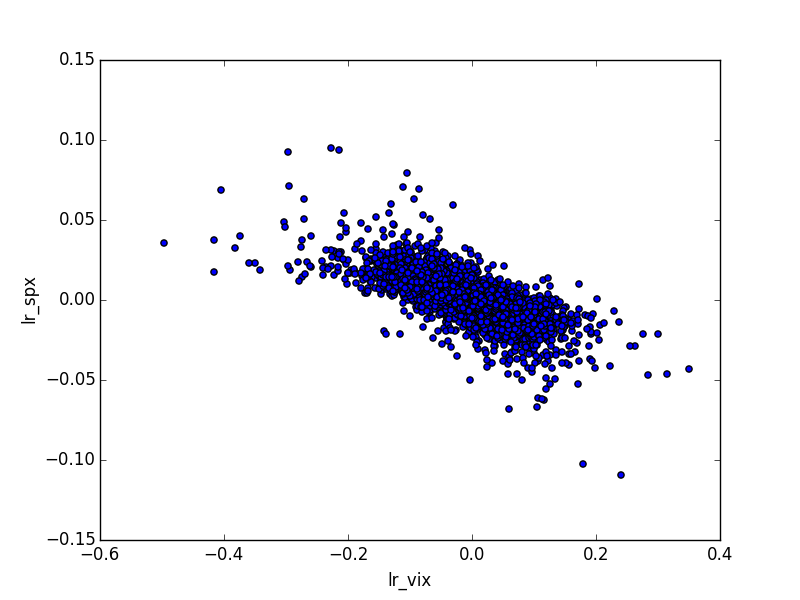
NBA 6450

Analysis package: anaconda (Python)

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2016

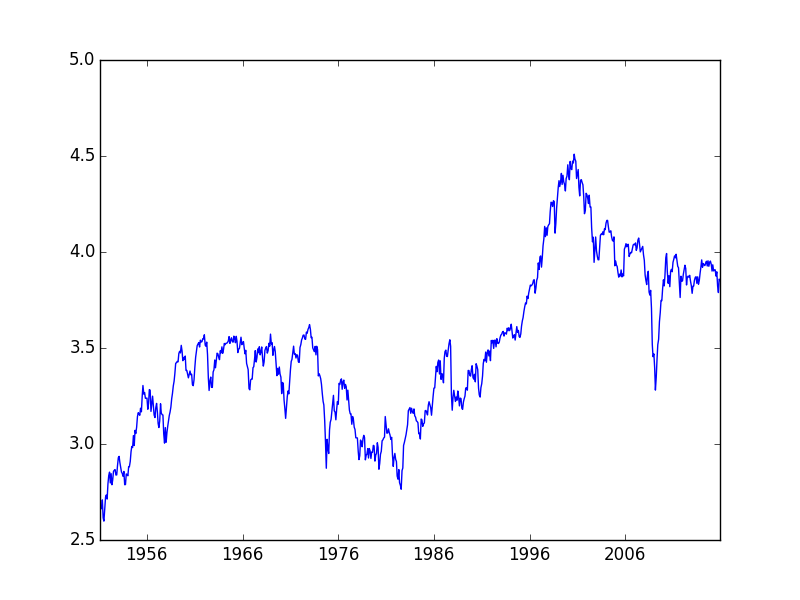
Problem 1



1. S&P500 std dev: 1.1359, VIX std dev: 6.2756, correlation: -0.7132
2. Slope: -0.1291, intercept: -0.0003. It is significant because P-value is 0.
3. Slope = correlation \* stddev(y)/stddev(x) -> beta = corr\*stddev(S&P500)/stddev(VIX)
4. S&P500 skew: 0.2400, VIX skew: -0.6745. No this is not in line with the market wisdom as seen from 1) the positive skew in S&P500 implies large declines in the stock market are less likely than large stock market rallies; 2) the negative skew in VIX implies large increases in volatility are less likely than large drops in volatility.
5. We see a negative correlation between aggregate stock return and volatility. As seen in the linear regression of S&P500 returns on VIX returns, there is a negative slope between the returns of S&P500 and VIX returns that is statistically significant. This implies an inverse relationship between VIX returns and S&P500 returns.

Problem 2

1. Log Price/Dividend Ratio



1. Correlation: 0.9000
2. Log P/D Ratio: Persistence: 0.9922, Half Life: 88.5343 months

Log CAPE Ratio: Persistence: 0.9960, Half Life: 173.5174 months

1. Based on the Dickey Fuller Test:

P-value for Log P/D Ratio: 0.2765

P-value for Log CAPE Ratio: 0.4835

Based on the P-values not < 0.05, it is not econometrically sound to use the P/D ratio or CAPE ratio in regressions.

