Carrion Portfolio Quant Analysis_Sept 2016

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Risk-free rate

```
## GMT
##             TS.1
## 2016-10-03 0.0163
## 2016-09-30 0.0160
## 2016-09-29 0.0156
## 2016-09-28 0.0157
## 2016-09-27 0.0156
```

Required return 8.5% or a real rate of 6.0% with a 2.5% inflation assumption. This required return was determined using the Personal Capital simulation tool. This assumed growth rate will satsify projected spending of $5,200/month or approx. $60,000/year. This assumes a Social Security benefit of $20,000/year and a VA benefit of $18,516/year.

Model Benchmark Portfolio

This benchmark portfolio is determined using non-ESG centric holdings

SPDR S&P 500 Index (SPY)

Standard deviation of returns

```
##             [,1]
## StdDev 0.1810829
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##             TS.1
## 2016-09-27 0.3844905
```

iShares S&P MidCap 400 Index Fund (IJH)

```
##                     TS.1
## Annualized Return 0.1176209
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.1468885
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                   TS.1
## 2016-09-27 0.6826374
```

iShares Russell 2000 ETF (IWM)

```
##                          TS.1
## Annualized Return 0.1123608
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.1829323
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                   TS.1
## 2016-09-27 0.3164178
```

iShares MSCI EAFE ETF (EFA)

```
##                          TS.1
## Annualized Return 0.01473366
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.1176595
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                   TS.1
## 2016-09-27 119.9649
```

iShares MSCI Emerging Markets ETF (EEM)

```
##                          TS.1
## Annualized Return -0.03371195
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.1434364
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -22.38956
```

iShares International Developed Real Estate ETF (IFGL)

```
##                            TS.1
## Annualized Return -0.02121399
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.07191995
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                   TS.1
## 2016-09-27 -0.4948654
```

iShares U.S. Real Estate ETF (IYR)

```
##                           TS.1
## Annualized Return 0.06117474
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.1143488
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 0.4204544
```

iShares S&P GSCI Commodity fund (GSG)

```
##                           TS.1
## Annualized Return -0.1617588
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.2016876
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -0.9923468
```

iShares Global Infrastructure ETF (IGF)

```
##                              TS.1
## Annualized Return 0.04548153
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.1327417
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 0.2195517
```

iShares Emerging Markets Infrastructure ETF (EMIF)

```
##                               TS.1
## Annualized Return -0.02167109
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.1179735
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -0.3315988
```

iShares Listed Private Equity UCITS ETF (IPRV)

```
##                              TS.1
## Annualized Return 0.1023511
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.1052126
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                 TS.1
## 2016-09-27 0.785975
```

iShares Barclays Aggregate Bond Fund (AGG)

```
##                           TS.1
## Annualized Return 0.003619398
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.04056375
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -0.2883961
```

iShares International Treasury Bond ETF (IGOV)

```
##                            TS.1
## Annualized Return -0.003587115
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.08477068
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -0.2096811
```

iShares JPMorgan USD Emerging Market Bond Fund ETF (EMB)

```
##                            TS.1
## Annualized Return -0.008145787
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.09503473
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -0.2498643
```

iShares Global High Yield Corporate Bond Fund ETF (GHGY)

```
##                             TS.1
## Annualized Return -0.01275439
```

Standard deviation of returns

```
##                [,1]
## StdDev 0.09572787
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -0.3067826
```

iShares Emerging Markets High Yield Bond Fund ETF (EMHY)

```
##                             TS.1
## Annualized Return -0.02053939
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.1003449
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                   TS.1
## 2016-09-27 -0.3473477
```

Aggregated Benchmark Portfolio Returns

This assumes an even exposure across all of the asset classes within the Benchmark
Portfolio
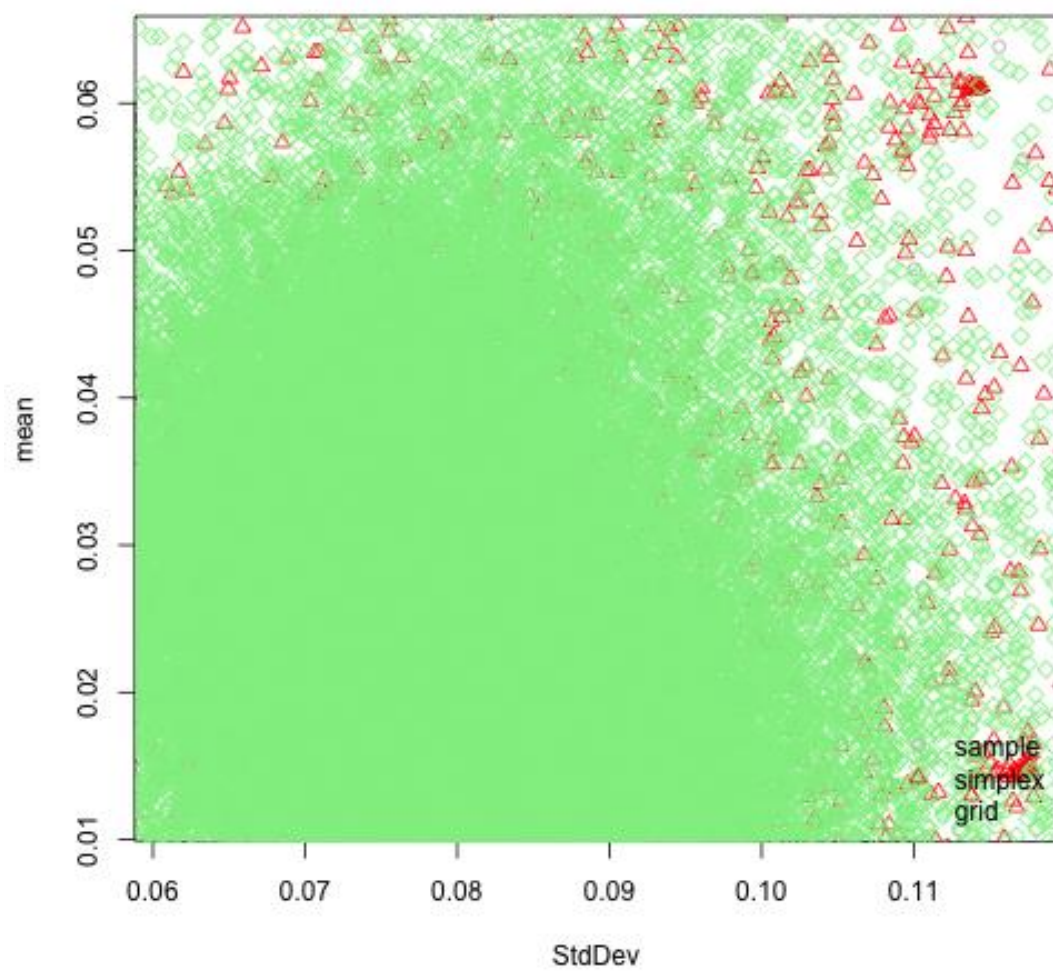
```
## GMT
##                    KLD         IJH         IWM          EFA          EEM
## 2013-12-31  0.29688924  0.31573255  0.36812144  0.180091453 -0.05749718
## 2014-12-31  0.11289182  0.08213138  0.03692788 -0.093293592 -0.06004785
## 2015-12-31 -0.00812493 -0.03784530 -0.05851864 -0.034845496 -0.18070756
## 2016-12-31  0.06097027  0.11046512  0.10291245  0.006982289  0.16340478
##                    IFGL         IYR         GSG          IGF          EMIF
## 2013-12-31 -0.06851796 -0.02458636 -0.01829826  0.09045085 -0.003212617
## 2014-12-31 -0.02657161  0.21813570 -0.32960547  0.08243451 -0.050395546
```
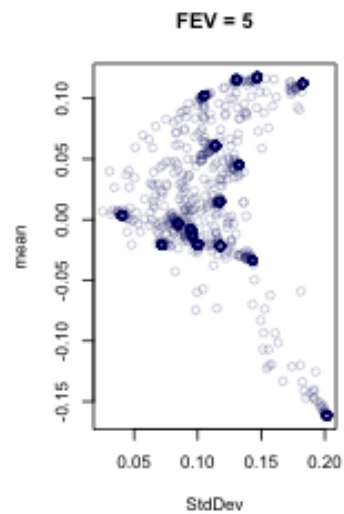
```
## 2015-12-31 -0.07190413 -0.02290474 -0.34059314 -0.14733096 -0.158901574
## 2016-12-31  0.08213773  0.07405434  0.04146170  0.15637173  0.125825385
##                     IPRV          AGG        IGOV          EMB        GHYG
## 2013-12-31 0.25490196 -0.04186172 -0.02662003 -0.11914651  0.02030746
## 2014-12-31 0.08779762  0.03467068 -0.03403533  0.01433062 -0.07031250
## 2015-12-31 0.02325581 -0.01916092 -0.07346559 -0.03582171 -0.10724290
## 2016-12-31 0.04344920  0.04082955  0.11977250  0.10805445  0.10623039
##                     EMHY
## 2013-12-31 -0.11523963
## 2014-12-31 -0.03631568
## 2015-12-31 -0.05157895
## 2016-12-31  0.12097669

## [1] 0.01810102
```

