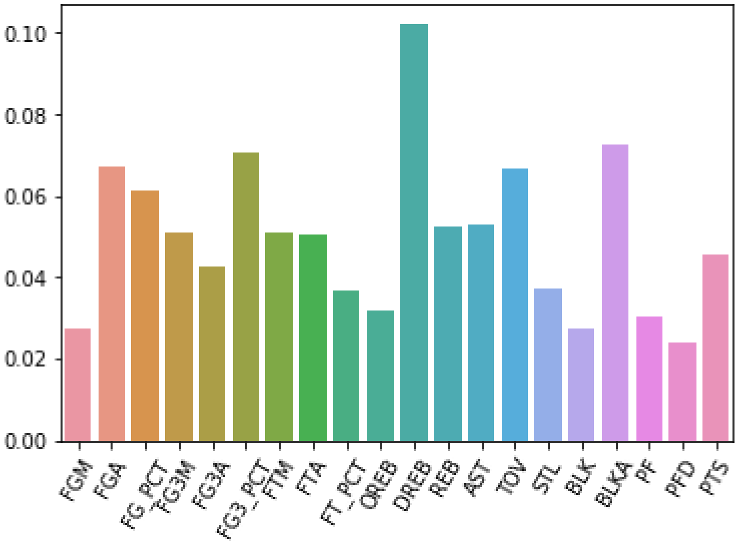
```
Logistic Model West Adv Stats
             precision    recall  f1-score   support

          0       0.95      0.84      0.89        44
          1       0.88      0.96      0.92        54

avg / total       0.91      0.91      0.91        98

Random Forest West Adv Stats
             precision    recall  f1-score   support

          0       0.95      0.86      0.90        44
          1       0.90      0.96      0.93        54

avg / total       0.92      0.92      0.92        98
```



In [53]:

```
playoff_reg_east_features = playoff_reg_east[r_features_no_plusminus]

X_train, X_test, y_train, y_test = train_test_split(playoff_reg_east_fea
print("Random Forest Model East Regular Stats ")
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
feature_weights = regular_rf.feature_importances_
bar_plot = sns.barplot(x=r_features_no_plusminus,y=feature_weights)
ticks = plt.xticks(rotation=60)
```

```
Random Forest Model East Regular Stats
             precision    recall  f1-score   support

          0       0.73      0.73      0.73        48
          1       0.75      0.75      0.75        51

avg / total       0.74      0.74      0.74        99
```



