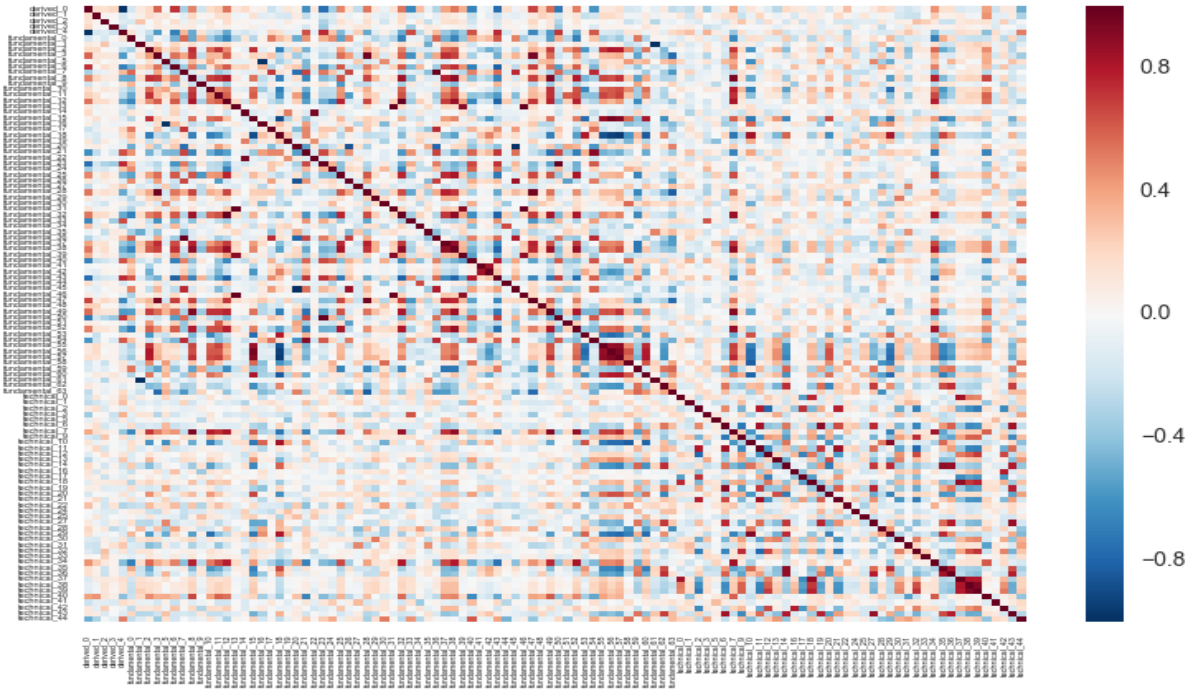
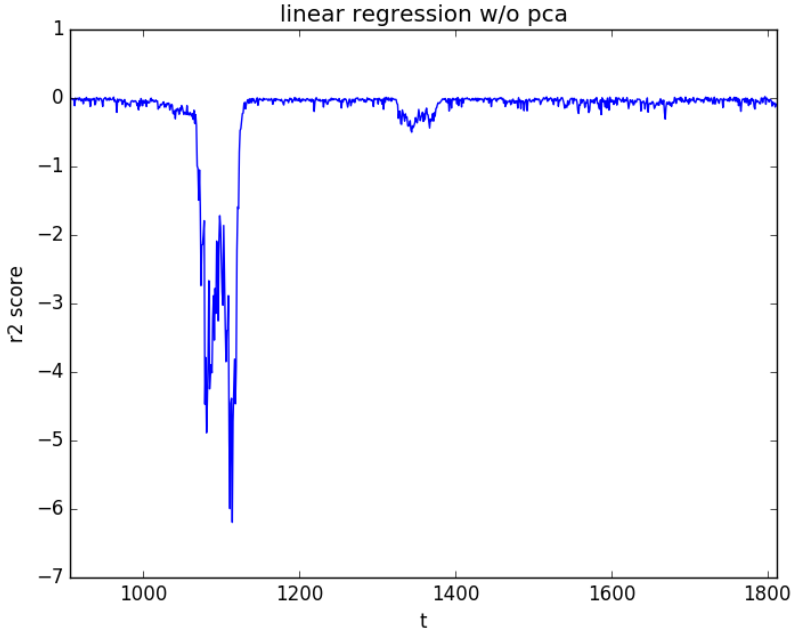
Results of Principal Component and Ridge Regression