Creating the optimal portfolio along the efficient frontier

Random Portfolio Method

FEV = 5

```
## Error in xy.coords(x, y, xlabel, ylabel, log): 'x' and 'y' lengths differ
```

Optimzed portfolio weights
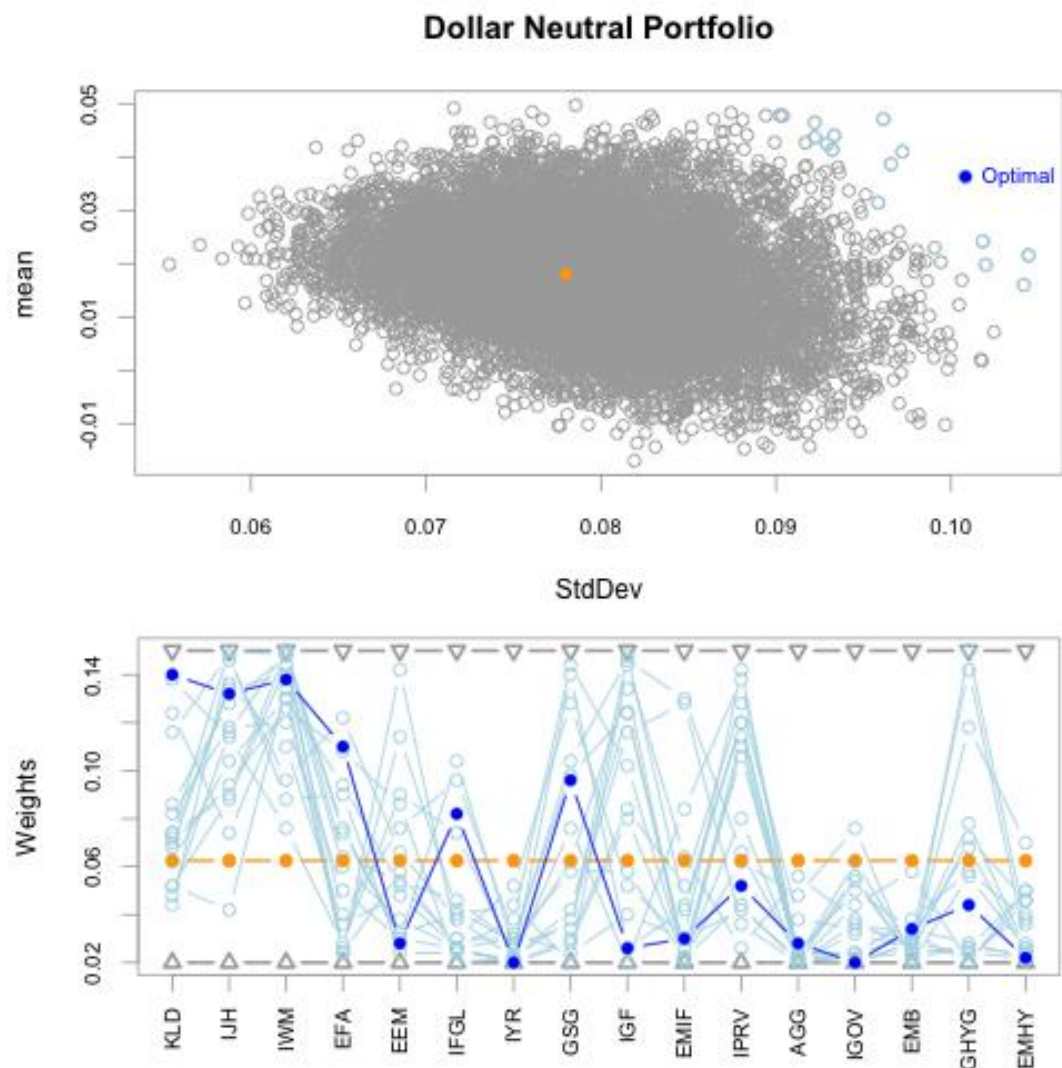
```
## GMT
##                   KLD         IJH         IWM          EFA          EEM
## 2013-12-31  0.29688924  0.31573255  0.36812144  0.180091453 -0.05749718
## 2014-12-31  0.11289182  0.08213138  0.03692788 -0.093293592 -0.06004785
## 2015-12-31 -0.00812493 -0.03784530 -0.05851864 -0.034845496 -0.18070756
## 2016-12-31  0.06097027  0.11046512  0.10291245  0.006982289  0.16340478
##                  IFGL         IYR         GSG          IGF         EMIF
## 2013-12-31 -0.06851796 -0.02458636 -0.01829826  0.09045085 -0.003212617
## 2014-12-31 -0.02657161  0.21813570 -0.32960547  0.08243451 -0.050395546
## 2015-12-31 -0.07190413 -0.02290474 -0.34059314 -0.14733096 -0.158901574
## 2016-12-31  0.08213773  0.07405434  0.04146170  0.15637173  0.125825385
##                  IPRV         AGG        IGOV          EMB         GHYG
## 2013-12-31 0.25490196 -0.04186172 -0.02662003 -0.11914651  0.02030746
```

```
## 2014-12-31 0.08779762  0.03467068 -0.03403533  0.01433062 -0.07031250
## 2015-12-31 0.02325581 -0.01916092 -0.07346559 -0.03582171 -0.10724290
## 2016-12-31 0.04344920  0.04082955  0.11977250  0.10805445  0.10623039
##                     EMHY
## 2013-12-31 -0.11523963
## 2014-12-31 -0.03631568
## 2015-12-31 -0.05157895
## 2016-12-31  0.12097669

## **********************************
## PortfolioAnalytics Optimization
## **********************************
##
## Call:
## optimize.portfolio(R = port.return.data.final, portfolio =
total.port.minEs,
##     optimize_method = "random", trace = TRUE, rp = rp)
##
## Optimal Weights:
##   KLD   IJH   IWM   EFA   EEM  IFGL   IYR   GSG   IGF  EMIF  IPRV   AGG
## 0.140 0.132 0.138 0.110 0.028 0.082 0.020 0.096 0.026 0.030 0.052 0.028
##  IGOV   EMB  GHYG  EMHY
## 0.020 0.034 0.044 0.022
##
## Objective Measures:
##    mean
## 0.03645
##
##
## StdDev
## 0.1008
##
##
##      ES
## 0.1335
```

