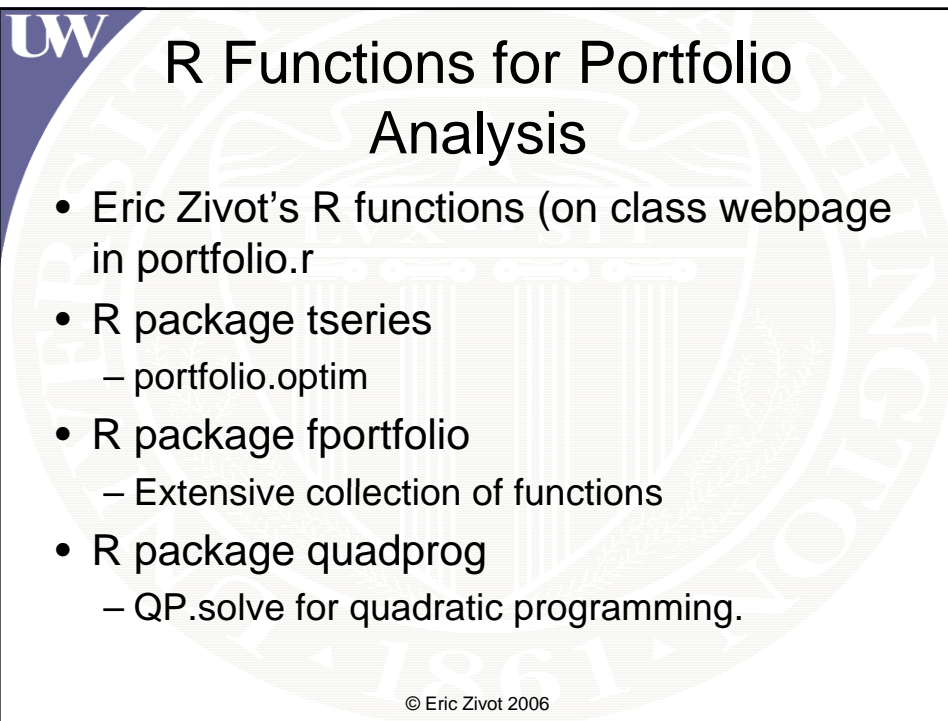



# Portfolio Analysis in R

Econ 424  
Eric Zivot  
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## R Functions for Portfolio Analysis

- Eric Zivot's R functions (on class webpage in portfolio.r)
- R package tseries
  - portfolio.optim
- R package fportfolio
  - Extensive collection of functions
- R package quadprog
  - QP.solve for quadratic programming.

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## My R functions

Function	Description
<code>getPortfolio</code>	Create portfolio object
<code>efficient.portfolio</code>	Compute minimum variance portfolio subject to target return
<code>globalMin.portfolio</code>	Compute global minimum variance portfolio
<code>tangency.portfolio</code>	Compute tangency portfolio
<code>efficient.frontier</code>	Compute efficient frontier of risky asset only portfolios

Note: these functions are based on matrix algebra solutions to portfolio calculations that allow short sales

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## 3 Firm Example Data

```
> er
  MSFT  NORD  SBUX
0.0427 0.0015 0.0285

> covmat
      MSFT  NORD  SBUX
MSFT 0.0100 0.0018 0.0011
NORD 0.0018 0.0109 0.0026
SBUX 0.0011 0.0026 0.0199

> rk.free
[1] 0.005
```

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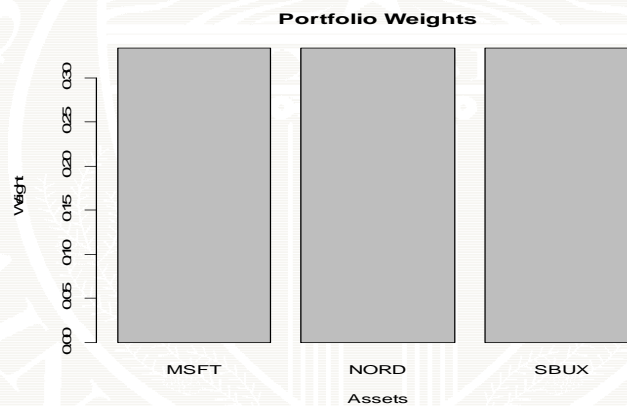
## Create Arbitrary Portfolio

```
# compute equally weighted portfolio
> ew = rep(1,3)/3
> equalWeight.portfolio =
+ getPortfolio(er=er,cov.mat=covmat,weights=ew)
> equalWeight.portfolio
Call:
getPortfolio(er = er, cov.mat = covmat,
             weights = ew)

Portfolio expected return:      0.02423333
Portfolio standard deviation:  0.07586538
Portfolio weights:
  MSFT  NORD  SBUX
0.3333 0.3333 0.3333
```

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## Plot Portfolio Weights



```
> plot(equalWeight.portfolio)
```

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## Compute Global Minimum Variance Portfolio

```

> gmin.port <- globalMin.portfolio(er, covmat)
> attributes(gmin.port)
$names
[1] "call" "er" "sd" "weights"

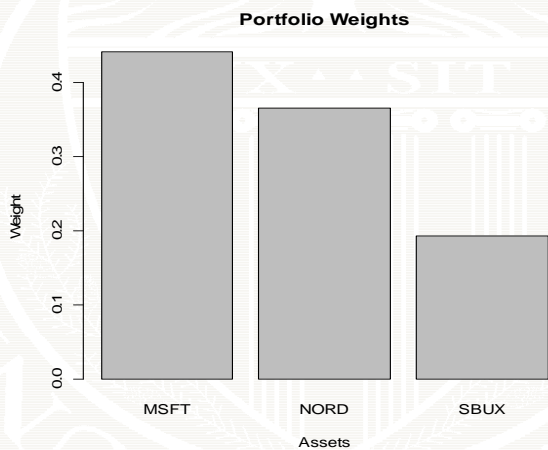
$class
[1] "portfolio"

> print(gmin.port)
Call:
globalMin.portfolio(er = er, cov.mat = covmat)

Portfolio expected return: 0.02489184
Portfolio standard deviation: 0.07267607
Portfolio weights:
  MSFT  NORD  SBUX
0.4411 0.3656 0.1933
    
```

