

In [1]:

```
import pyodbc
```

In [2]:

```
conn = pyodbc.connect(r'DSN=tekkredi;UID=yavuzs;PWD=18651438-155E-4450-859D-803181407D18')
```

In [3]:

```
import pandas as pd
import numpy as np
```

In [4]:

```
#database connection and import table
df2 = pd.read_sql("select * from dbo.ConsCredPerf_2", conn)
```

In [5]:

```
import matplotlib.pyplot as plt
import seaborn as sns
sns.set(style="white") #white background style for seaborn plots
sns.set(style="whitegrid", color_codes=True)
```

In [6]:

```
df2['Year'] = df2['StartDate'].dt.year
df2['Default'] = np.where(df2['DefMon'] > 0, 'Def', 'NonDef')
df2['Maturity'] = np.where(df2['CredTime'] <= 12, '0-12',
                           (np.where(df2['CredTime'] <= 24, '12-24',
                                       (np.where(df2['CredTime'] <= 36, '24-36',
                                                 (np.where(df2['CredTime'] <= 48, '36-48',
                                                           '>48'))))))))
df2['Maturity_2'] = np.where(df2['Installment'] <= 12, '0-12',
                             (np.where(df2['Installment'] <= 24, '12-24',
                                       (np.where(df2['Installment'] <= 36, '24-36',
                                                 (np.where(df2['Installment'] <= 48, '36-48',
                                                           '>48'))))))))
df2['TermRatio'] = np.where(df2['Installment'] == 0, 0, df2['CredTime'] / df2['Installment'])
```

In [7]:

```
df2.head()
```

Out[7]:

	CustomerId	ReferenceNo	CreditLimit	StartDate	EndDate	Occp	DefMon	CredTime	Installment	CredStat	Year
0	4EF95873-C58C-4323-AA9E-060826AF4A0F	0093557431285G	10000.0	2014-06-05	2015-01-05	1.00	0	7	36.0	Closed	2014
1	4EF95873-C58C-4323-AA9E-060826AF4A0F	1052557067285I	10000.0	2016-10-24	NaT	1.00	0	19	36.0	Open	2016
2	4EF95873-C58C-4323-AA9E-060826AF4A0F	2420414329080I	3500.0	2015-07-13	NaT	0.97	0	34	36.0	Open	2015
3	4EF95873-C58C-4323-AA9E-060826AF4A0F	27668948337182D	5000.0	2014-06-05	2016-12-05	0.83	0	30	36.0	Closed	2014

	CustomerId	ReferenceNo	CreditLimit	StartDate	EndDate	Occp	DefMon	CredTime	Installment	CredStat	Year
4	AA9E-060826AF4A0F	2969778214253A	5000.0	2017-03-24	NaT	1.00	0	14	48.0	Open	2017

In [8]:

```
#All
bin_1=[0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60]

All_Def = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def')]
Count_All = df2.DefMon[(df2.Occp >= 0.5)].count()
```

In [89]:

```
#All Sample
df2.DefMon.count(), df2.DefMon[(df2.Default == 'Def')].count()
#df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def')].count() / df2.DefMon[(df2.Occp >= 0.5)].count()
```