Dollar Neutral Portfolio

plot of chunk unnamed-chunk-53

Benchmark Portfolio Sharpe Ratio

Current Portfolio Selections

Mutual Bond and Fixed Income Holdings

1.   iShares 1-3yr International Treasury Bond ETF (ISHG - 1.8yr duration)

Returns

```
##                             TS.1
## Annualized Return -0.03009854
```

Standard deviation of returns

```
##                     [,1]
## StdDev 0.05869528
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                     TS.1
## 2016-09-27 -0.7777907
```

Beta

```
## [1] 0.8133069
```

Sortino Ratio

```
##                               TS.1
## Sortino Ratio (MAR = 8.5%) -0.9042815
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.02602969
```

2. Calvert Short Duration Income Fund (CSDAX - 2.5yr duration)

Returns

```
##                               TS.1
## Annualized Return -0.0008545439
```

Standard deviation of returns

```
##                 [,1]
## StdDev 0.02598303
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                     TS.1
## 2016-09-27 -0.6156598
```

Beta

```
## [1] 0.2828307
```

Sortino Ratio

```
##                                 TS.1
## Sortino Ratio (MAR = 8.5%) -0.9629164
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.008430296
```

3.   Access Capital Community Fund (ACASX - 4.2yr duration)

Returns

```
##                             TS.1
## Annualized Return -0.00695073
```

Standard deviation of returns

```
##                 [,1]
## StdDev 0.02355784
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                     TS.1
## 2016-09-27 -0.9572495
```

Beta

```
## [1] 0.7850124
```

Sortino Ratio

```
##                                 TS.1
## Sortino Ratio (MAR = 8.5%) -0.9730031
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.008453524
```

4.   PAX World High Yield Bond Fund (PAXHX - 4.3yr duration)

```
##                              TS.1
## Annualized Return -0.02001561
```

Standard deviation of returns

```
##                  [,1]
## StdDev 0.06492024
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                     TS.1
## 2016-09-27 -0.5677196
```

Beta

```
## [1] 0.4726875
```

Sortino Ratio

```
##                                       TS.1
## Sortino Ratio (MAR = 8.5%) -0.8679028
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.007999039
```

5.   iShares Core Treasury Bond ETF (GOVT - 6.06yr duration)

```
## Error: {"quandl_error":{"code":"QECx02","message":"You have submitted an
incorrect Quandl code. Please check your Quandl codes and try again."}}

##                              TS.1
## Annualized Return 0.01027858
```

Standard deviation of returns

```
##                 [,1]
## StdDev 0.03609648
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                    TS.1
## 2016-09-27 -0.1474222
```

Beta

```
## [1] 0.4726875
```

Sortino Ratio

```
##                                TS.1
## Sortino Ratio (MAR = 8.5%) -0.9225213
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.04747256
```

6.   iShares International Treasury Bond ETF (IGOV - 8.06yr duration)
```
## Error: {"quandl_error":{"code":"QECx02","message":"You have submitted an
incorrect Quandl code. Please check your Quandl codes and try again."}}

##                       TS.1
## Annualized Return -0.003587115
```

Standard deviation of returns

```
##                 [,1]
## StdDev 0.08477068
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                    TS.1
## 2016-09-27 -0.2096811
```

Beta

```
## [1] 1
```

Sortino Ratio

```
##                               TS.1
## Sortino Ratio (MAR = 8.5%) -0.7789117
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.04515759
```

Mutual Fund U.S. Stock Holdings

1. Parnassus Endeavor Fund (PARWX - Large Cap Growth)

```
##                     TS.1
## Annualized Return 0.07684704
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.1030606
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                   TS.1
## 2016-09-27 0.5881156
```

Beta

```
## [1] 0.8724749
```

Sortino Ratio

```
##                               TS.1
## Sortino Ratio (MAR = 8.5%) -0.1052447
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
```

```
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.009137164
```

2. Parnassus Mid-Cap Fund (PARMX - Mid Cap Blend)

```
##                       TS.1
## Annualized Return 0.09066998
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.1060059
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                 TS.1
## 2016-09-27 0.7013985
```

Beta

```
## [1] 0.639725
```

Sortino Ratio

```
##                               TS.1
## Sortino Ratio (MAR = 8.5%) 0.07848458
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.02127641
```

