Financial Analysis-PCA

11/25/2018

Introduction

In This part of the project, a Principal component analysis is to be conducted on the dataset which consists of the following: Three sectors and five representative firm of each sector, selected macroeconomic indicators and Fama-French factors.

An overlook of the Data

There are two datasets 1. a simple return 2. log return

```
##         Year UAL US Equity SKYW US Equity JBLU US Equity LUV US Equity
## 1 2008-09-01   -0.20882088    -0.06495026    -0.18451400  -0.047275115
## 2 2008-10-01    0.65642776    -0.03566959     0.12121212  -0.188146106
## 3 2008-11-01   -0.22733516    -0.01362751    -0.05585586  -0.265704584
## 4 2008-12-01   -0.02044444     0.22368421     0.35496183  -0.003468208
## 5 2009-01-01   -0.14337568    -0.15860215    -0.20704225  -0.184454756
## 6 2009-02-01   -0.47987288    -0.34568690    -0.32326821  -0.162162162
##   DAL US Equity BRK/B US Equity ABX US Equity STLD US Equity HL US Equity
## 1   -0.08364084      0.12634546    0.05787504    -0.31171969  -0.33333333
## 2    0.47382550     -0.12627986   -0.38105607    -0.30251609  -0.46794872
## 3   -0.19763206     -0.08880208    0.29551451    -0.30704698  -0.06827309
## 4    0.30079455     -0.08145184    0.24813306     0.35351090   0.20689655
## 5   -0.39790576     -0.07000622    0.01958118    -0.05008945  -0.05357143
## 6   -0.27101449     -0.14218802   -0.19445185    -0.21374765  -0.42641509
##   MUX US Equity SWC US Equity RIO US Equity AA US Equity C US Equity
## 1    0.04763092    -0.2201342   -0.34293690  -0.29722931  0.08004213
## 2   -0.46972943    -0.3184165   -0.25503006  -0.49069987 -0.33447099
## 3    0.35717492    -0.2095960   -0.46198956  -0.06434892 -0.39267399
## 4   -0.04211687     0.5782748   -0.11090000   0.04646936 -0.19059107
## 5    1.17587477    -0.1599190   -0.02429423  -0.30817214 -0.47093890
## 6    0.07575116    -0.2385542    0.17579251  -0.20025679 -0.57746479
##   MA US Equity AXP US Equity WFC US Equity USB US Equity COF US Equity
## 1  -0.26889301   -0.10710685    0.23984143    0.13057125    0.15541459
## 2  -0.16641290   -0.22382162   -0.09272582   -0.17240422   -0.23294118
## 3  -0.01704776   -0.15236364   -0.15154185   -0.09493459   -0.12039877
## 4  -0.01631108   -0.20420420    0.02042229   -0.07301705   -0.07323452
## 5  -0.05002449   -0.09811321   -0.35888738   -0.40663735   -0.50329257
## 6   0.16386802   -0.27913927   -0.35978836   -0.03571429   -0.23926768
##   emp_value xport_value import_value ppi_value cpi_value manuf_value
## 1    136783       137.8        124.9     188.9   218.877       182.9
## 2    136308       129.6        122.3     184.1   216.995       176.8
## 3    135549       120.0        118.4     174.7   213.153       169.4
## 4    134842       114.5        115.8     173.0   211.398       164.1
## 5    134055       113.0        116.6     178.4   211.933       164.7
## 6    133351       113.0        116.3     184.7   212.705       163.9
##   Mkt-RF   SMB    HML   RF
## 1  -9.24 -1.13   6.33 0.15
## 2 -17.23 -2.34  -2.90 0.08
```

