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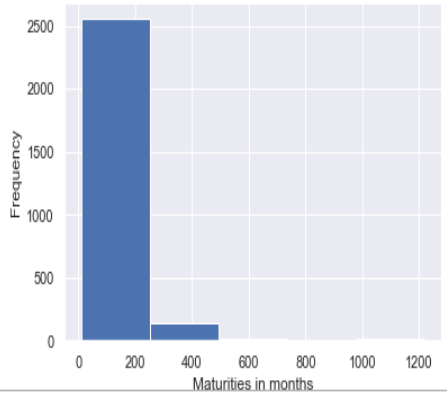
In [135]:
```
# Import the `pandas` library as `pd`
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
# Load in the data with `read_csv()`
hy = pd.read_csv(r'C:\Users\ankur\OneDrive\Desktop\Machine Learning\IE598_F1Ankur_HW3\HY_Universe_corporate bond.csv')
hy.head()

#Histogram to plot Maturity Distribution of the bond universe
sns.set()
plt.hist(hy['Maturity At Issue months'],bins=5)
plt.xlabel('Maturities in months')
plt.ylabel('Frequency')
plt.show()


#Inference:
print("Observation 1: Most of the bonds(around 2500) have maturities <=200 months or 16 years")
```



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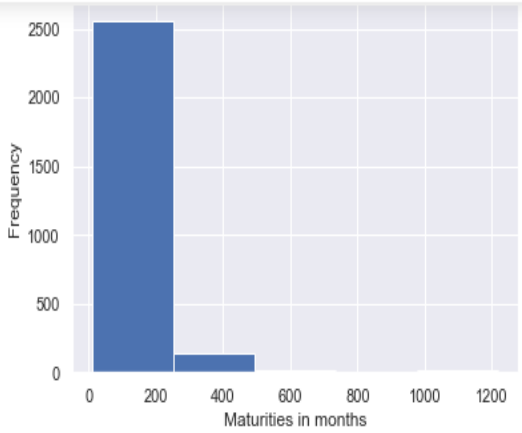

Observation 1: Most of the bonds(around 2500) have maturities <=200 months or 16 years

In [136]:
```
#Liquidity Metrics Analysis
#Finding out the best measure for liquidity
print("Liquidity correlation with weekly_mean_ntrades")
hy['LiquidityScore'].corr(hy['weekly_mean_ntrades'])
```

```
Liquidity correlation with weekly_mean_ntrades
```

Out[136]: 0.6735692718631965

In [138]:
```
print("Liquidity correlation with weekly_mean_volume")
hy['LiquidityScore'].corr(hy['weekly_mean_volume'])
```

```
Liquidity correlation with weekly_mean_volume
```

Out[138]: 0.3859779715509154

In [139]:
```
print("Liquidity correlation with weekly_mean_volume")
hy['LiquidityScore'].corr(hy['weekly_mean_volume'])
```

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Liquidity correlation with weekly_mean_volume

Out[139]: 0.3859779715509154

In [140]:
```
print("Observation 2: Hence, weekly_mean_ntrades is the best indicator of liquidity")
```

```
Observation 2: Hence, weekly_mean_ntrades is the best indicator of liquidity
```

In [141]:
```
#Bee Swarm plot for liquidity vs weekly_mean_ntrades
sns.swarmplot(x='weekly_mean_ntrades', y='LiquidityScore', data=hy)
plt.xlabel('Weekly Mean Trades')
plt.ylabel('Liquidity Score')
plt.show()
```

In [142]:
```
#Summary Statistics of the bond universe
#Maturity Statistics
mean_mat = hy['Maturity At Issue months'].mean()
print("Avg Maturity: " + str(mean_mat))

median_mat = hy['Maturity At Issue months'].median()
```