3. Pax World Small-Cap Fund (PXSCX - Small Cap Blend)

```
##                       TS.1
## Annualized Return 0.09066998
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.1060059
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                 TS.1
## 2016-09-27 0.7013985
```

Beta

```
## [1] 0.639725
```

Sortino Ratio

```
##                                 TS.1
## Sortino Ratio (MAR = 8.5%) 0.07848458
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.02127641
```

Mutual Fund Developed Market Stock Holdings

1. Pax MSCI International ESG Index Fund (PXINX - Developed World International)
```
##                          TS.1
## Annualized Return -0.001123857
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.1218419
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                  TS.1
## 2016-09-27 -0.1734403
```

Beta

```
## [1] 0.9210095
```

Sortino Ratio

```
##                                TS.1
## Sortino Ratio (MAR = 8.5%) -0.6162617
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.005978689
```

Mutual Fund Developing Market Stock Holdings

1. Calvert Emerging Markets Equity Fund (CVMAX - Developing International)

```
## [1] 0.01816068
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.0869076
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                 TS.1
## 2016-09-27 0.04800099
```

Beta

```
## [1] 0.7256115
```

Sortino Ratio

```
##                              yearly.returns
## Sortino Ratio (MAR = 8.5%)       -0.6681232
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] NA
```

Single Stock Holdings

Real Assets

1. Avalonbay Communities Inc. (AVB)

```
##                     TS.1
## Annualized Return 0.1344944
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.2610724
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                TS.1
## 2016-09-27 0.459995
```

Beta

```
## [1] 1.525012
```

Sortino Ratio

```
##                               TS.1
## Sortino Ratio (MAR = 8.5%) 0.3214165
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.004786509
```

2. ProLogis Inc. (PLD)

```
##                     TS.1
## Annualized Return 0.07883884
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.2012641
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                 TS.1
## 2016-09-27 0.3178014
```

Beta

```
## [1] 0.7175708
```

Sortino Ratio

```
##                                TS.1
## Sortino Ratio (MAR = 8.5%) -0.03664808
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## [1] 0.003953808
```

3.   Extra Space Storage Inc (EXR)

```
##                       TS.1
## Annualized Return 0.1933297
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.2786177
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                 TS.1
## 2016-09-27 0.1061801
```

Beta

```
## [1] 0.109607
```

Sortino Ratio

```
##                              TS.1
## Sortino Ratio (MAR = 8.5%) 0.7399104
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## [1] 0.01192606
```

3. iShares Gold Trust

```
##                      TS.1
## Annualized Return 0.1006931
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.1843145
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                TS.1
## 2016-09-27 0.4616732
```

Beta

```
## [1] 0.2515437
```

Sortino Ratio

```
##                             TS.1
## Sortino Ratio (MAR = 8.5%) 0.1213491
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## [1] 0.03023124
```

Water Utilities & Infrastructure

US Equities

1. Middlesex Water Company (MSEX)

```
##                      TS.1
## Annualized Return 0.03432783
```

Standard deviation of returns

```
##                 [,1]
## StdDev 0.1828465
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                  TS.1
## 2016-09-27 0.1061801
```

Beta

```
## [1] 0.2680041
```

Sortino Ratio

```
##                              TS.1
## Sortino Ratio (MAR = 8.5%) -0.3126203
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.01078915
```

2. Xylem, Inc (XYL)

```
##                        TS.1
## Annualized Return 0.1655347
```

Standard deviation of returns

```
##                 [,1]
## StdDev 0.1905987
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                  TS.1
## 2016-09-27 0.7894132
```

Beta

```
## [1] 1.372663
```

Sortino Ratio

```
##                             TS.1
## Sortino Ratio (MAR = 8.5%) 1.387564
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.05163357
```

3. Danaher, Inc (DHR)

```
##                         TS.1
## Annualized Return 0.2366094
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.2665522
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                    TS.1
## 2016-09-27 0.8271275
```

Beta

```
## [1] -0.2311883
```

Sortino Ratio

```
##                             TS.1
## Sortino Ratio (MAR = 8.5%) 1.293253
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.009881453
```

4.   American Water Works Co., Inc (AWK)

```
##                      TS.1
## Annualized Return 0.1749945
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.07320485
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                TS.1
## 2016-09-27 2.105498
```

Beta

```
## [1] 0.388555
```

Sortino Ratio

```
##                          TS.1
## Sortino Ratio (MAR = 8.5%) 21.71102
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object
```

```
## [1] 0.03594233
```

5.   Raven Industries, Inc (RAVN)

```
##                      TS.1
## Annualized Return 0.1250224
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.3812562
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays
```

```
## GMT
##                 TS.1
## 2016-09-27 0.2861471
```

Beta

```
## [1] 2.573338
```

Sortino Ratio

```
##                              TS.1
## Sortino Ratio (MAR = 8.5%) 0.1841119
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.006154062
```

6.   Hannon Armstrong (HASI)

```
##                  TS.1
## Annualized Return 0.1947091
```

Standard deviation of returns

```
##              [,1]
## StdDev 0.1590364
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                 TS.1
## 2016-09-27 1.135745
```

Beta

```
## [1] -0.5580826
```

Sortino Ratio

```
##                              TS.1
## Sortino Ratio (MAR = 8.5%) 2.894068
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.1045975
```

Autonomous Vehicles

1.   IBM Corp. (IBM)

```
##                        TS.1
## Annualized Return 0.0396722
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.3208168
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                   TS.1
## 2016-09-27 0.0748055
```

Beta

```
## [1] 0.5784978
```

Sortino Ratio

```
##                                TS.1
## Sortino Ratio (MAR = 8.5%) -0.1824246
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.001123293
```

2.   Verizon Wireless (VZW)

```
##                         TS.1
## Annualized Return 0.02203071
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.2356538
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                 TS.1
## 2016-09-27 0.02750861
```

Beta

```
## [1] 0.5072672
```

Sortino Ratio

```
##                           TS.1
## Sortino Ratio (MAR = 8.5%) -0.3079149
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.001966427
```

2.   Apple Inc (AAPL)

```
##                   TS.1
## Annualized Return 0.2307773
```

Standard deviation of returns

```
##             [,1]
## StdDev 0.7081682
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                 TS.1
## 2016-09-27 0.3038506
```

Beta

```
## [1] 1.426028
```

Sortino Ratio

```
##                             TS.1
## Sortino Ratio (MAR = 8.5%) 0.4636536
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.001815149
```

Renewable Energy Production/Infrastructure

1. Enersys (ENS)

```
##                         TS.1
## Annualized Return 0.2236345
```

Standard deviation of returns

```
##               [,1]
## StdDev 0.4628528
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                 TS.1
## 2016-09-27 0.4494616
```

