# FNCE611 Problem Set 4

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*2017-03-24*

## 1 Question 1

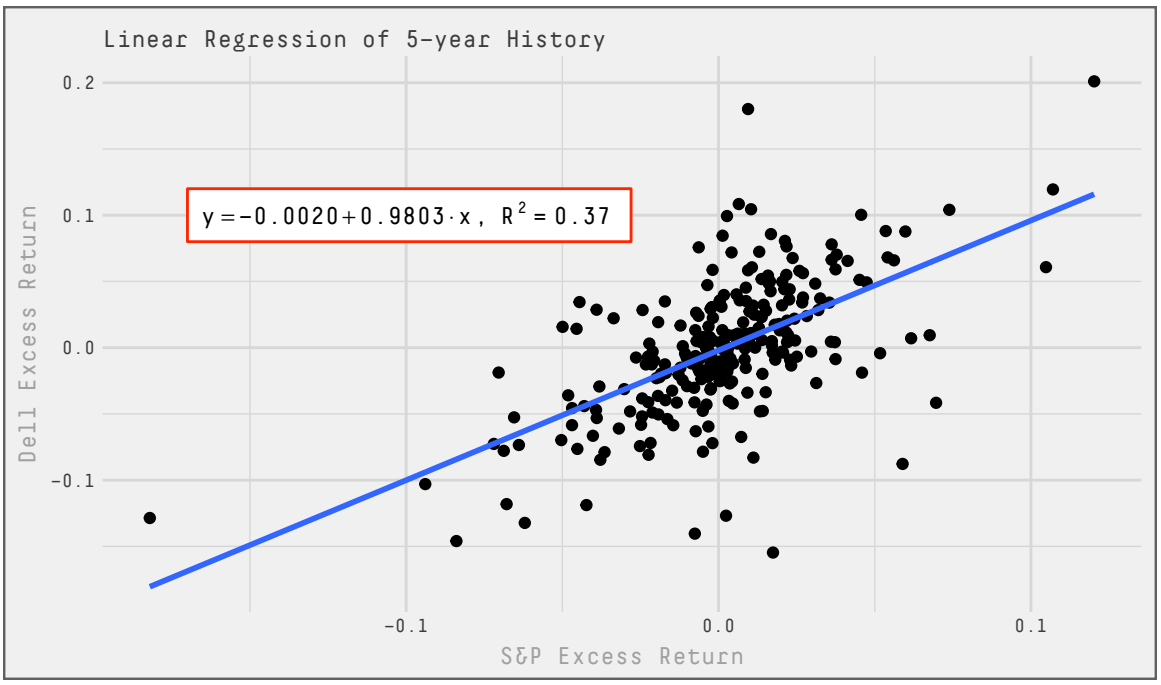
```
dell_data <- read_csv("fnce611_hw4.csv")
```

### 1.1 Part a

```
lm1 <- lm(dell_excess_return ~ sp_excess_return, data = dell_data)

equation = function(x) {
  lm_coef <- list(a = formatC(coef(x)[1], digits = 4, format = 'f'),
                  b = formatC(coef(x)[2], digits = 4, format = 'f'),
                  r2 = formatC(summary(x)$r.squared, digits = 2, format = 'f'));
  lm_eq <- substitute(italic(y) == a + b %.% italic(x)*","~~italic(R)^2~"="~r2,lm_coef)
  as.character(as.expression(lm_eq));
}

dell_data %>%
  ggplot(aes(x = sp_excess_return, y = dell_excess_return)) +
  geom_point() +
  geom_smooth(method = 'lm', se = FALSE) +
  annotate("rect", xmin = -.17, xmax = -.028, ymin = .08, ymax = 0.12, fill="white", colour = pal538[['red']]) +
  annotate("text", x = -0.1, y = 0.1, label = equation(lm1), parse = TRUE,
           family = "DecimaMonoPro", size = 3) +
  theme_jrf(users_v = 'rstudio') +
  labs(title = "Linear Regression of 5-year History", x = "S&P Excess Return",
       y = "Dell Excess Return")
```




```
beta <-
  lm1 %>%
  tidy() %>%
  filter(term == "sp_excess_return") %>%
  select(estimate) %>%
  unlist() %>%
  unname()
```

We find that $\beta = \mathbf{0.9803}$.

## 1.2 Part b

```
dell_expected_return <- mean(dell_data$risk_free_return) * 52 +
        beta * (mean(dell_data$sp_return) * 52 - mean(dell_data$risk_free_return) * 52)
```

Dell's expected return is **0.0726**.

## 1.3 Part c

$$
\begin{aligned}
r_{dell} &= r_f + \beta_{dell}(r_m + r_f) && (1)\\
&= 0.0387 + 0.9803(0.0845 - 0.0387) && (2)\\
&= 0.0836 && (3)
\end{aligned}
$$

- Pros:
- Cons:

## 1.4 Part d

```r
variance <-
  dell_data %>%
  summarise(
    dell_var = sd(dell_return)^2 * 52
    , sp_var = sd(sp_return)^2 * 52
    )
```

Table 1: Annualized Variance of Dell and the market return

| dell_var | sp_var |
|---|---|
| 0.1342 | 0.0513 |

### 1.5 Part e

$$Var(r_{dell}) = \beta_{dell}^2 Var(r_m) + [\text{firm specific risk}] \tag{4}$$

$$0.1342 = 0.9803^2 \cdot 0.0513 + [\text{firm specific risk}] \tag{5}$$

Of Dell's sample variance, **0.1342**, we can say that **0.0493** is from market risk and **0.0849** is firm specific risk.

## 2 Question 2

## 3 Question 3

## 4 Question 4