Estimating the equity beta of Norsk Hydro

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In the CAPM, the *equity beta* of a stock is an estimate of the degree to which the stock covaries with the broad equity market, typically proxied by an broad stock market index.

If we let r_{it} be the stock return, and r_{mt} the market return, both observed at time t, the beta β_i is calculated as

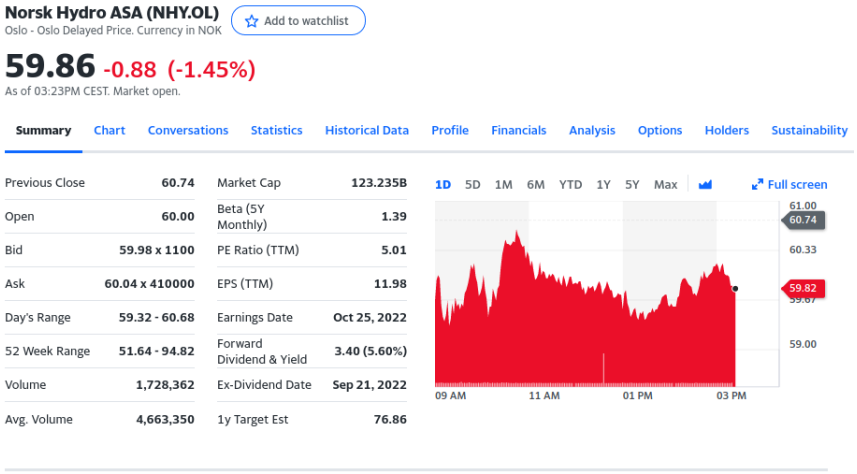
$$\beta_i = \frac{\text{cov}(r_{it}, r_{mt})}{\text{var}(r_{mt})}$$

In practice this beta needs to be estimated.

A typical procedure is to gather historical returns of the stock in question, and a relevant stock market index.

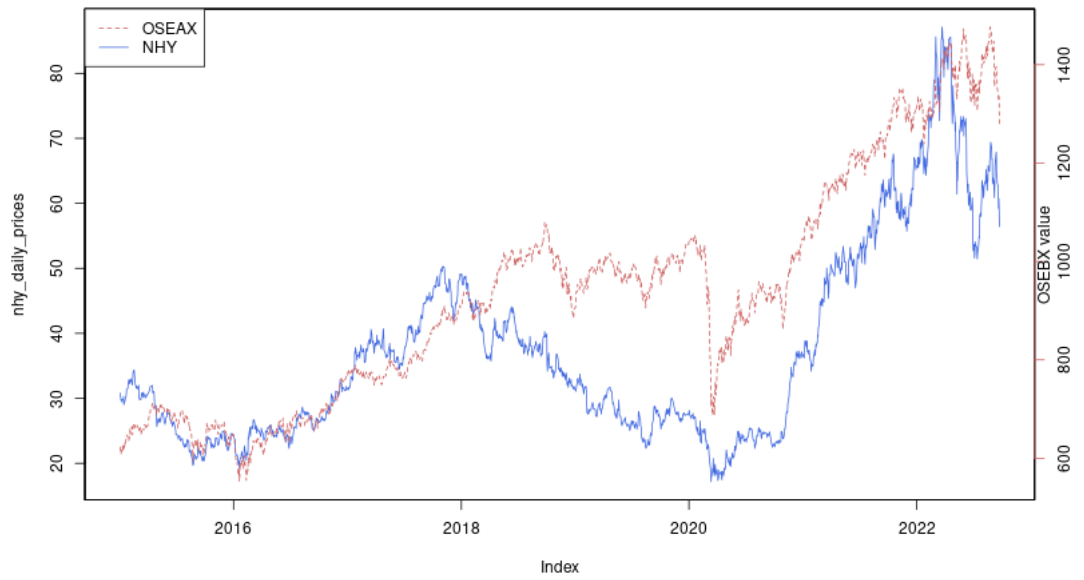
In this example we want to estimate the beta of the company Norsk Hydro (NHY.OL)

Data on stock and index prices easily available, for example at Yahoo finance



Suppose we want to estimate the beta for Norsk Hydro (NHY) at year-end 2018, using stock market data for the period 2015–2019.

The beta is calculated relative to an index. In this example we use a broad stock market index from the Oslo Stock Exchange, OSEBX.



Actual estimation is illustrated using R:
To calculate beta, read the data on NHY and the stock market index.
For example, reading the NHY data:

```
## get prices for NHY and OSEBX from the internet

library(quantmod)
                                        # quantmod is a library for finance.
                                        # functions used here: getting data (getSymbols)
                                        # and calculating returns (monthlyReturn, dailyReturn)
                                        # NHY.OL is the symbol for NHY traded at the OSE
getSymbols("NHY.OL",
           from="2010-01-01",
           source="yahoo")
nhy_daily_prices <- na.omit(NHY.OL$NHY.OL.Adjusted)
nhy_monthly_returns   <- monthlyReturn(nhy_daily_prices,  leading=FALSE)
```

Once have the monthly returns, just align data:

```
> data <- merge(nhy_monthly_returns,OSEBX_monthly_returns,all=FALSE)
> data <- data["2017/2021"]
> ri <- data[,1]
> rm <- data[,2]
```

and then estimate beta, either by direct calculation

```
> beta <- cov(ri,rm)/var(rm)
> print(beta)
          1.53
```

or, preferably, relying on the fact that the beta is *also* the coefficient estimate of a regression with r_{it} as the dependent variable, and r_{mt} as explanatory variable.

$$r_{it} = a_i + \beta_i r_{mt} + \varepsilon_{it}$$

```
> regr <- lm(ri~rm)
```

	Dependent variable:
	ri
rm	1.529***
	(0.233)
Constant	0.002
	(0.010)
Observations	59
Adjusted R^2	0.420
Note:	*p<0.1; **p<0.05; ***p<0.01