Problem 3

1. Default Spread Statistics:

Mean: 1.1028

Standard Deviation: 0.4702

Persistence: 0.9633

Half Life: 18.5419 months

1. Term Spread Statistics:

Mean: 1.7857

Standard Deviation: 1.2824

Persistence: 0.9524

Half Life: 14.2232 months

1. ICC statistics:

Mean: 7.4448

Standard Deviation: 2.6913

Persistence: 0.9486

Half Life: 13.1425

1 month

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | P/D Ratio | CAPE Ratio | Default Spread | Term Spread | ICC |
| slope | 0.005 | 0.0054 | -0.0093 | 0.0009 | 0.0016 |
|  | 0.002 | 0.003 | 0.009 | 0.001 | 0.009 |
| T-Stats | 1.02 | 1.165 | -2.015 | 0.535 | 1.952 |

3 months

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | P/D Ratio | CAPE Ratio | Default Spread | Term Spread | ICC |
| slope | 0.0136 | 0.0121 | -0.0248 | 0.002 | 0.0047 |
|  | 0.003 | 0.003 | 0.018 | 0.001 | 0.02 |
| T-Stats | 1.062 | 1.032 | -1.223 | 0.484 | 2.001 |

1 year

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | P/D Ratio | CAPE Ratio | Default Spread | Term Spread | ICC |
| slope | 0.0497 | 0.0583 | -0.155 | -0.0187 | 0.0193 |
|  | 0.018 | 0.028 | 0.198 | 0.021 | 0.096 |
| T-Stats | 1.037 | 1.419 | -3.256 | -1.543 | 2.327 |

3 years

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | P/D Ratio | CAPE Ratio | Default Spread | Term Spread | ICC |
| slope | 0.0658 | 0.1164 | -0.207 | -0.071 | 0.0233 |
|  | 0.014 | 0.047 | 0.148 | 0.13 | 0.059 |
| T-Stats | 0.589 | 1.344 | -3.04 | -2.01 | 1.442 |

5 years

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | P/D Ratio | CAPE Ratio | Default Spread | Term Spread | ICC |
| slope | 0.1651 | 0.2211 | -0.195 | -0.0812 | -0.0102 |
|  | 0.058 | 0.117 | 0.091 | 0.118 | 0.007 |
| T-Stats | 1.098 | 1.64 | -1.852 | -2.119 | -0.774 |



1 month

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P/D Ratio and ICC | CAPE Ratio and ICC | Default Spread and ICC | Term Spread and ICC |
| Slope ICC | 0.0017 | 0.0017 | 0.0013 | 0.0016 |
| Slope (other) | 0.0056 | 0.0059 | -0.0083 | 0.0007 |
|  | 0.007 | 0.008 | 0.012 | 0.005 |
| T-Stats (ICC) | 2.077 | 2.08 | 1.538 | 1.948 |
| T-Stats (Other) | 1.078 | 1.204 | -1.747 | 0.422 |

3 months

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P/D Ratio and ICC | CAPE Ratio and ICC | Default Spread and ICC | Term Spread and ICC |
| Slope ICC | 0.0043 | 0.0043 | 0.0025 | 0.0039 |
| Slope (other) | 0.0149 | 0.0169 | -0.0373 | -0.0006 |
|  | 0.017 | 0.02 | 0.055 | 0.011 |
| T-Stats (ICC) | 1.677 | 1.682 | 1.119 | 1.617 |
| T-Stats (Other) | 1.052 | 1.282 | -1.992 | -0.168 |

1 year

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P/D Ratio and ICC | CAPE Ratio and ICC | Default Spread and ICC | Term Spread and ICC |
| Slope ICC | 0.0206 | 0.0207 | 0.0137 | 0.0193 |
| Slope (other) | 0.0608 | 0.0683 | -0.0159 | -0.0193 |
|  | 0.116 | 0.126 | 0.259 | 0.114 |
| T-Stats (ICC) | 2.345 | 2.348 | 1.853 | 2.4 |
| T-Stats (Other) | 1.249 | 1.474 | -3.196 | -1.625 |

3 years

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P/D Ratio and ICC | CAPE Ratio and ICC | Default Spread and ICC | Term Spread and ICC |
| Slope ICC | 0.0253 | 0.0263 | 0.0161 | 0.0234 |
| Slope (other) | 0.0946 | 0.1478 | -0.19 | -0.071 |
|  | 0.079 | 0.122 | 0.173 | 0.184 |
| T-Stats (ICC) | 1.664 | 1.642 | 0.935 | 1.615 |
| T-Stats (Other) | 0.0857 | 1.546 | -2.431 | -1.940 |

5 years

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | P/D Ratio and ICC | CAPE Ratio and ICC | Default Spread and ICC | Term Spread and ICC |
| Slope ICC | -0.0114 | -0.101 | -0.0227 | -0.0132 |
| Slope (other) | 0.0927 | 0.1634 | -0.2451 | -0.083 |
|  | 0.03 | 0.078 | 0.169 | 0.153 |
| T-Stats (ICC) | -1.008 | -0.888 | -1.674 | -1.225 |
| T-Stats (Other) | 0.635 | 1.252 | -2.537 | -2;264 |

Term Spread and ICC works best for a 3 years window based on its relatively higher R^2 and higher T-Stat