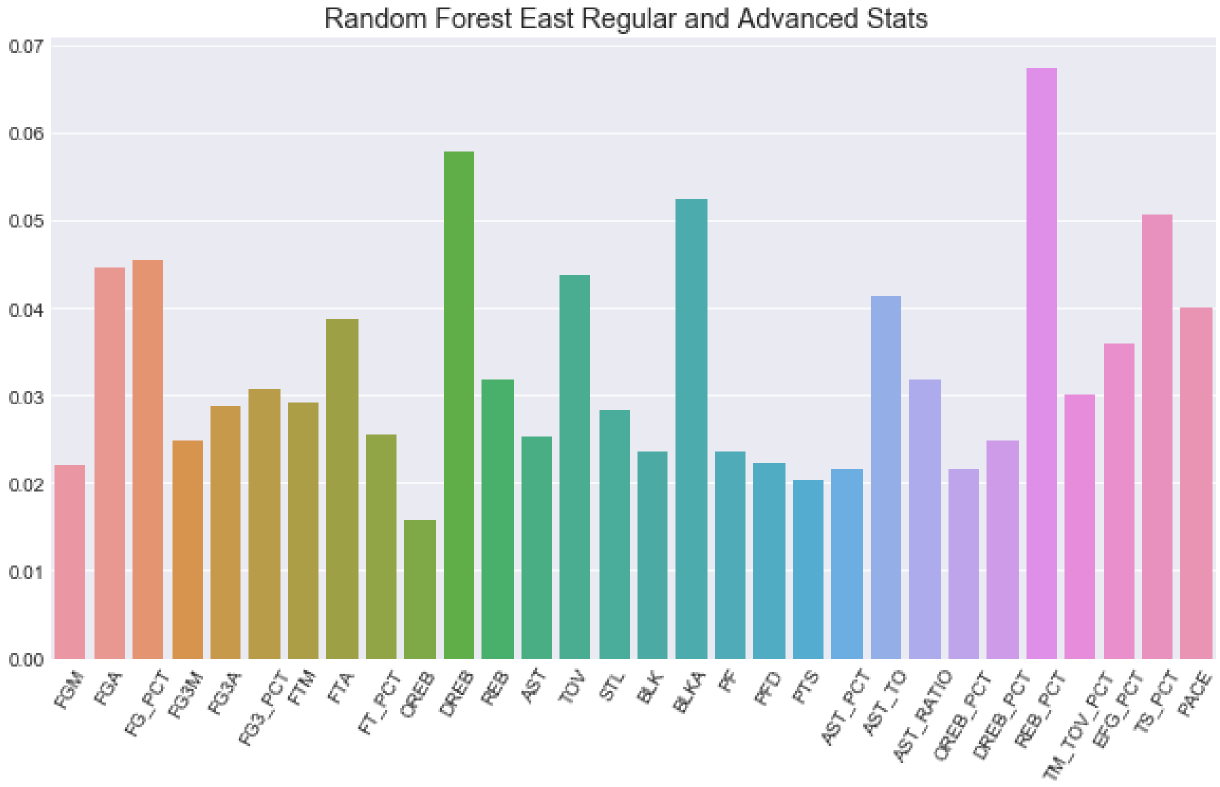
In [58]:

```
all_east_stats = pd.concat([playoff_reg_east_features, playoff_adv_east_
all_west_stats = pd.concat([playoff_reg_west_features, playoff_adv_west_
mixed_features = ['FGM', 'FGA', 'FG_PCT', 'FG3M', 'FG3A', 'FG3_PCT', 'FT
        'FT_PCT', 'OREB', 'DREB', 'REB', 'AST', 'TOV', 'STL', 'BLK', 'BLI
        'PF', 'PFD', 'PTS', 'AST_PCT', 'AST_TO',
        'AST_RATIO', 'OREB_PCT', 'DREB_PCT', 'REB_PCT', 'TM_TOV_PCT', 'EI
        'TS_PCT', 'PACE']
all_east_features = all_east_stats[mixed_features]
all_west_features = all_west_stats[mixed_features]
```

In [59]:

```
X_train, X_test, y_train, y_test = train_test_split(all_east_features, 
print("Random Forest East Regular and Advanced Stats ")
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
fig, ax = plt.subplots(figsize=(11,6))
feature_weights = regular_rf.feature_importances_
bar_plot = sns.barplot(x=mixed_features,y=feature_weights)
ax.set_title('Random Forest East Regular and Advanced Stats  ')
ticks = plt.xticks(rotation=60)
```