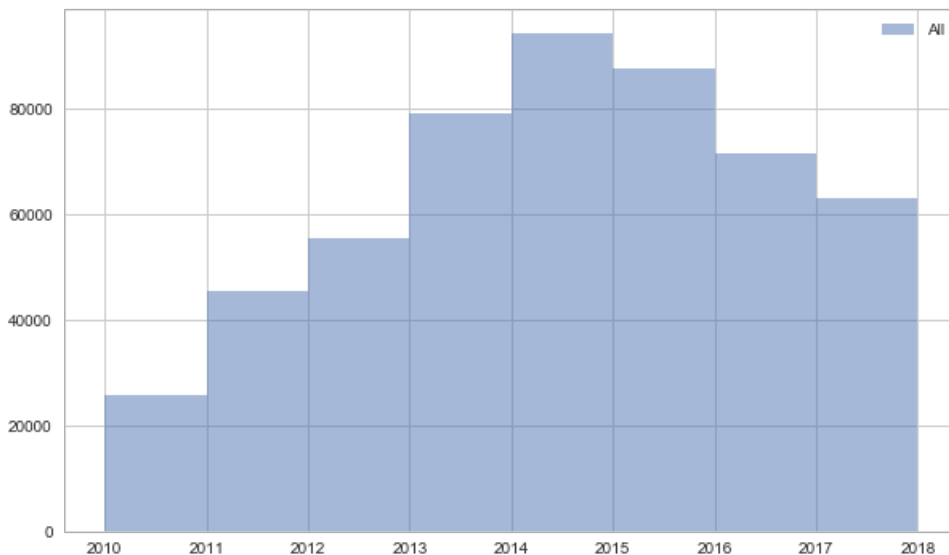
Out[89]:

```
(534209, 31091)
```

In [90]:

```
plt.figure(figsize=(10,6))
bin_2=[2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018]
hist_1 = plt.hist(df2.Year, bins=bin_2, alpha=0.5, label='All')

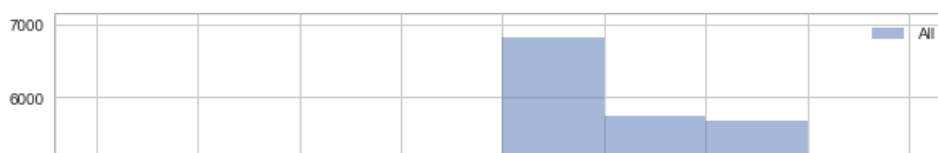
plt.legend(loc='upper right')
plt.show()
```

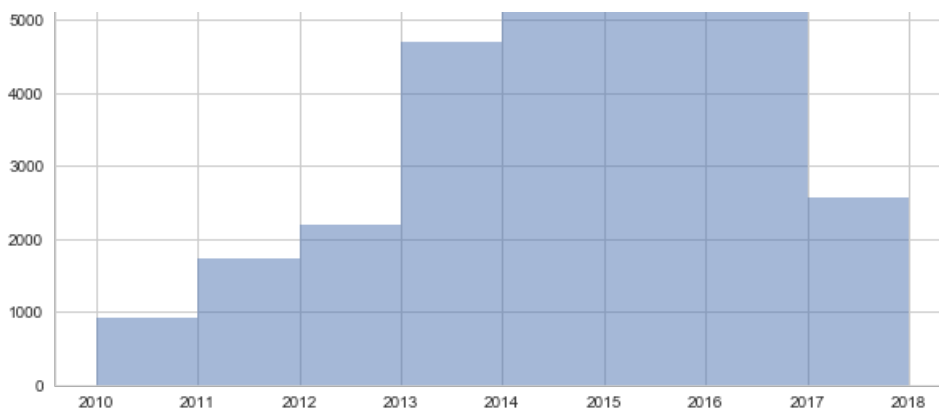


In [91]:

```
plt.figure(figsize=(10,6))
hist_2 = plt.hist(df2.Year[(df2.Default == 'Def')], bins=bin_2, alpha=0.5, label='All')

plt.legend(loc='upper right')
plt.show()
```





In [15]:

```
#Maturity
bin_1=[0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60]

Def_0_12 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '0-12')]
Count_0_12 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '0-12')].count()

Def_12_24 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '12-24')]
Count_12_24 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '12-24')].count()

Def_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36')]
Count_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36')].count()

Def_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '36-48')]
Count_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '36-48')].count()
```

In [112]:

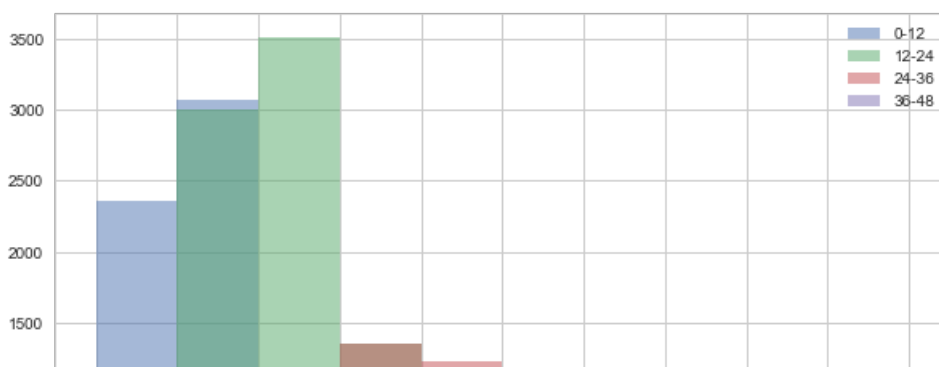
```
print('Matur', 'Default', 'All')
print(' 0-12', Def_0_12.count(), Count_0_12)
print('12-24', Def_12_24.count(), Count_12_24)
print('24-36', Def_24_36.count(), Count_24_36)
print('36-48', Def_36_48.count(), Count_36_48)
```