Beta

```
## [1] 2.424678
```

Sortino Ratio

```
##                            TS.1
## Sortino Ratio (MAR = 8.5%) 0.610811
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
```

```
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.01176088
```

1.   Oramat Technologies Inc (ORA)
```
##                              TS.1
## Annualized Return 0.1512404
```

Standard deviation of returns

```
##                 [,1]
## StdDev 0.345551
```

Sharpe ratio

```
## Error in e1/e2: non-conformable arrays

## GMT
##                     TS.1
## 2016-09-27 0.3925337
```

Beta

```
## [1] 0.4360892
```

Sortino Ratio

```
##                                      TS.1
## Sortino Ratio (MAR = 8.5%) 0.3009391
```

Treynor Ratio

```
## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## Warning in class(x) <- oclass: Setting class(x) to multiple strings
("xts",
## "zoo", ...); result will no longer be an S4 object

## [1] 0.01354222
```

Optimzed portfolio weights
```
## GMT
##                     TS.1      TS.1.1.1     TS.1.2.1     TS.1.1.3.2     TS.1.2.4.2
## 2013-12-31 -0.02762317 -0.01215061 -0.05175983   0.005312085 -0.034181240
## 2014-12-31 -0.10430358 -0.01230018   0.01965066 -0.071334214   0.034979424
## 2015-12-31 -0.07786982 -0.01556656 -0.02034261 -0.110953058 -0.003578529
##             TS.1.1.1.3.1.5.3.1 TS.1.2.1.4.1.6.3.1 TS.1.1.3.2.5.1.7.4.1
## 2013-12-31         -0.02662003         0.21741092           0.23828318
## 2014-12-31         -0.03403533         0.10967029           0.09163347
```

```
## 2015-12-31          -0.07346559          -0.06277132          -0.06715332
##            TS.1.2.4.2.6.1.8.4.1 TS.1.1.1.3.1.5.3.1.7.2.1.9.5.2
## 2013-12-31           0.28355388                    0.147058824
## 2014-12-31           0.02503682                   -0.125000000
## 2015-12-31          -0.04454023                   -0.007326007
##            yearly.returns TS.1.2.1.4.1.6.3.1.8.2.1.10.5.2.1
## 2013-12-31     0.04971933                        -0.1280330
## 2014-12-31    -0.04736440                         0.3819674
## 2015-12-31    -0.08580593                         0.1269356
##            TS.1.1.3.2.5.1.7.4.1.9.2.1.11.6.2.1
## 2013-12-31                         0.012606193
## 2014-12-31                         0.164546685
## 2015-12-31                        -0.002556356
##            TS.1.2.4.2.6.1.8.4.1.10.2.1.12.6.2.1
## 2013-12-31                            0.1577356
## 2014-12-31                            0.3918823
## 2015-12-31                            0.5042633
##            TS.1.1.1.3.1.5.3.1.7.2.9.5.2.11.3.2.13.7.3
## 2013-12-31                                 -0.28255528
## 2014-12-31                                 -0.02054795
## 2015-12-31                                 -0.10576923
##            TS.1.2.1.4.1.6.3.1.8.2.10.5.2.12.3.2.14.7.3.2
## 2013-12-31                                    0.07055225
## 2014-12-31                                    0.10124154
## 2015-12-31                                    0.15091076
##            TS.1.1.3.2.5.1.7.4.1.9.2.11.6.2.13.3.2.15.8.3.2
## 2013-12-31                                      0.27675277
## 2014-12-31                                      0.10028902
## 2015-12-31                                     -0.04123982