```
## 3  -7.86 -2.99  -5.94 0.03
## 4   1.74  3.59  -0.24 0.00
## 5  -8.12 -0.01 -11.10 0.00
## 6 -10.10  0.16  -7.25 0.01
```

```
##         Year UAL US Equity SKYW US Equity JBLU US Equity LUV US Equity
## 1 2008-09-01   -0.23423089    -0.06715556    -0.20397103  -0.048429100
## 2 2008-10-01    0.50466333    -0.03632129     0.11441035  -0.208434889
## 3 2008-11-01   -0.25790991    -0.01372122    -0.05747643  -0.308843857
## 4 2008-12-01   -0.02065632     0.20186615     0.30377329  -0.003474236
## 5 2009-01-01   -0.15475582    -0.17269066    -0.23198534  -0.203898379
## 6 2009-02-01   -0.65368204    -0.42416930    -0.39048025  -0.176930708
##   DAL US Equity BRK/B US Equity ABX US Equity STLD US Equity HL US Equity
## 1   -0.08734689      0.11897829    0.05626221    -0.37355910  -0.40546511
## 2    0.38786140     -0.13499516   -0.47974059    -0.36027584  -0.63101540
## 3   -0.22018800     -0.09299515    0.25890792    -0.36679307  -0.07071552
## 4    0.26297527     -0.08496095    0.22164888     0.30270188   0.18805223
## 5   -0.50734130     -0.07257738    0.01939194    -0.05138745  -0.05505978
## 6   -0.31610143     -0.15337034   -0.21623231    -0.24047748  -0.55584931
##   MUX US Equity SWC US Equity RIO US Equity AA US Equity C US Equity
## 1    0.04653135    -0.2486335    -0.4199752  -0.35272463  0.07700005
## 2   -0.63436789    -0.3833365    -0.2944114  -0.67471780 -0.40717305
## 3    0.30540528    -0.2352110    -0.6198773  -0.06651265 -0.49868955
## 4   -0.04302950     0.4563323    -0.1175456   0.04542198 -0.21145102
## 5    0.77743078    -0.1742570    -0.0245942  -0.36841810 -0.63665135
## 6    0.07301917    -0.2725363     0.1619424  -0.22346459 -0.86148250
##   MA US Equity AXP US Equity WFC US Equity USB US Equity COF US Equity
## 1  -0.31319547    -0.1132884    0.21498349    0.12272304    0.14445923
## 2  -0.18201709    -0.2533729   -0.09731058   -0.18923043   -0.26519179
## 3  -0.01719475    -0.1653036   -0.16433452   -0.09974806   -0.12828663
## 4  -0.01644557    -0.2284127    0.02021655   -0.07582011   -0.07605474
## 5  -0.05131907    -0.1032663   -0.44455015   -0.52194951   -0.69975409
## 6   0.15174896    -0.3273093   -0.44595647   -0.03636764   -0.27347373
##   emp_value xport_value import_value ppi_value cpi_value manuf_value
## 1    136783       137.8        124.9     188.9   218.877       182.9
## 2    136308       129.6        122.3     184.1   216.995       176.8
## 3    135549       120.0        118.4     174.7   213.153       169.4
## 4    134842       114.5        115.8     173.0   211.398       164.1
## 5    134055       113.0        116.6     178.4   211.933       164.7
## 6    133351       113.0        116.3     184.7   212.705       163.9
##   Mkt-RF   SMB    HML   RF
## 1  -9.24 -1.13   6.33 0.15
## 2 -17.23 -2.34  -2.90 0.08
## 3  -7.86 -2.99  -5.94 0.03
## 4   1.74  3.59  -0.24 0.00
## 5  -8.12 -0.01 -11.10 0.00
## 6 -10.10  0.16  -7.25 0.01
```