Pair-wise correlation among features over the entire training set:

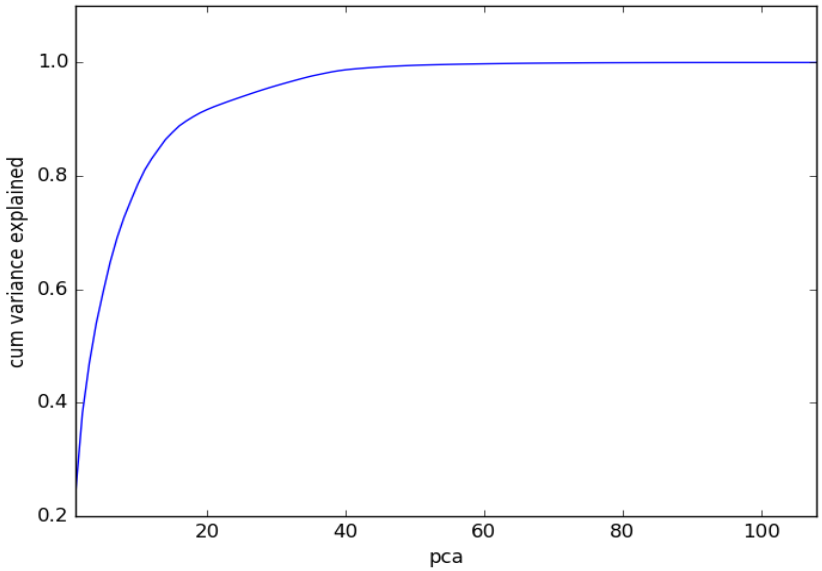


The abundance of collinearity among features implies pure linear regression may not work.
This problem is addressed by two methods: principal component and ridge regression.
To assess the performance of each, I divide the data sets into 60%:40% and use the first portion as training and the second as testing.
A time series of r2 scores is generated from the testing set: the best score is 1 and the worst score can be arbitrarily negative.
Below is the time series of r2 scores with pure linear regression as our baseline:

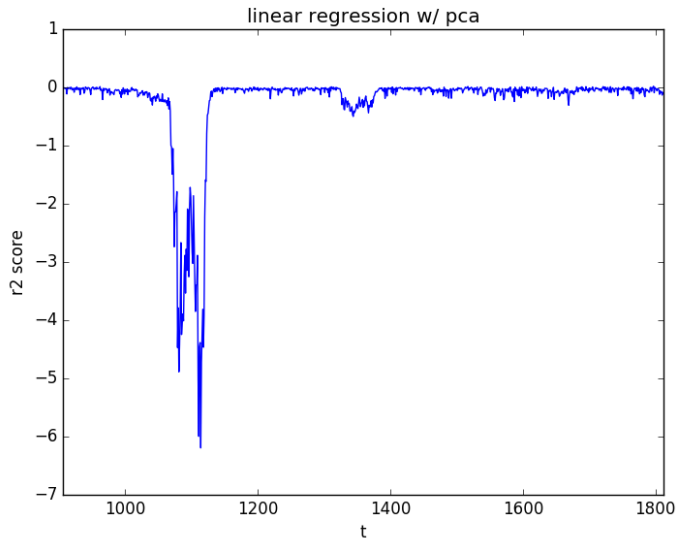
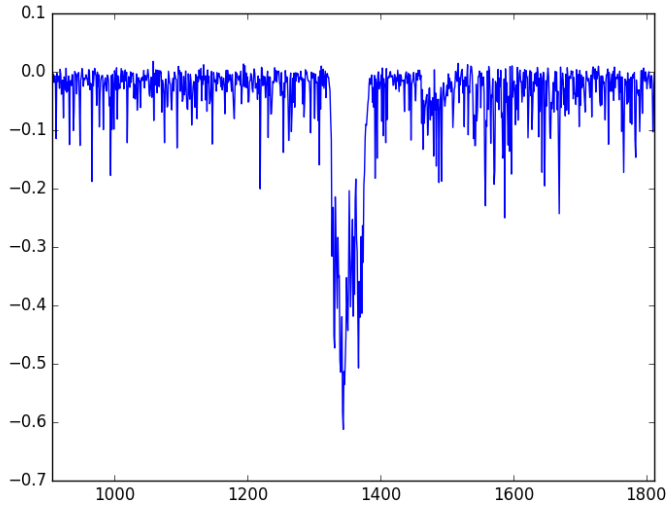