##            TS.1.2.4.2.6.1.8.4.1.10.2.1.12.6.2.14.3.2.16.8.3.2
## 2013-12-31                                         0.38103757
## 2014-12-31                                         0.11023316
## 2015-12-31                                         0.08365418
##            TS.1.1.1.3.1.5.3.7.2.9.5.2.11.3.13.7.3.15.4.17.9.4
## 2013-12-31                                          0.1381632
## 2014-12-31                                          0.2612399
## 2015-12-31                                          0.1210131
##            TS.1.2.1.4.1.6.3.8.2.10.5.2.12.3.14.7.3.16.4.18.9.4
## 2013-12-31                                          0.5606979
## 2014-12-31                                         -0.3923189
## 2015-12-31                                         -0.3760000
##            TS.1.1.3.2.5.1.7.4.9.2.11.6.2.13.3.15.8.3.17.4.19.10.4
## 2013-12-31                                             0.05681560
## 2014-12-31                                            -0.03131502
## 2015-12-31                                            -0.13789990
##            TS.1.2.4.2.6.1.8.4.10.2.12.6.2.14.3.2.16.8.3.18.4.3.20.10.4
## 2013-12-31                                                 -0.02077784
## 2014-12-31                                                 -0.14463936
## 2015-12-31                                                 -0.14223390
##            TS.1.1.1.3.5.3.7.2.9.5.11.3.13.7.15.4.17.9.19.5.21.11
```
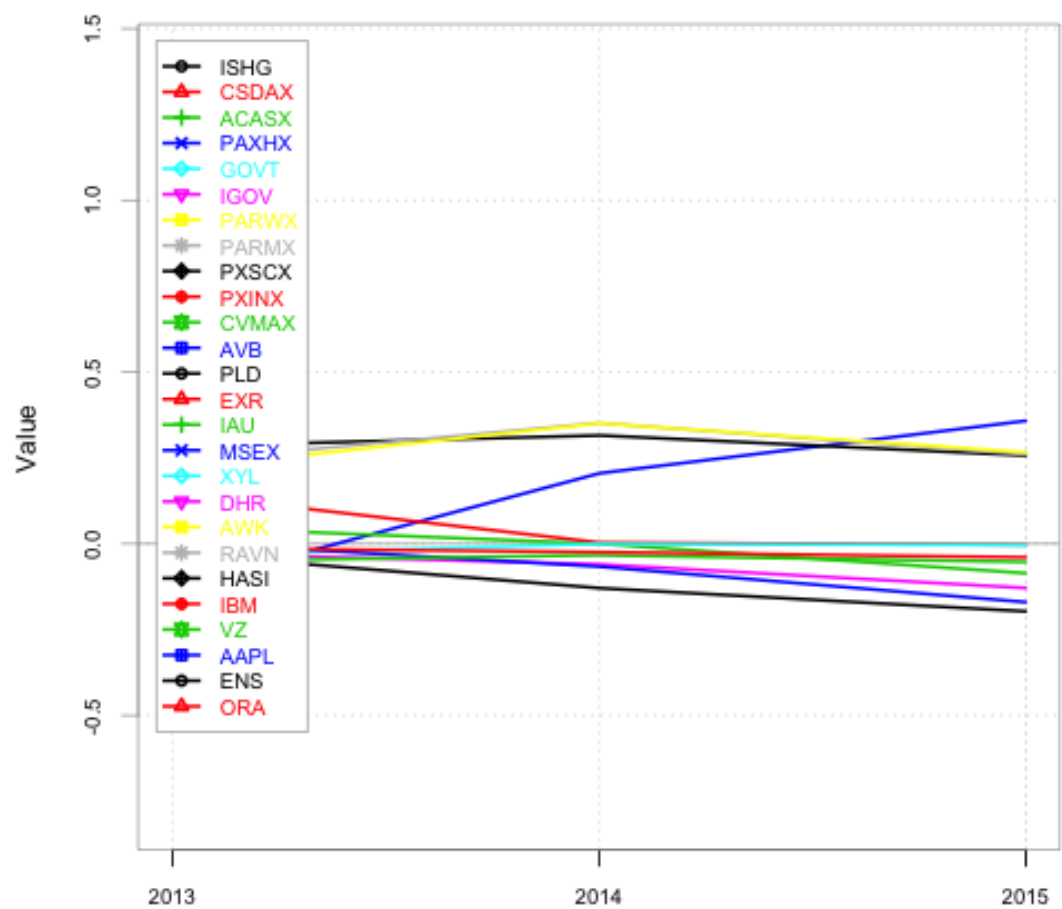
```
## 2013-12-31                                           0.13565979
## 2014-12-31                                          -0.04802605
## 2015-12-31                                          -0.01197089
##          TS.1.2.1.4.6.3.8.2.10.5.12.3.14.7.16.4.18.9.20.5.22.11
## 2013-12-31                                           0.05421201
## 2014-12-31                                          -0.80325123
## 2015-12-31                                          -0.04638517
##          TS.1.1.3.2.5.7.4.9.2.11.6.13.3.15.8.17.4.19.10.21.5.23.12
## 2013-12-31                                           0.86260946
## 2014-12-31                                          -0.11941783
## 2015-12-31                                          -0.09381077
##          TS.1.2.4.2.6.8.4.10.2.12.6.14.3.16.8.18.4.20.10.22.5.24.12
## 2013-12-31                                           0.411306929
## 2014-12-31                                          -0.001102499
## 2015-12-31                                           0.341795475

## GMT
##                 ISHG       CSDAX       ACASX       PAXHX        GOVT
## 2013-12-31 -0.02762317 -0.01215061 -0.05175983  0.005312085 -0.034181240
## 2014-12-31 -0.10430358 -0.01230018  0.01965066 -0.071334214  0.034979424
## 2015-12-31 -0.07786982 -0.01556656 -0.02034261 -0.110953058 -0.003578529
##                 IGOV       PARWX       PARMX       PXSCX        PXINX
## 2013-12-31 -0.02662003  0.21741092  0.23828318  0.28355388  0.147058824
## 2014-12-31 -0.03403533  0.10967029  0.09163347  0.02503682 -0.125000000
## 2015-12-31 -0.07346559 -0.06277132 -0.06715332 -0.04454023 -0.007326007
##                 CVMAX        AVB         PLD        EXR         IAU
## 2013-12-31  0.04971933 -0.1280330  0.012606193 0.1577356 -0.28255528
## 2014-12-31 -0.04736440  0.3819674  0.164546685 0.3918823 -0.02054795
## 2015-12-31 -0.08580593  0.1269356 -0.002556356 0.5042633 -0.10576923
##                 MSEX         XYL         DHR        AWK        RAVN
## 2013-12-31 0.07055225  0.27675277 0.38103757 0.1381632  0.5606979
## 2014-12-31 0.10124154  0.10028902 0.11023316 0.2612399 -0.3923189
## 2015-12-31 0.15091076 -0.04123982 0.08365418 0.1210131 -0.3760000
##                 HASI         IBM         VZ        AAPL        ENS
## 2013-12-31  0.05681560 -0.02077784  0.13565979  0.05421201  0.86260946
## 2014-12-31 -0.03131502 -0.14463936 -0.04802605 -0.80325123 -0.11941783
## 2015-12-31 -0.13789990 -0.14223390 -0.01197089 -0.04638517 -0.09381077
##                 ORA
## 2013-12-31  0.411306929
## 2014-12-31 -0.001102499
## 2015-12-31  0.341795475
```
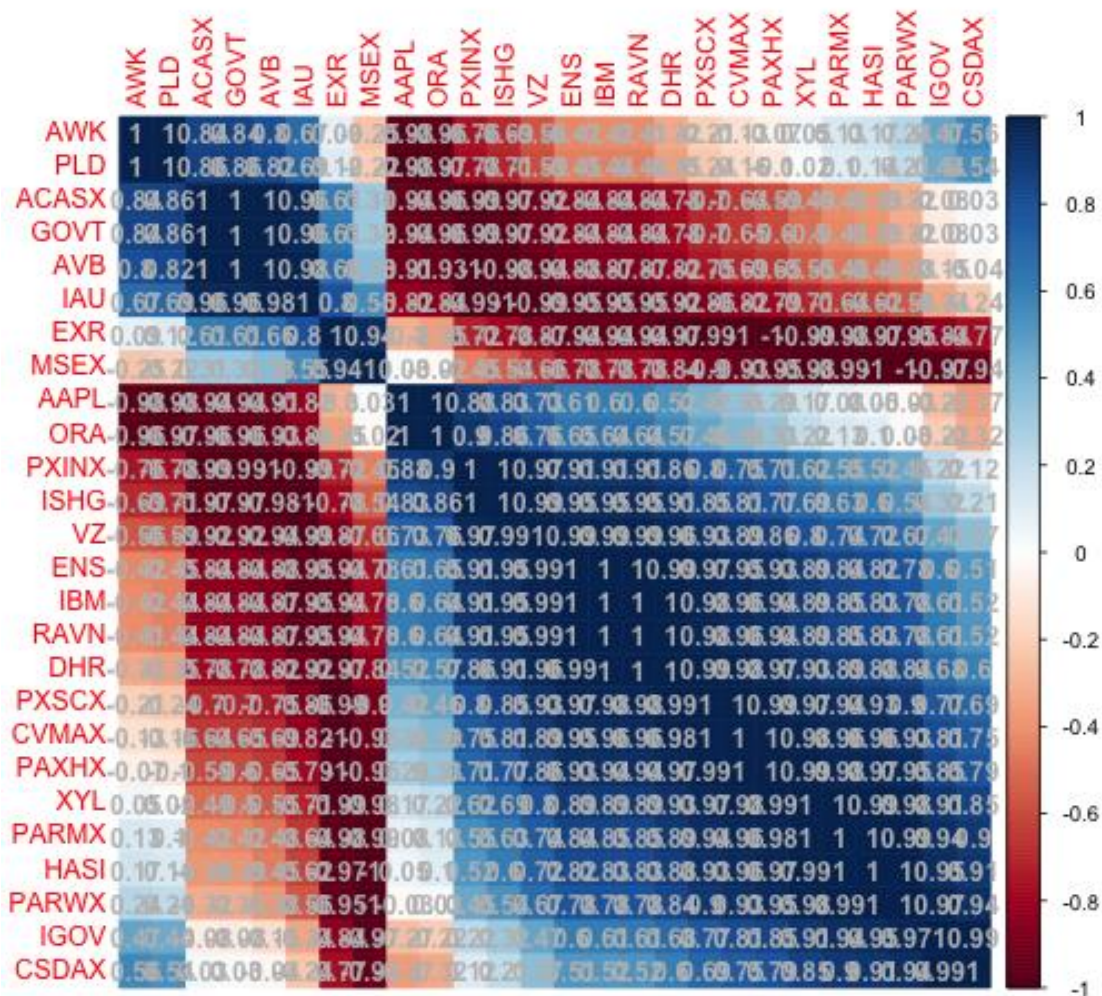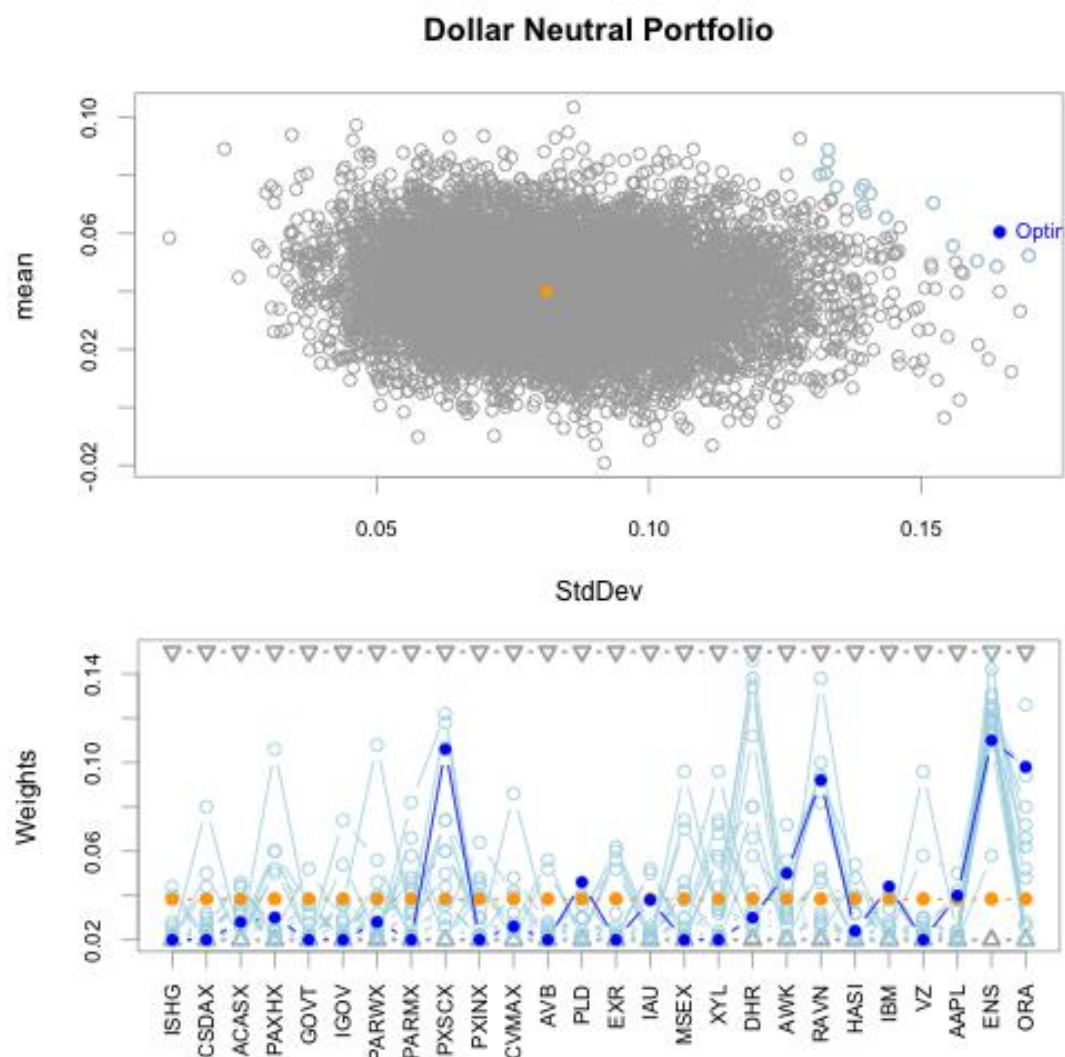
```
## GMT
##                   ISHG        CSDAX        ACASX        PAXHX        GOVT
## 2013-12-31 -0.02762317 -0.01215061 -0.05175983  0.005312085 -0.034181240
## 2014-12-31 -0.10430358 -0.01230018  0.01965066 -0.071334214  0.034979424
## 2015-12-31 -0.07786982 -0.01556656 -0.02034261 -0.110953058 -0.003578529
##                   IGOV        PARWX        PARMX        PXSCX        PXINX
## 2013-12-31 -0.02662003  0.21741092  0.23828318  0.28355388  0.147058824
## 2014-12-31 -0.03403533  0.10967029  0.09163347  0.02503682 -0.125000000
## 2015-12-31 -0.07346559 -0.06277132 -0.06715332 -0.04454023 -0.007326007
##                   CVMAX         AVB          PLD        EXR         IAU
## 2013-12-31  0.04971933 -0.1280330  0.012606193 0.1577356 -0.28255528
## 2014-12-31 -0.04736440  0.3819674  0.164546685 0.3918823 -0.02054795
## 2015-12-31 -0.08580593  0.1269356 -0.002556356 0.5042633 -0.10576923
##                   MSEX         XYL         DHR        AWK        RAVN
## 2013-12-31 0.07055225  0.27675277 0.38103757 0.1381632  0.5606979
## 2014-12-31 0.10124154  0.10028902 0.11023316 0.2612399 -0.3923189
## 2015-12-31 0.15091076 -0.04123982 0.08365418 0.1210131 -0.3760000
```

```
##                     HASI          IBM          VZ         AAPL          ENS
## 2013-12-31  0.05681560 -0.02077784  0.13565979  0.05421201  0.86260946
## 2014-12-31 -0.03131502 -0.14463936 -0.04802605 -0.80325123 -0.11941783
## 2015-12-31 -0.13789990 -0.14223390 -0.01197089 -0.04638517 -0.09381077
##                     ORA
## 2013-12-31  0.411306929
## 2014-12-31 -0.001102499
## 2015-12-31  0.341795475

## *********************************
## PortfolioAnalytics Optimization
## *********************************
##
## Call:
## optimize.portfolio(R = jc_port_return_final, portfolio = jc.StdDev,
##     optimize_method = "random", trace = TRUE, rp = jc.rp)
##
## Optimal Weights:
##  ISHG CSDAX ACASX PAXHX  GOVT  IGOV PARWX PARMX PXSCX PXINX CVMAX   AVB
## 0.020 0.020 0.028 0.030 0.020 0.020 0.028 0.020 0.106 0.020 0.026 0.020
##   PLD   EXR   IAU  MSEX   XYL   DHR   AWK  RAVN  HASI   IBM    VZ  AAPL
## 0.046 0.020 0.038 0.020 0.020 0.030 0.050 0.092 0.024 0.044 0.020 0.040
##   ENS   ORA
## 0.110 0.098
##
## Objective Measures:
##    mean
## 0.06046
##
##
## StdDev
## 0.1644
```
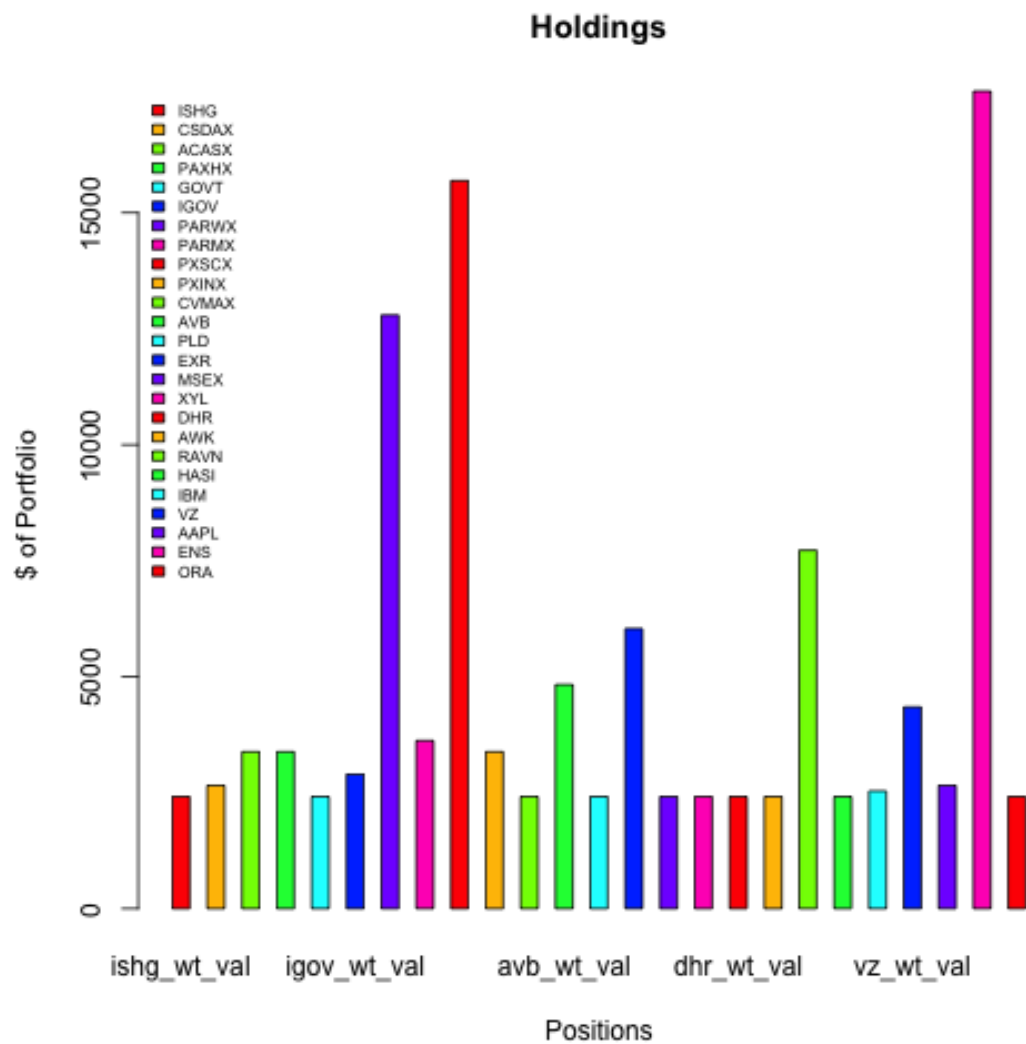
Dollar Neutral Portfolio