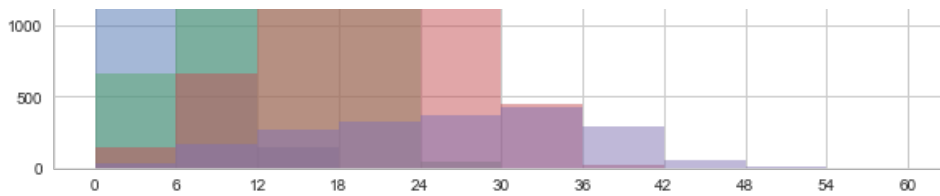
```
Matur Default All
0-12 5569 199800
12-24 8573 114633
24-36 5018 43582
36-48 1944 6773
```

In [41]:

```
#Maturity hist
plt.figure(figsize=(10,6))
hist_0_12 = plt.hist(Def_0_12.dropna(), bins=bin_1, alpha=0.5, label='0-12')
hist_12_24 = plt.hist(Def_12_24.dropna(), bins=bin_1, alpha=0.5, label='12-24')
hist_24_36 = plt.hist(Def_24_36.dropna(), bins=bin_1, alpha=0.5, label='24-36')
hist_36_48 = plt.hist(Def_36_48.dropna(), bins=bin_1, alpha=0.5, label='36-48')

plt.legend(loc='upper right')
plt.xticks([0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
plt.show()
```





In [23]:

```
#Maturity hist2
hist_0_12a, bins_1a = np.histogram(Def_0_12, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
hist_0_12a = [float(n)/Count_0_12 for n in hist_0_12a]

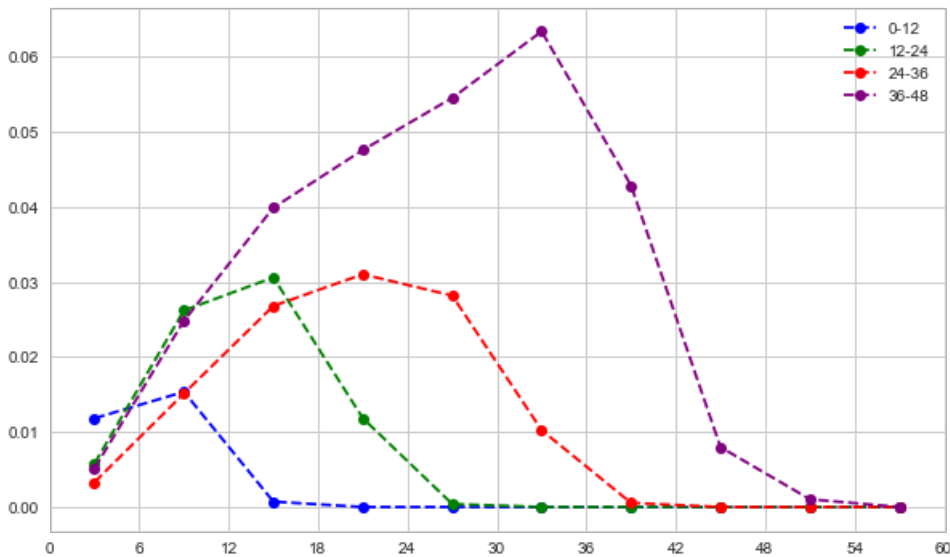
hist_12_24a, bins_1a = np.histogram(Def_12_24, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
hist_12_24a = [float(n)/Count_12_24 for n in hist_12_24a]

hist_24_36a, bins_1a = np.histogram(Def_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
hist_24_36a = [float(n)/Count_24_36 for n in hist_24_36a]

hist_36_48a, bins_1a = np.histogram(Def_36_48, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
hist_36_48a = [float(n)/Count_36_48 for n in hist_36_48a]
```