The analysis

After conducting the analysis we have the following results

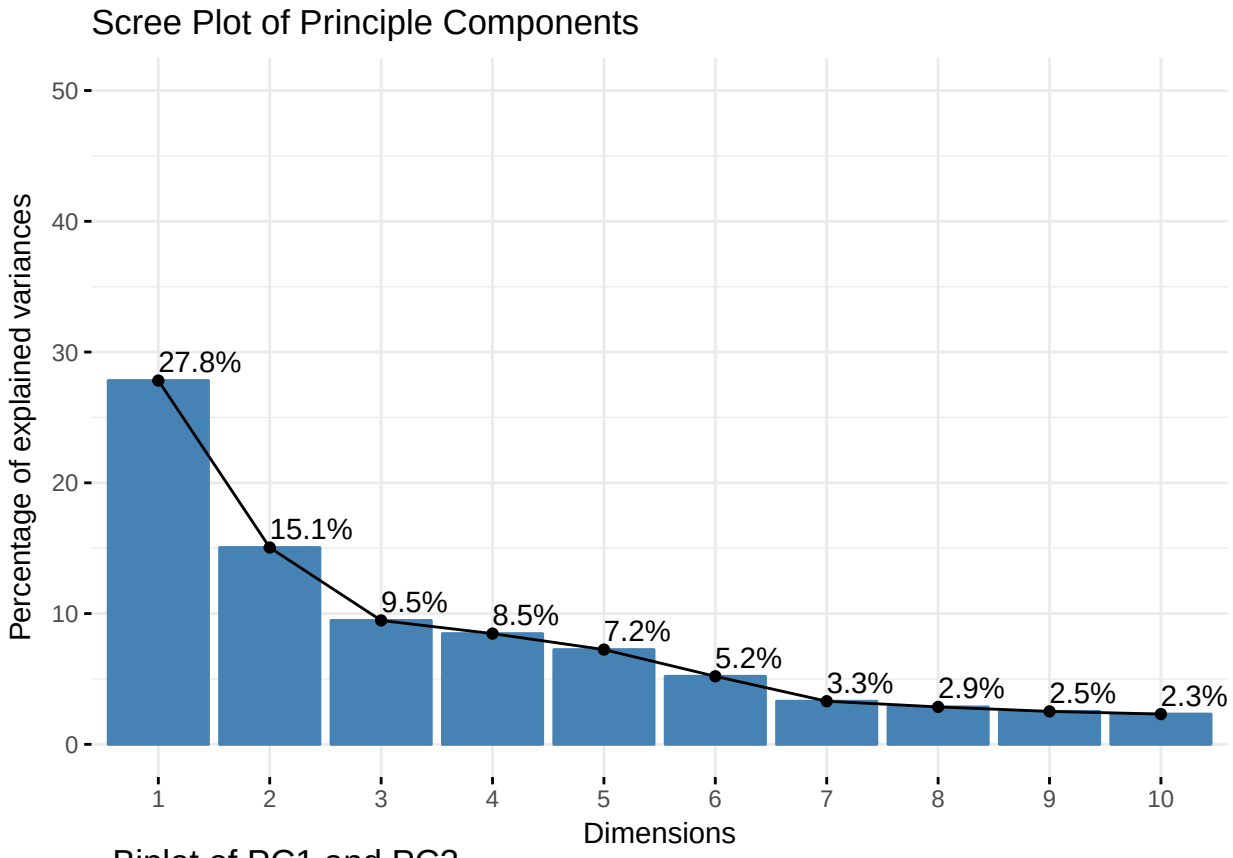
```
##         eigenvalue variance.percent cumulative.variance.percent
## Dim.1  8.068418931      27.82213424                    27.82213
```