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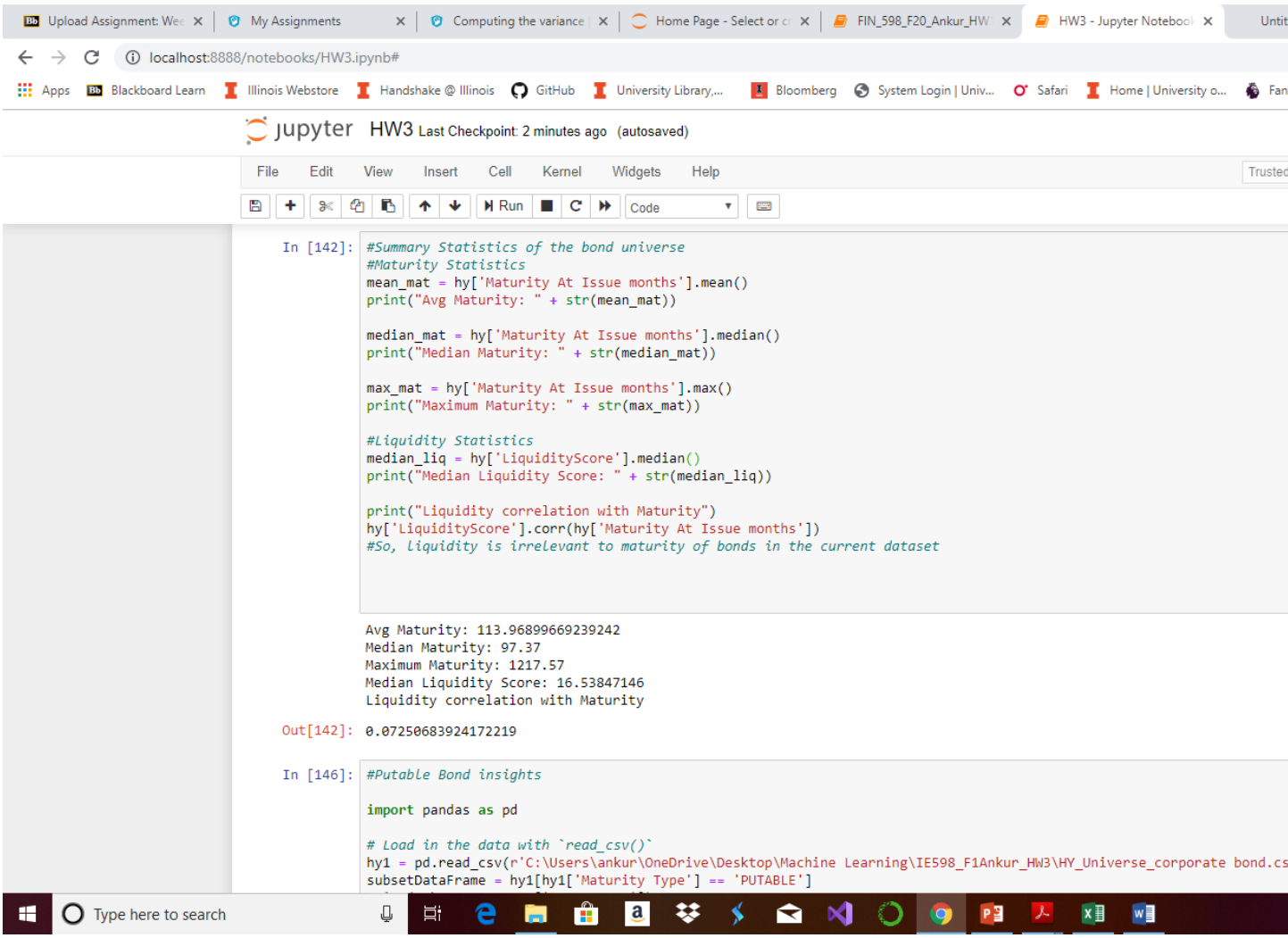
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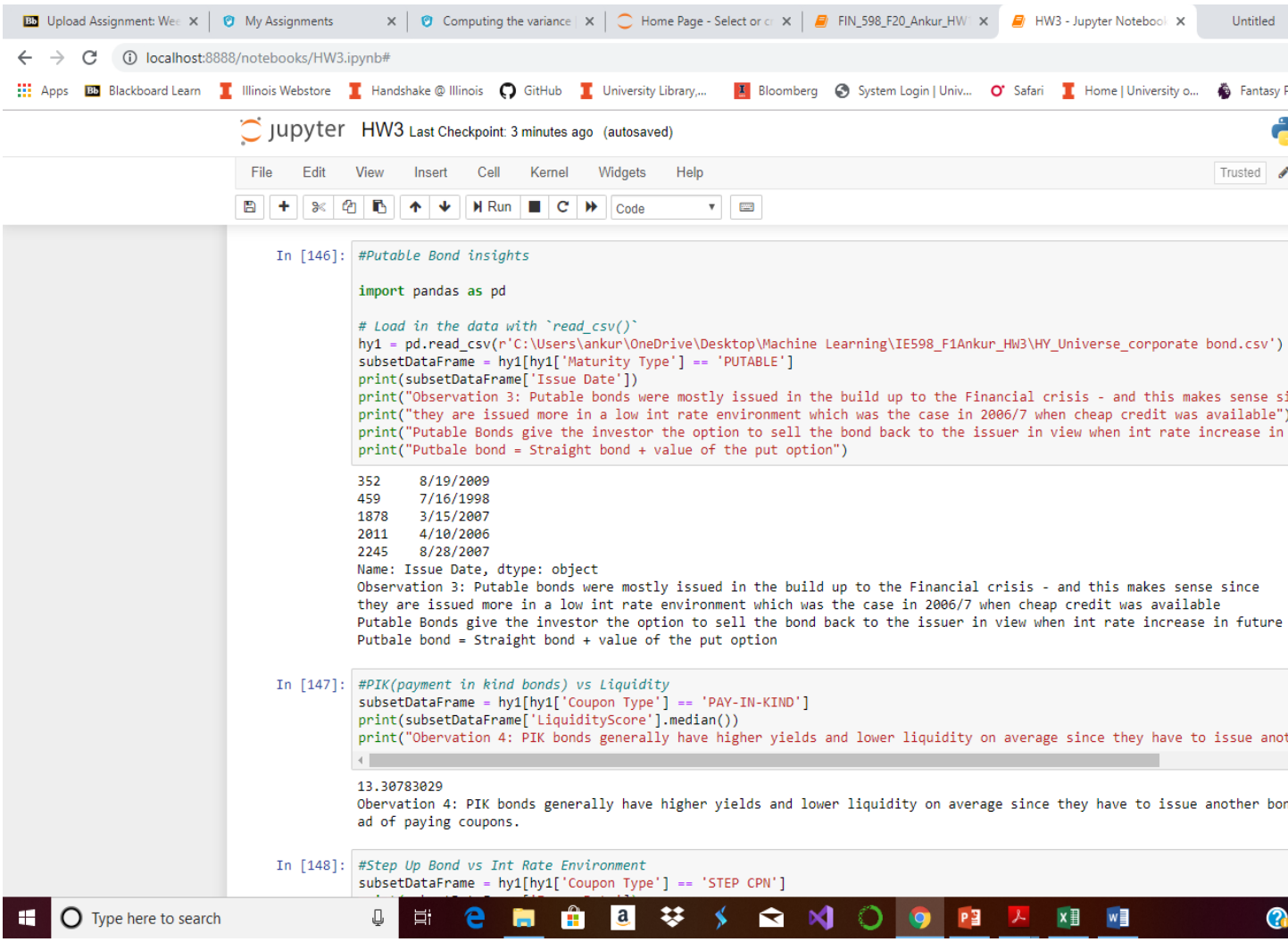
In [142]:
#Summary Statistics of the bond universe
#Maturity Statistics
mean_mat = hy['Maturity At Issue months'].mean()
print("Avg Maturity: " + str(mean_mat))
median_mat = hy['Maturity At Issue months'].median()
print("Median Maturity: " + str(median_mat))
max_mat = hy['Maturity At Issue months'].max()
print("Maximum Maturity: " + str(max_mat))
#Liquidity Statistics
median_liq = hy['LiquidityScore'].median()
print("Median Liquidity Score: " + str(median_liq))
print("Liquidity correlation with Maturity")
hy['LiquidityScore'].corr(hy['Maturity At Issue months'])
#So, liquidity is irrelevant to maturity of bonds in the current dataset
Avg Maturity: 113.96899669239242
Median Maturity: 97.37
Maximum Maturity: 1217.57
Median Liquidity Score: 16.53847146
Liquidity correlation with Maturity
Out[142]:
0.07250683924172219
In [146]:
#Putable Bond insights
import pandas as pd
# Load in the data with `read_csv()`
hy1 = pd.read_csv(r'C:\Users\ankur\OneDrive\Desktop\Machine Learning\IE598_F1Ankur_HW3\HY_Universe_corporate bond.cs
subsetDataFrame = hy1[hy1['Maturity Type'] == 'PUTABLE']
Type here to search