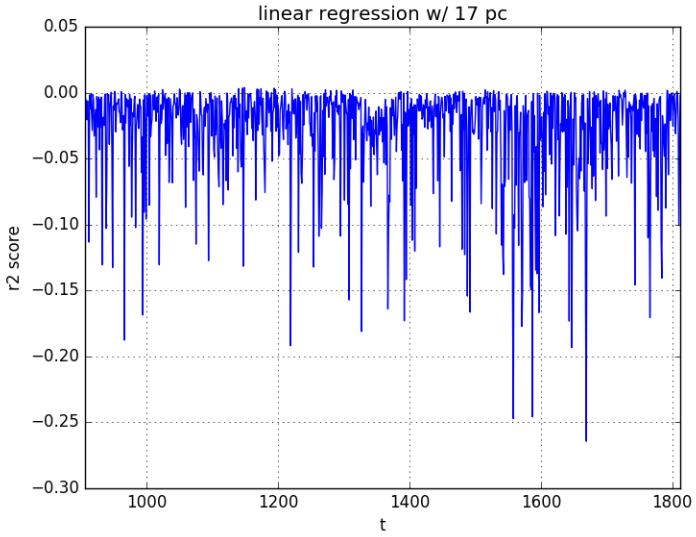
Principal Component Analysis

Variance explained with Principal Component: 17 PCs explains ~ 90% variance

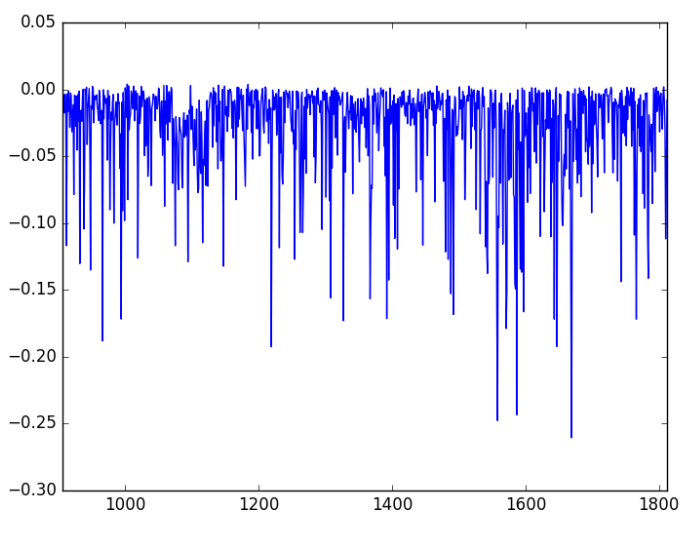


Time series of r2 scores of testing set using different # PCs: Overall scores have improved by reducing # PCs and stabilize at ~ 17 PCs.

	
All PCs	**60 PCs**



17 PCs



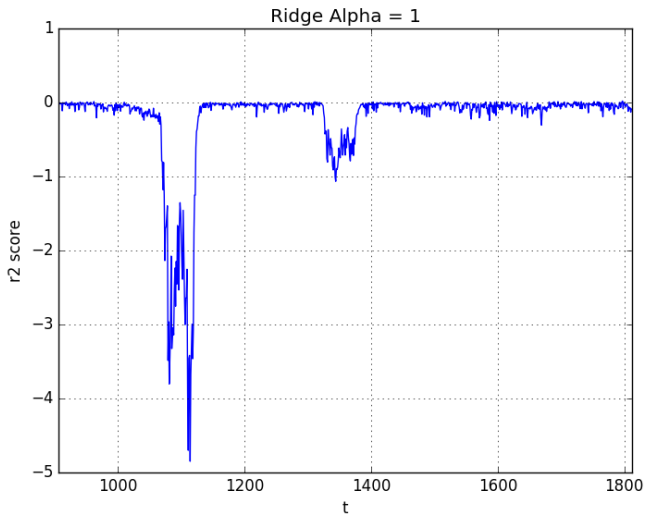
2 PCs

Statistics of r2 scores using 17 PCs:

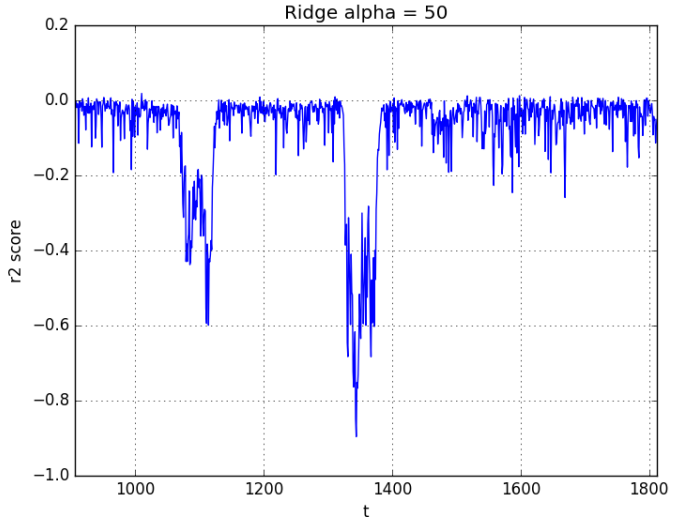
count	907.000000
mean	-0.029043
std	0.038069
min	-0.264366
25%	-0.036402
50%	-0.015020
75%	-0.004523
max	0.003937

Ridge Regression

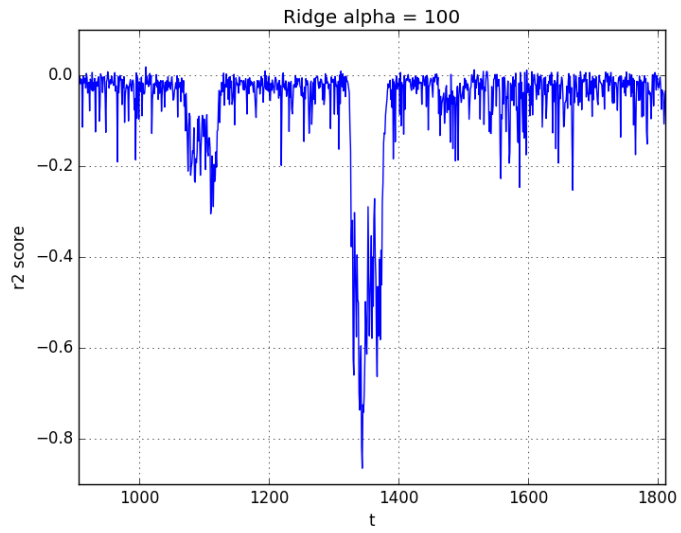
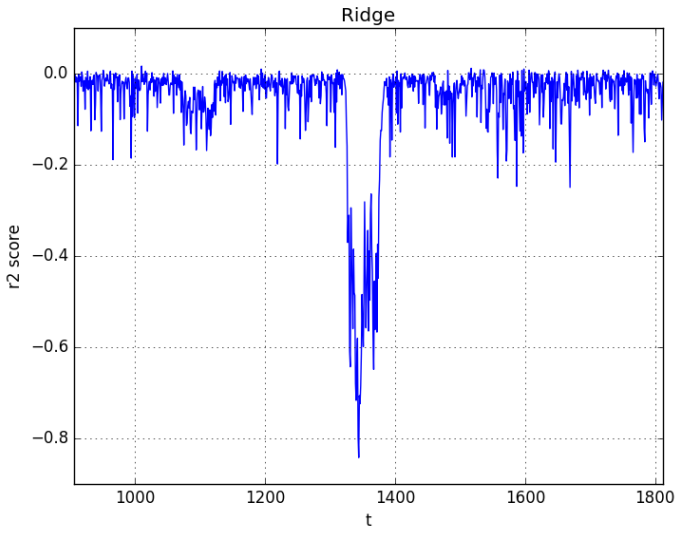
Time series of r2 scores of Ridge Regression using different alphas (penalty coefficient): scores have improved by increasing alpha. But alpha cannot be too big or else the model will become trivial.