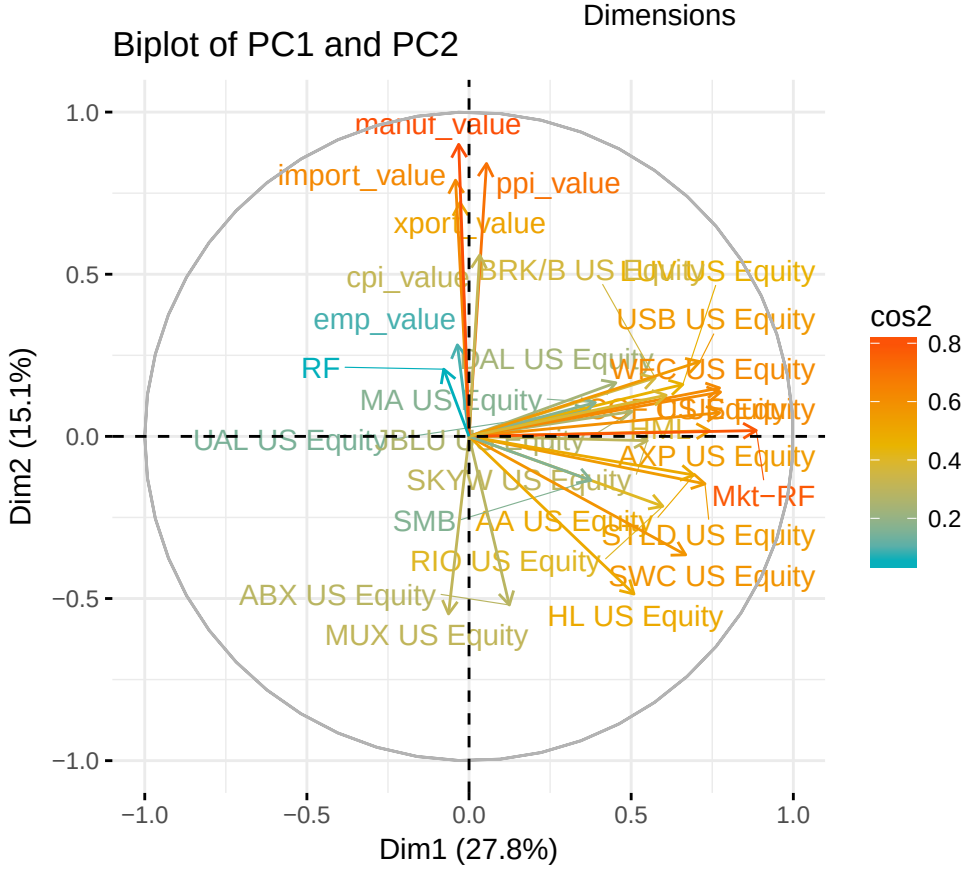
```
## Dim.2  4.364794765      15.05101643                    42.87315
## Dim.3  2.747737213       9.47495591                    52.34811
## Dim.4  2.455993461       8.46894297                    60.81705
## Dim.5  2.102111008       7.24865865                    68.06571
## Dim.6  1.509581580       5.20545373                    73.27116
## Dim.7  0.956562824       3.29849250                    76.56965
## Dim.8  0.830399362       2.86344608                    79.43310
## Dim.9  0.731048733       2.52085770                    81.95396
## Dim.10 0.671638936       2.31599633                    84.26995
## Dim.11 0.605303538       2.08725358                    86.35721
## Dim.12 0.548305434       1.89070839                    88.24792
## Dim.13 0.514825573       1.77526060                    90.02318
## Dim.14 0.380292950       1.31135500                    91.33453
## Dim.15 0.364667977       1.25747578                    92.59201
## Dim.16 0.332868848       1.14782361                    93.73983
## Dim.17 0.304542725       1.05014733                    94.78998
## Dim.18 0.292503038       1.00863117                    95.79861
## Dim.19 0.248134604       0.85563656                    96.65425
## Dim.20 0.218403999       0.75311724                    97.40736
## Dim.21 0.177332185       0.61149029                    98.01885
## Dim.22 0.166341703       0.57359208                    98.59245
## Dim.23 0.121894685       0.42032650                    99.01277
## Dim.24 0.102346637       0.35291944                    99.36569
## Dim.25 0.088354737       0.30467151                    99.67036
## Dim.26 0.071581691       0.24683342                    99.91720
## Dim.27 0.012877517       0.04440523                    99.96160
## Dim.28 0.008234414       0.02839453                    99.99000
## Dim.29 0.002900933       0.01000322                   100.00000
```