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In [146]:
```
#Putable Bond insights

import pandas as pd

# Load in the data with `read_csv()`
hy1 = pd.read_csv(r'C:\Users\ankur\OneDrive\Desktop\Machine Learning\IE598_F1Ankur_HW3\HY_Universe_corporate bond.csv')
subsetDataFrame = hy1[hy1['Maturity Type'] == 'PUTABLE']
print(subsetDataFrame['Issue Date'])
print("Observation 3: Putable bonds were mostly issued in the build up to the Financial crisis - and this makes sense si
print("they are issued more in a low int rate environment which was the case in 2006/7 when cheap credit was available")
print("Putable Bonds give the investor the option to sell the bond back to the issuer in view when int rate increase in
print("Putbale bond = Straight bond + value of the put option")
```

```
352     8/19/2009
459     7/16/1998
1878    3/15/2007
2011    4/10/2006
2245    8/28/2007
Name: Issue Date, dtype: object
Observation 3: Putable bonds were mostly issued in the build up to the Financial crisis - and this makes sense since
they are issued more in a low int rate environment which was the case in 2006/7 when cheap credit was available
Putable Bonds give the investor the option to sell the bond back to the issuer in view when int rate increase in future
Putbale bond = Straight bond + value of the put option
```

In [147]:
```
#PIK(payment in kind bonds) vs Liquidity
subsetDataFrame = hy1[hy1['Coupon Type'] == 'PAY-IN-KIND']
print(subsetDataFrame['LiquidityScore'].median())
print("Obervation 4: PIK bonds generally have higher yields and lower liquidity on average since they have to issue anot
```

```
13.30783029
Obervation 4: PIK bonds generally have higher yields and lower liquidity on average since they have to issue another bon
ad of paying coupons.
```

In [148]:
```
#Step Up Bond vs Int Rate Environment
subsetDataFrame = hy1[hy1['Coupon Type'] == 'STEP CPN']
```