In [38]:

```
plt.figure(figsize=(10,6))
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist_0_12a, color='blue', linestyle='dashed', marker='o', label = '0-12')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist_12_24a, color='green', linestyle='dashed', marker='o', label = '12-24')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist_24_36a, color='red', linestyle='dashed', marker='o', label = '24-36')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist_36_48a, color='purple', linestyle='dashed', marker='o', label = '36-48')
plt.xticks([0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
plt.legend(loc='upper right')
plt.show()
```



In [65]:

```
Def2010_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36') & (df2.Year == 2010)]
Count2010_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36') & (df2.Year == 2010)].count()

Def2011_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36') & (df2.Year == 2011)]
Count2011_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36') & (df2.Year == 2011)].count()

Def2012_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36') & (df2.Year == 2012)]
Count2012_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36') & (df2.Year == 2012)].count()
```

```

unt()

Def2013_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36') &
(df2.Year == 2013)]
Count2013_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36') & (df2.Year == 2013)].co
unt()

Def2014_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36') &
(df2.Year == 2014)]
Count2014_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36') & (df2.Year == 2014)].co
unt()

Def2015_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36') &
(df2.Year == 2015)]
Count2015_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36') & (df2.Year == 2015)].co
unt()

Def2016_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '24-36') &
(df2.Year == 2016)]
Count2016_24_36 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '24-36') & (df2.Year == 2016)].co
unt()

```

In [64]:

```

hist2010_24_36a, bins_1a = np.histogram(Def2010_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2010_24_36a = [float(n)/Count2010_24_36 for n in hist2010_24_36a]

hist2011_24_36a, bins_1a = np.histogram(Def2011_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2011_24_36a = [float(n)/Count2011_24_36 for n in hist2011_24_36a]

hist2012_24_36a, bins_1a = np.histogram(Def2012_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2012_24_36a = [float(n)/Count2012_24_36 for n in hist2012_24_36a]

hist2013_24_36a, bins_1a = np.histogram(Def2013_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2013_24_36a = [float(n)/Count2013_24_36 for n in hist2013_24_36a]

hist2014_24_36a, bins_1a = np.histogram(Def2014_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2014_24_36a = [float(n)/Count2014_24_36 for n in hist2014_24_36a]

hist2015_24_36a, bins_1a = np.histogram(Def2015_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2015_24_36a = [float(n)/Count2015_24_36 for n in hist2015_24_36a]

hist2016_24_36a, bins_1a = np.histogram(Def2016_24_36, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2016_24_36a = [float(n)/Count2016_24_36 for n in hist2016_24_36a]

```

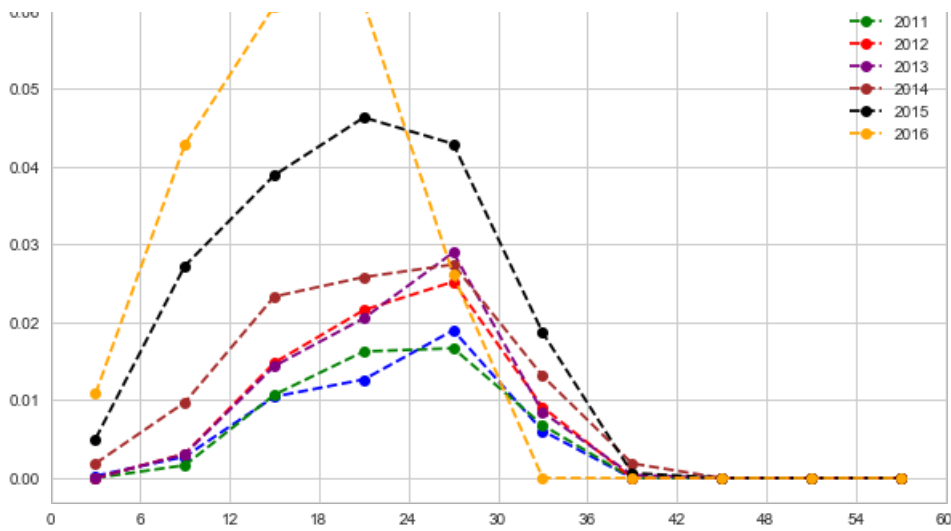
In [68]:

```

plt.figure(figsize=(10,6))
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2010_24_36a, color='blue', linestyle='dashed', marker='o'
, label = '2010')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2011_24_36a, color='green', linestyle='dashed', marker='o'
, label = '2011')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2012_24_36a, color='red', linestyle='dashed', marker='o'
, label = '2012')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2013_24_36a, color='purple', linestyle='dashed', marker='o'
, label = '2013')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2014_24_36a, color='brown', linestyle='dashed', marker='o'
, label = '2014')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2015_24_36a, color='black', linestyle='dashed', marker='o'
, label = '2015')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2016_24_36a, color='orange', linestyle='dashed', marker='o'
, label = '2016')
plt.xticks([0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
plt.legend(loc='upper right')
plt.show()