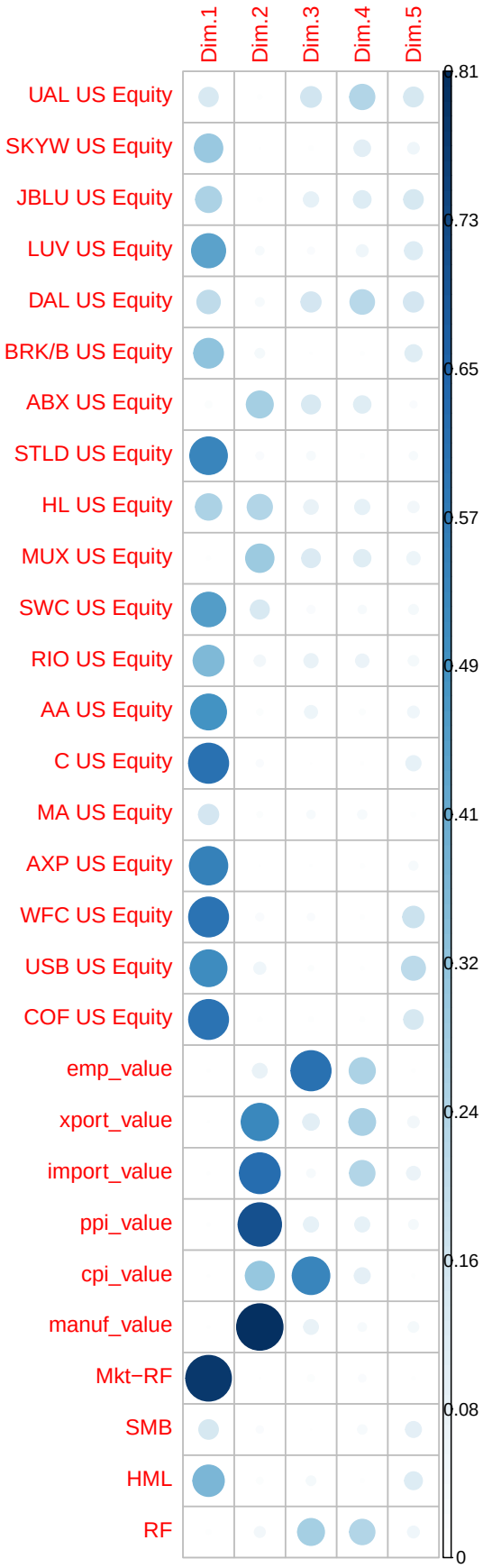
```
##         eigenvalue variance.percent cumulative.variance.percent
## Dim.1  8.472725394      29.21629446                    29.21629
## Dim.2  4.346870426      14.98920837                    44.20550
## Dim.3  2.775590378       9.57100130                    53.77650
## Dim.4  2.489582612       8.58476763                    62.36127
## Dim.5  1.991798011       6.86826900                    69.22954
## Dim.6  1.544098611       5.32447797                    74.55402
## Dim.7  0.939795373       3.24067370                    77.79469
## Dim.8  0.767840905       2.64772726                    80.44242
## Dim.9  0.709332585       2.44597443                    82.88839
## Dim.10 0.640868054       2.20988984                    85.09828
## Dim.11 0.567247293       1.95602515                    87.05431
## Dim.12 0.532977055       1.83785192                    88.89216
## Dim.13 0.486389171       1.67720404                    90.56937
## Dim.14 0.363645105       1.25394864                    91.82331
## Dim.15 0.341515656       1.17764019                    93.00095
## Dim.16 0.332520807       1.14662347                    94.14758
## Dim.17 0.308445684       1.06360581                    95.21118
## Dim.18 0.254951167       0.87914195                    96.09033
## Dim.19 0.240494767       0.82929230                    96.91962
## Dim.20 0.185315930       0.63902045                    97.55864
## Dim.21 0.158187328       0.54547354                    98.10411
## Dim.22 0.151392133       0.52204184                    98.62615
## Dim.23 0.119346458       0.41153951                    99.03769
## Dim.24 0.104969554       0.36196398                    99.39966
```

```
## Dim.25 0.078335731       0.27012321                 99.66978
## Dim.26 0.072530276       0.25010440                 99.91988
## Dim.27 0.012554615       0.04329178                 99.96318
## Dim.28 0.007747405       0.02671519                 99.98989
## Dim.29 0.002931513       0.01010867                100.00000
```

Figures and plots







The correlation between each variable and PC

Analysis

From the Exploratory analysis above, we can view how each variable contribute to each PC In order for us to represent certain percentage of the dataset, we can view the percentage of each Principle component. to represent: 50% we need PC1-PC3 75% we need PC1-PC6 90% we need PC1-PC13