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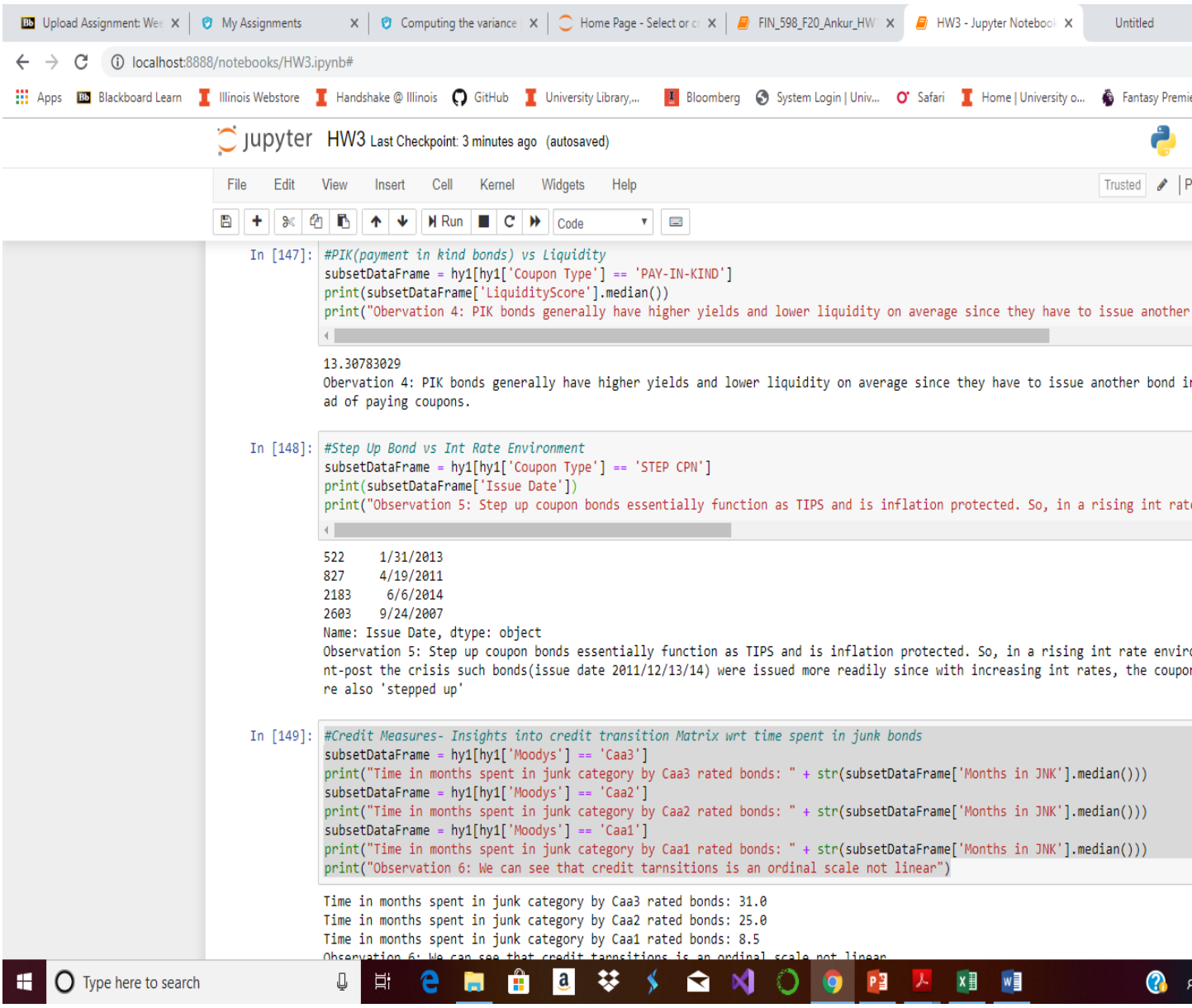
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In [147]:
#PIK(payment in kind bonds) vs Liquidity
subsetDataFrame = hy1[hy1['Coupon Type'] == 'PAY-IN-KIND']
print(subsetDataFrame['LiquidityScore'].median())
print("Obervation 4: PIK bonds generally have higher yields and lower liquidity on average since they have to issue another
13.30783029
Obervation 4: PIK bonds generally have higher yields and lower liquidity on average since they have to issue another bond in
ad of paying coupons.
In [148]:
#Step Up Bond vs Int Rate Environment
subsetDataFrame = hy1[hy1['Coupon Type'] == 'STEP CPN']
print(subsetDataFrame['Issue Date'])
print("Observation 5: Step up coupon bonds essentially function as TIPS and is inflation protected. So, in a rising int rat
522 1/31/2013
827 4/19/2011
2183 6/6/2014
2603 9/24/2007
Name: Issue Date, dtype: object
Observation 5: Step up coupon bonds essentially function as TIPS and is inflation protected. So, in a rising int rate enviro
nt-post the crisis such bonds(issue date 2011/12/13/14) were issued more readily since with increasing int rates, the coupon
re also 'stepped up'
In [149]:
#Credit Measures- Insights into credit transition Matrix wrt time spent in junk bonds
subsetDataFrame = hy1[hy1['Moodys'] == 'Caa3']
print("Time in months spent in junk category by Caa3 rated bonds: " + str(subsetDataFrame['Months in JNK'].median()))
subsetDataFrame = hy1[hy1['Moodys'] == 'Caa2']
print("Time in months spent in junk category by Caa2 rated bonds: " + str(subsetDataFrame['Months in JNK'].median()))
subsetDataFrame = hy1[hy1['Moodys'] == 'Caa1']
print("Time in months spent in junk category by Caa1 rated bonds: " + str(subsetDataFrame['Months in JNK'].median()))
print("Observation 6: We can see that credit tarnsitions is an ordinal scale not linear")