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## Global Minimum Variance Portfolio



```
> plot(gmin.port)
```

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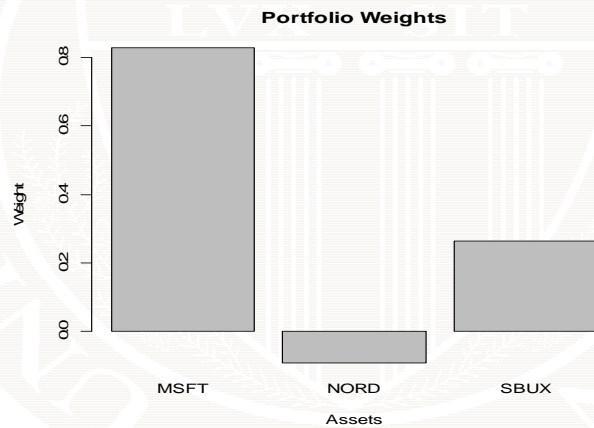
# Compute Efficient Portfolio

```
# compute efficient portfolio subject to target
# return equal to E[Rmsft] = 0.0427
> target.return <- er[1]
> e.port.msft <- efficient.portfolio(er, covmat,
+                                 target.return)
> print(e.port.msft)
```

```
Call:
efficient.portfolio(er = er, cov.mat = covmat,
target.return = target.return)
```

```
Portfolio expected return:    0.0427
Portfolio standard deviation: 0.091656
Portfolio weights:
  MSFT   NORD   SBUX
0.8275 -0.0907 0.2633
```

# Efficient Portfolio Weights



# Compute Tangency Portfolio

```
> tan.port <- tangency.portfolio(er, covmat,
+                               rk.free)
> print(tan.port)
```

```
Call:
tangency.portfolio(er = er, cov.mat =
covmat, risk.free = rk.free)
```

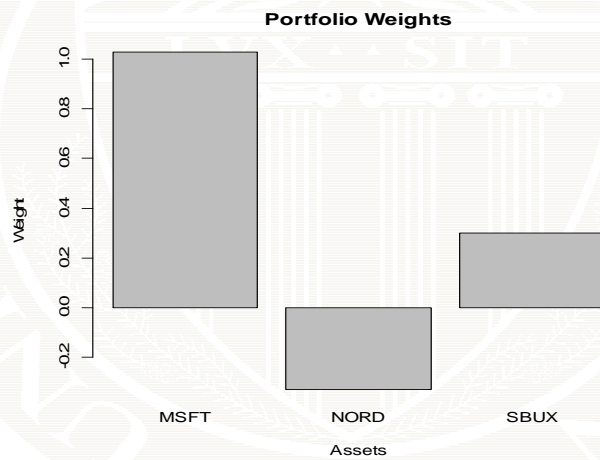
Portfolio expected return: 0.05188967

Portfolio standard deviation: 0.1115816

Portfolio weights:

MSFT	NORD	SBUX
1.0268	-0.3263	0.2994

# Tangency Portfolio Weights



# Compute Efficient Frontier

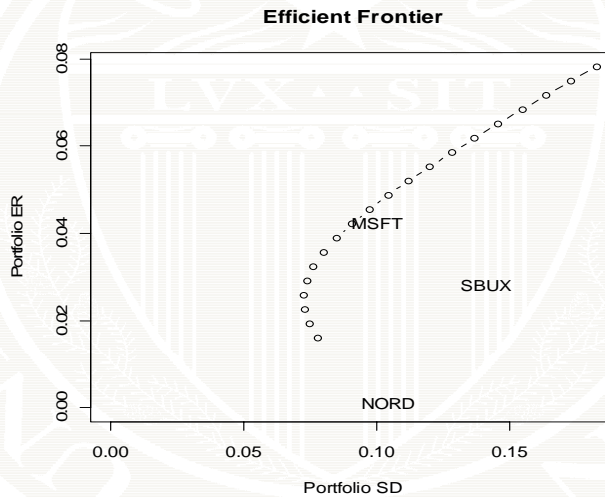
```
> ef <- efficient.frontier(er, covmat, alpha.min=-2,
+                          alpha.max=1.5)
> ef
Call:
efficient.frontier(er = er, cov.mat = covmat, alpha.min = -2,
                  alpha.max = 1.5)
```

Frontier portfolios' expected returns and standard deviations

	port 1	port 2	port 3	port 4	port 5	port 6	port 7
ER	0.0783	0.0750	0.0718	0.0685	0.0652	0.0619	0.0586
SD	0.1826	0.1732	0.1640	0.1548	0.1458	0.1370	0.1284
	port 8	port 9	port 10	port 11	port 12	port 13	port 14
ER	0.0554	0.0521	0.0488	0.0455	0.0422	0.039	0.0357
SD	0.1200	0.1120	0.1044	0.0973	0.0908	0.085	0.0802
	port 15	port 16	port 17	port 18	port 19	port 20	
ER	0.0324	0.0291	0.0258	0.0225	0.0193	0.0160	
SD	0.0764	0.0739	0.0727	0.0730	0.0748	0.0779	

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# Plot Efficient Frontier



```
> plot(ef, plot.assets=T)
```

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