Alpha = 1



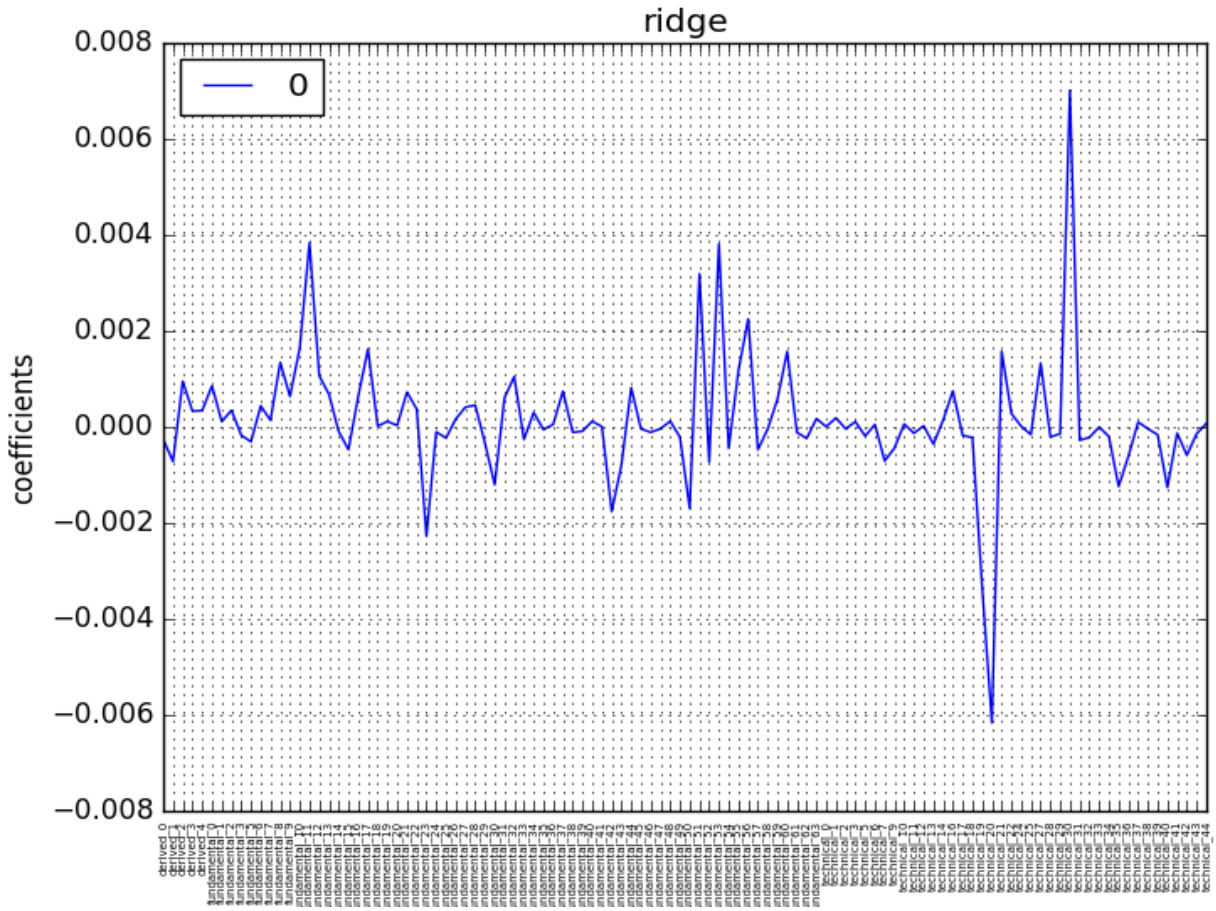
Alpha = 50

	
Alpha = 100	**Alpha = 200**

Statistics of r2 scores with alpha = 200:

count	907.000000
mean	-0.061561
std	0.117495
min	-0.842012
25%	-0.059893
50%	-0.023498
75%	-0.009553
max	0.016547

Coefficients of features with alpha = 200:



Features ranked by top coefficients are listed below: 'technical_20' and 'technical_30' stand out much more than the other features.

Feature Name	Coefficient
'technical_20'	-0.006
'technical_19'	-0.003
'fundamental_23'	-0.002
'fundamental_42'	-0.002
'fundamental_50'	-0.002
'fundamental_56'	0.002
'fundamental_51'	0.003
'fundamental_53'	0.004
'fundamental_11'	0.004
'technical_30'	0.007

Conclusions

PC and Ridge Regression have performed better than pure linear regression.
PC performs on average better than Ridge but the latter has a significantly better max score, i.e., 0.02 (ridge) vs. 0.004 (PC).
'technical_20' and 'technical_30' may be of special interest and for further analysis please refer to my Jupyter Notebook "Analysis of technical_20 and technical_30'.