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Testing the CAPM

Econ 424
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Monthly Returns: Jan 1978 – Dec 1987

```
> colIds(berndt.dat)
[1] "CITCRP" "CONED" "CONTIL" "DATGEN" "DEC" "DELTA"
[7] "GENMIL" "GERBER" "IBM" "MARKET" "MOBIL" "PANAM"
[13] "PSNH" "TANDY" "TEXACO" "WEYER" "RKFREE"
```

create excess returns by subtracting off risk free rate

```
> returns.mat = as.matrix(seriesData(berndt.dat))
> excessReturns.mat = returns.mat -
+ returns.mat[,"RKFREE"]
> excessReturns.df = as.data.frame(excessReturns.mat)
```

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Coefficients:

	Value	Std. Error	t value	Pr(> t)
(Intercept)	0.001	0.009	0.065	0.948
MARKET	0.447	0.119	3.746	0.000

Residual standard error: 0.0703 on 58 degrees of freedom
Multiple R-Squared: 0.195

CAPM regression for CITCRP

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Coefficients:

	Value	Std. Error	t value	Pr(> t)
(Intercept)	0.000	0.007	-0.036	0.971
MARKET	0.339	0.089	3.818	0.000

Residual standard error: 0.0524 on 58 degrees of freedom
Multiple R-Squared: 0.201

CAPM regression for IBM

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Test CAPM: $H_0: \alpha^*_i = 0$

$$t = \frac{\hat{\alpha}_i}{SE(\alpha_i)}$$

Decision: Reject H_0 at 5% level if $|t| > 2$

```

> tstats
  CITCRP  CONED  CONTIL DATGEN   DEC  DELTA GENMIL  GERBER
0.06502 1.2141 -0.6703 -1.043 0.030922 0.62137 0.5411 -0.068848

  IBM  MOBIL  PANAM  PSNH TANDY  TEXACO WEYER
-0.036301 0.085956 -0.89396 -0.27455 1.997 -0.40445 -0.52

```

Conclusion: Do not reject CAPM for any of the assets!

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Relationship Between Average Return and β

```

> print(rbind(mu.hat,betas), digits=3)
  CITCRP  CONED  CONTIL  DATGEN   DEC DELTA  GENMIL  GERBER
mu.hat 0.0056 0.0098 -0.00319 -0.00372 0.00818 0.012 0.00535 0.00453
betas  0.4466 0.1405  0.38855  1.00562 0.70677 0.392 0.09874 0.46316

  IBM  MOBIL  PANAM  PSNH TANDY  TEXACO  WEYER
mu.hat 0.00355 0.00838 -0.0053 0.000831 0.0427 0.00371 0.00325
betas  0.33901 0.67978  0.7466 0.218017 1.0308 0.64326 0.70789

```

Estimated Security Market Line (SML)

$$\hat{\mu}_i = \gamma_0 + \gamma_1 \hat{\beta}_i + \text{error}_i$$

CAPM $\Rightarrow \gamma_0 = 0, \gamma_1 = \hat{\mu}_M - r_f = 0.011$

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