```





In [81]:

```
Def2010_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '36-48') &
(df2.Year == 2010)]
Count2010_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '36-48') & (df2.Year == 2010)].co
unt()

Def2011_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '36-48') &
(df2.Year == 2011)]
Count2011_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '36-48') & (df2.Year == 2011)].co
unt()

Def2012_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '36-48') &
(df2.Year == 2012)]
Count2012_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '36-48') & (df2.Year == 2012)].co
unt()

Def2013_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '36-48') &
(df2.Year == 2013)]
Count2013_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '36-48') & (df2.Year == 2013)].co
unt()

Def2014_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '36-48') &
(df2.Year == 2014)]
Count2014_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '36-48') & (df2.Year == 2014)].co
unt()

Def2015_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Default == 'Def') & (df2.Maturity == '36-48') &
(df2.Year == 2015)]
Count2015_36_48 = df2.DefMon[(df2.Occp >= 0.5) & (df2.Maturity == '36-48') & (df2.Year == 2015)].co
unt()
```

In [83]:

```
hist2010_36_48a, bins_1a = np.histogram(Def2010_36_48, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2010_36_48a = [float(n)/Count2010_36_48 for n in hist2010_36_48a]

hist2011_36_48a, bins_1a = np.histogram(Def2011_36_48, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2011_36_48a = [float(n)/Count2011_36_48 for n in hist2011_36_48a]

hist2012_36_48a, bins_1a = np.histogram(Def2012_36_48, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2012_36_48a = [float(n)/Count2012_36_48 for n in hist2012_36_48a]

hist2013_36_48a, bins_1a = np.histogram(Def2013_36_48, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2013_36_48a = [float(n)/Count2013_36_48 for n in hist2013_36_48a]

hist2014_36_48a, bins_1a = np.histogram(Def2014_36_48, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
hist2014_36_48a = [float(n)/Count2014_36_48 for n in hist2014_36_48a]

hist2015_36_48a, bins_1a = np.histogram(Def2015_36_48, bins = [0, 6, 12, 18, 24, 30, 36, 42, 48, 54
, 60])
```

```
hist2015_36_48a = [float(n)/Count2015_36_48 for n in hist2015_36_48a]
```

C:\Users\Tekkredi\Anaconda3\lib\site-packages\ipykernel_launcher.py:2: RuntimeWarning: invalid value encountered in true_divide

In [88]:

```
plt.figure(figsize=(10,6))
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2011_36_48a, color='green', linestyle='dashed', marker='o', label = '2011')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2012_36_48a, color='red', linestyle='dashed', marker='o', label = '2012')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2013_36_48a, color='purple', linestyle='dashed', marker='o', label = '2013')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2014_36_48a, color='brown', linestyle='dashed', marker='o', label = '2014')
plt.plot((bins_1a[:-1]+bins_1a[1:])/2, hist2015_36_48a, color='black', linestyle='dashed', marker='o', label = '2015')
plt.xticks([0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60])
plt.legend(loc='upper right')
plt.show()
```

