



Testing the CAPM

Econ 424

Eric Zivot

Fall 2006

Updated: November 28, 2006

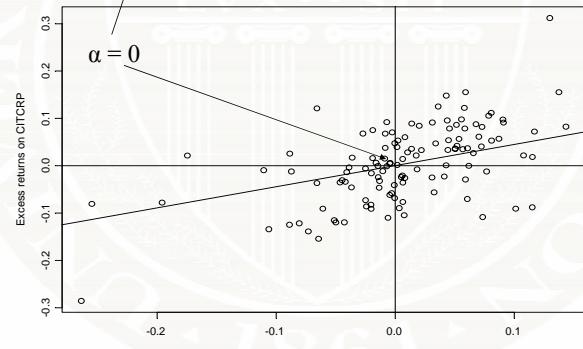
© Eric Zivot 2006



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



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)
```

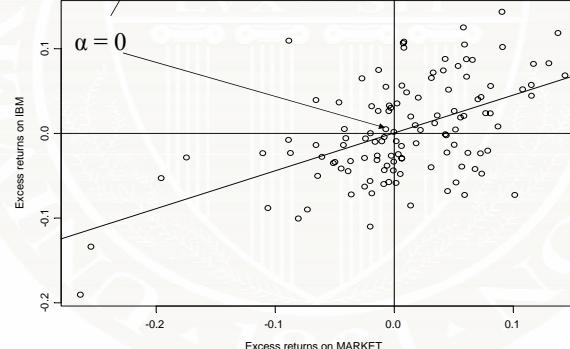
© Eric Zivot 2006



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



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
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
```

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

© Eric Zivot 2006

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)

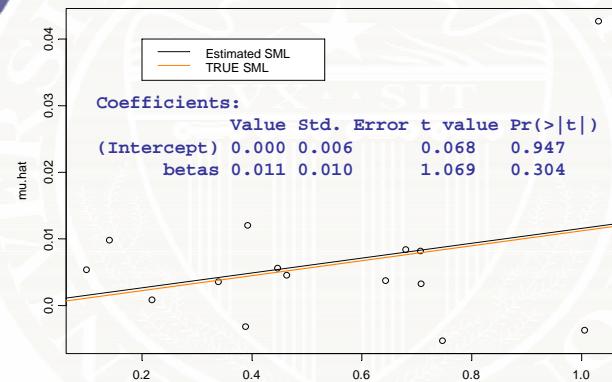
$$\hat{\mu}_i = \gamma_0 + \gamma_1 \hat{\beta}_i + error_i$$

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

© Eric Zivot 2006

Jan 1978 – Dec 1982

TRUE and Estimated SML

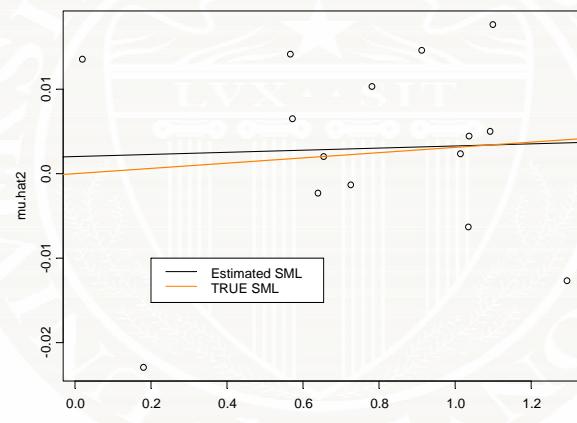


$$t_{\gamma_0=0} = 0.068, t_{\gamma_1=\mu_M - r_f} = \frac{0.011 - 0.011}{0.010} = 0$$

© Eric Zivot 2006

Jan 1983 – Dec 1987

TRUE and Estimated SML



© Eric Zivot 2006