Time in months spent in junk category by Caa3 rated bonds: 31.0
Time in months spent in junk category by Caa2 rated bonds: 25.0
Time in months spent in junk category by Caa1 rated bonds: 8.5
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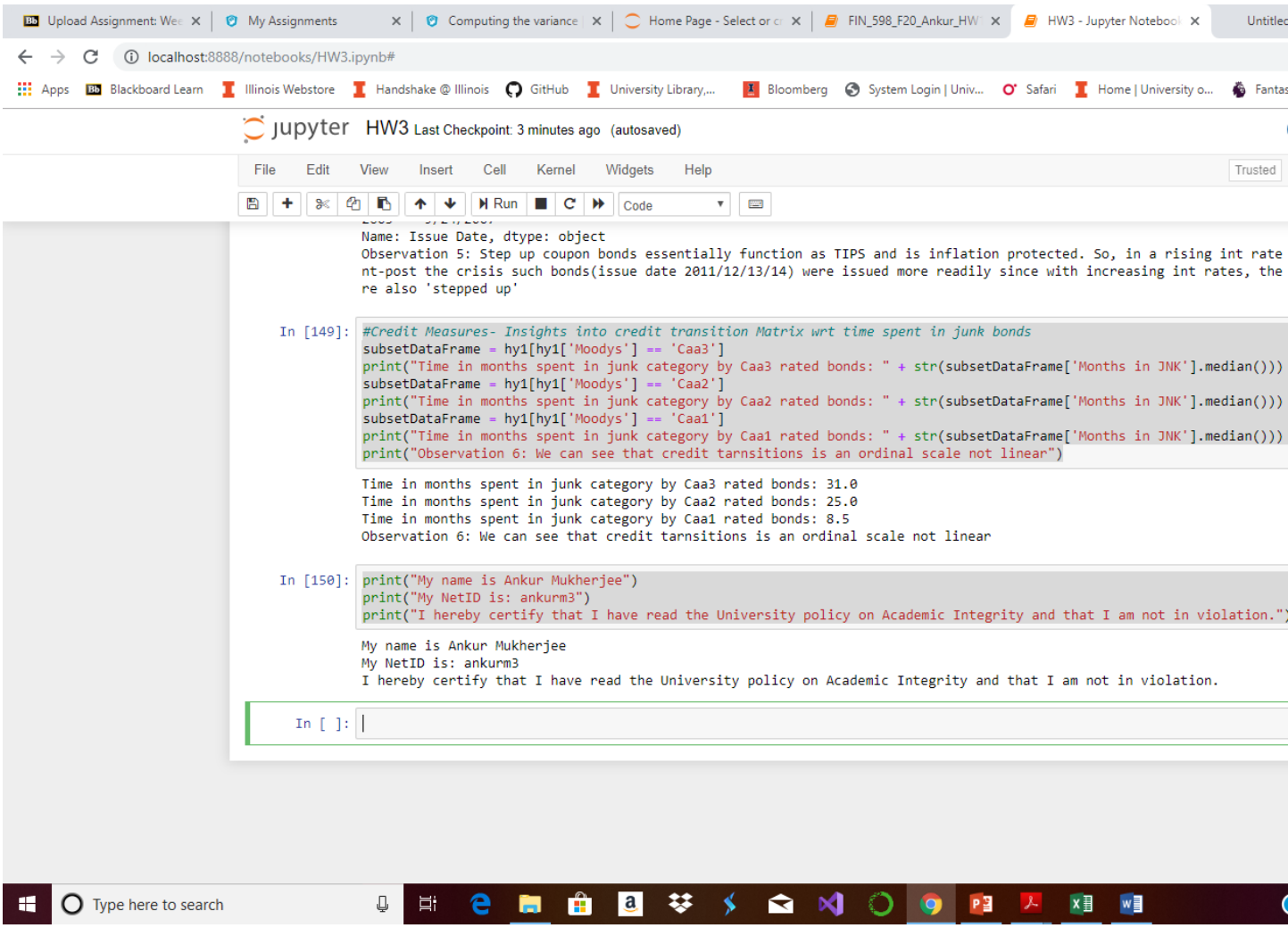
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Name: Issue Date, dtype: object
Observation 5: Step up coupon bonds essentially function as TIPS and is inflation protected. So, in a rising int rate
nt-post the crisis such bonds(issue date 2011/12/13/14) were issued more readily since with increasing int rates, the
re also 'stepped up'
In [149]:
#Credit Measures- Insights into credit transition Matrix wrt time spent in junk bonds
subsetDataFrame = hy1[hy1['Moodys'] == 'Caa3']
print("Time in months spent in junk category by Caa3 rated bonds: " + str(subsetDataFrame['Months in JNK'].median()))
subsetDataFrame = hy1[hy1['Moodys'] == 'Caa2']
print("Time in months spent in junk category by Caa2 rated bonds: " + str(subsetDataFrame['Months in JNK'].median()))
subsetDataFrame = hy1[hy1['Moodys'] == 'Caa1']
print("Time in months spent in junk category by Caa1 rated bonds: " + str(subsetDataFrame['Months in JNK'].median()))
print("Observation 6: We can see that credit tarnsitions is an ordinal scale not linear")
Time in months spent in junk category by Caa3 rated bonds: 31.0
Time in months spent in junk category by Caa2 rated bonds: 25.0
Time in months spent in junk category by Caa1 rated bonds: 8.5
Observation 6: We can see that credit tarnsitions is an ordinal scale not linear
In [150]:
print("My name is Ankur Mukherjee")
print("My NetID is: ankurm3")
print("I hereby certify that I have read the University policy on Academic Integrity and that I am not in violation.")
My name is Ankur Mukherjee
My NetID is: ankurm3
I hereby certify that I have read the University policy on Academic Integrity and that I am not in violation.
In [ ]:
Type here to search