plot of chunk unnamed-chunk-211

Asset Allocation

```
##       ishg_wt_val csdax_wt_val acasx_wt_val paxhx_wt_val govt_wt_val
## [1,]     2413.84     2655.224     3379.376     3379.376     2413.84
##       igov_wt_val parwx_wt_val parmx_wt_val pxscx_wt_val pxinx_wt_val
## [1,]    2896.608     12793.35      3620.76     15689.96     3379.376
##       cvmax_wt_val avb_wt_val pld_wt_val exr_wt_val msex_wt_val xyl_wt_val
## [1,]      2413.84    4827.68    2413.84     6034.6     2413.84     2413.84
##       dhr_wt_val awk_wt_val ravn_wt_val hasi_wt_val ibm_wt_val vz_wt_val
## [1,]     2413.84    2413.84     7724.288     2413.84    2534.532  4344.912
##       aapl_wt_val ens_wt_val ora_wt_val
## [1,]     2655.224   17621.03     2413.84
```

Holdings

Legend:
- ISHG
- CSDAX
- ACASX
- PAXHX
- GOVT
- IGOV
- PARWX
- PARMX
- PXSCX
- PXINX
- CVMAX
- AVB
- PLD
- EXR
- MSEX
- XYL
- DHR
- AWK
- RAVN
- HASI
- IBM
- VZ
- AAPL
- ENS
- ORA

Y-axis: $ of Portfolio
X-axis: Positions (ishg_wt_val, igov_wt_val, avb_wt_val, dhr_wt_val, vz_wt_val)

plot of chunk unnamed-chunk-212

Bond portfolio duration
```
## [1] 3.755573e-05

##
##
## processing file: JC_Quant Report_09.2016.Rmd

## Error in parse_block(g[-1], g[1], params.src): duplicate label 'setup'
```