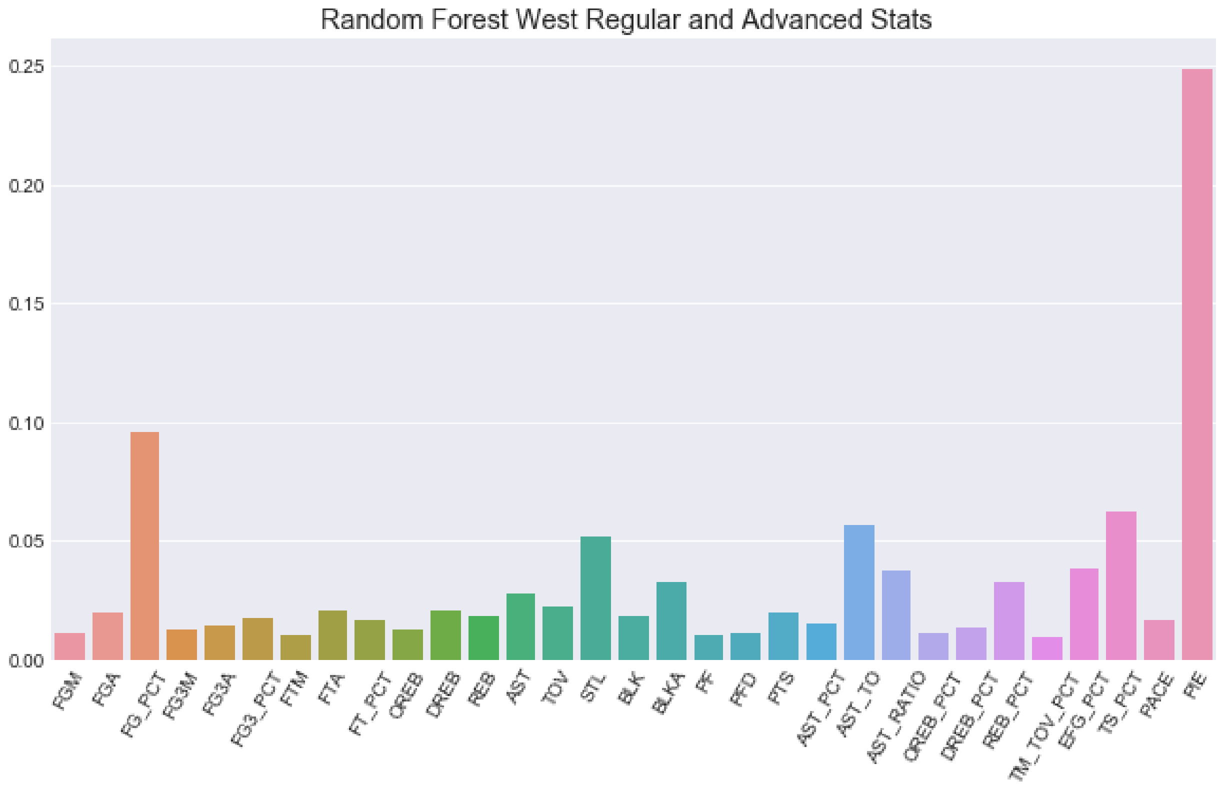
```
Random Forest East Regular and Advanced Stats
             precision    recall  f1-score   support

          0       0.79      0.76      0.77        45
          1       0.80      0.83      0.82        54

avg / total       0.80      0.80      0.80        99
```



In [57]:

```
X_train, X_test, y_train, y_test = train_test_split(all_west_features, p
print("Random Forest West Regular and Advanced Stats ")
regular_rf = RandomForestClassifier(n_estimators=100)
regular_rf.fit(X_train,y_train)
predictions = regular_rf.predict(X_test)
print(classification_report(y_test,predictions))
fig, ax = plt.subplots(figsize=(11,6))
feature_weights = regular_rf.feature_importances_
bar_plot = sns.barplot(x=mixed_features,y=feature_weights)
ax.set_title('Random Forest West Regular and Advanced Stats  ')
ticks = plt.xticks(rotation=60)
```

```
Random Forest West Regular and Advanced Stats
             precision    recall  f1-score   support

          0       0.84      0.91      0.87        34
          1       0.93      0.87      0.90        47

avg / total       0.89      0.89      0.89        81
```


Random Forest West Regular and Advanced Stats
FGM
FGA
FG_PCT
FG3M
FG3A
FG3_PCT
FTM
FTA
FT_PCT
OREB
DREB
REB
AST
TOV
STL
BLK
BLKA
PF
PFD
PTS
AST_PCT
AST_TO
AST_RATIO
OREB_PCT
DREB_PCT
REB_PCT
TM_TOV_PCT
EFG_PCT
TS_PCT
PACE
PIE