Do you want to be as smart as a Nobel laureate?

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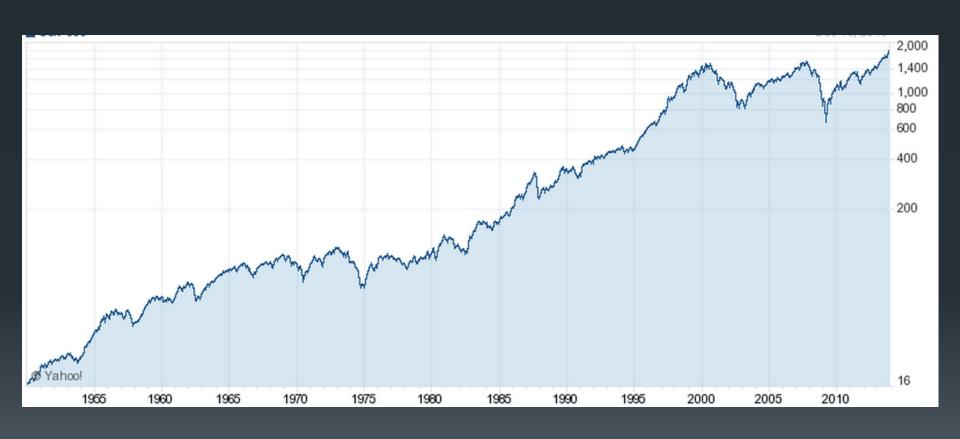




Eugene F. Fama, Lars Peter Hansen and Robert J. Shiller

"for their empirical analysis of asset prices"

S&P500 Index 1965-2013



Fama-French 3-Factor Model

$$r_{it} - r_{ft} = \alpha_i + \beta_{im}(r_{mt} - r_{ft}) + \beta_{is}SMB_t + \beta_{ih}HML_t$$

Excess Return of Asset =

Return by Effective Management +

Excess Return by General Market +

Size Premium as Measured by Capitalization +

Value Premium as Measured by Book/Market

Data Scientist Skills

```
# Goal: Using data from Yahoo finance,
#
        estimate the Fama-French Factors
        for any security using monthly returns
library(tseries)
library(zoo)
# Load FF factor returns
startyear = 2000;
startmonth = 11;
endyear = 2010;
endmonth = 10;
start = (startyear-1926.5)*12+startmonth;
stop = (endyear - 1926.5)*12+endmonth;
ff_returns = read.table("F-F_Factors_monthly.txt")
rmrf = ff_returns[start:stop,2]/100
smb = ff_returns[start:stop,3]/100
hml = ff_returns[start:stop,4]/100
rf = ff_returns[start:stop,5]/100
# Load Fund Data
prices <- get.hist.quote("^GSPC", quote="Adj",</pre>
                       start="2000-10-30", retclass="zoo")
```

```
prices <- na.locf(prices) # Copy last traded price when NA</pre>
# To make weekly returns, you must have this incantation:
monthly.prices <- aggregate(prices, as.yearmon, tail, 1)
# Convert monthly prices to monthly returns
r <- diff(log(monthly.prices))</pre>
r1 \leftarrow exp(r)-1
# Now shift out of zoo to become an ordinary matrix --
rj <- coredata(r1)
rj <- rj[1:120]
rjrf <- rj - rf
d \leftarrow lm(rjrf \sim rmrf + smb + hml) \# FF model estimation.
print(summary(d))
```

```
call:
lm(formula = rjrf \sim rmrf + smb + hml)
Residuals:
               1Q Median
                                  3Q
     Min
                                          Max
-0.010823 -0.001461 -0.000252 0.001382
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -0.001749 0.000281
                                -6.22 8.1e-09
rmrf 0.995072 0.006006 165.67 < 2e-16 ***
         -0.134611 0.010601 -12.70 < 2e-16 ***
smb
hml
          0.030516 0.008340 3.66 0.00038 ***
              0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Signif. codes:
Residual standard error: 0.00298 on 116 degrees of freedom
Multiple R-squared: 0.996, Adjusted R-squared: 0.996
```

F-statistic: 1.01e+04 on 3 and 116 DF. p-value: <2e-16

Performance of Selected Equities Between 11/2008 & 10/2013



Effective Management: APPL, AMZN

Outperformed Market: GE, APPL, AMZN, BA

Size Premium: LUV, AMZN

Value Premium: GE, LUV, PC, COST, BA