Case Study Report

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Data Wrangling

```
# Import the Dataset
kick.2018 <- read_csv("ks-projects-201801.csv")

# Sort out failed and successful projects
kick.2018 <- kick.2018 %>% filter(state %in% c("failed", "successful")) %>%
    mutate(diff_date = as.numeric(as.Date(deadline) - as.Date(str_extract(launched,
        "^.{10}"))))

# Random Sampling of the Data

## index <- sample(nrow(kick.2018), 2000, replace=FALSE)

## kick.sample <- kick.2018[index, ]

## write.csv(kick.sample, file = 'Kickstarter_sample.csv', row.names = FALSE)
```

Launched-Deadline and Success/Failure

Summary Statistic

```
kickstarter <- read_csv("Kickstarter_sample.csv")  ## pull in sample data

failed <- subset(kickstarter, select = diff_date, subset = state == "failed",
    drop = T)  ## subset failed projects
successful <- subset(kickstarter, select = diff_date, subset = state == "successful",
    drop = T)  ## subset successful projects

stargazer::stargazer(data.frame(kickstarter$diff_date), header = FALSE, title = "Summary statistics of
```

Table 1: Summary statistics of the duration of investment window (pooled data, days)

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
kickstarter.diff_date	2,000	34.068	13.093	2	30	36	91

```
stargazer::stargazer(data.frame(failed), header = FALSE, title = "Summary statistics of the duration of
```

```
stargazer::stargazer(data.frame(successful), header = FALSE, title = "Summary statistics of the duratio
```

Table 2: Summary statistics of the duration of investment window (failed, days)

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
failed	1,174	35.395	13.386	5	30	40	91

Table 3: Summary statistics of the duration of investment window (successful, days)

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
successful	826	32.182	12.432	2	29	34.8	91

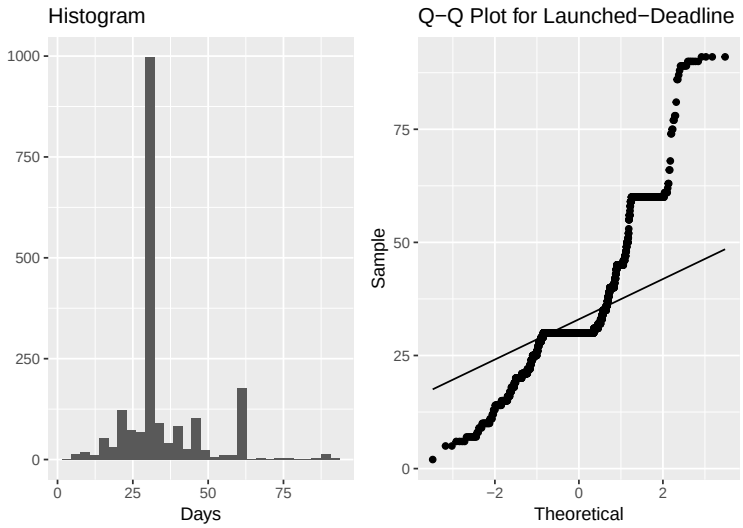
Data Visualization

```
pooled.hist <- ggplot(kickstarter) +
  geom_histogram(aes(x = diff_date), bins = 30) +
  xlab("Days") +
  ylab("") +
  ggtitle("Histogram")

kickstarter$state <- factor(kickstarter$state)

pooled.qqplot <- ggplot(kickstarter, aes(sample = diff_date)) +
  stat_qq() +
  stat_qq_line() +
  xlab("Theoretical") +
  ylab("Sample") +
  ggtitle("Q-Q Plot for Launched-Deadline")

grid.arrange(pooled.hist, pooled.qqplot, ncol=2)
```

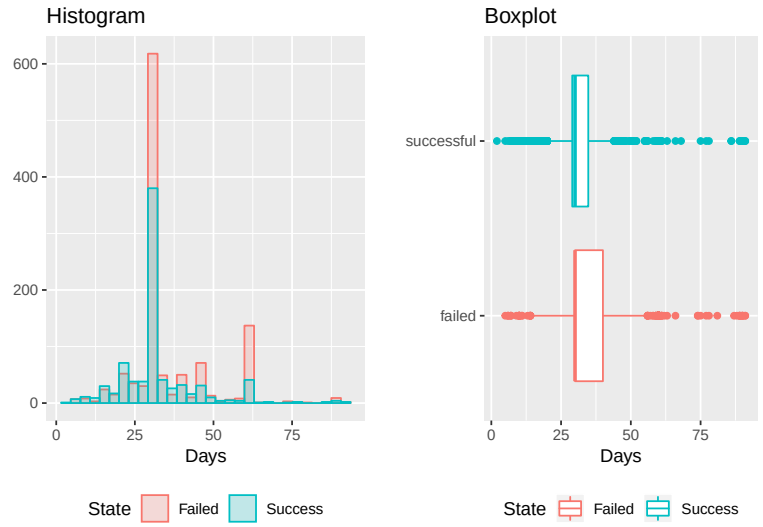



```
category.hist <- ggplot(kickstarter, aes(x = diff_date, fill = state, color = state)) +
  geom_histogram(alpha=0.2, position="identity", bins = 30) +
  xlab("Days") +
  ylab("") +
```

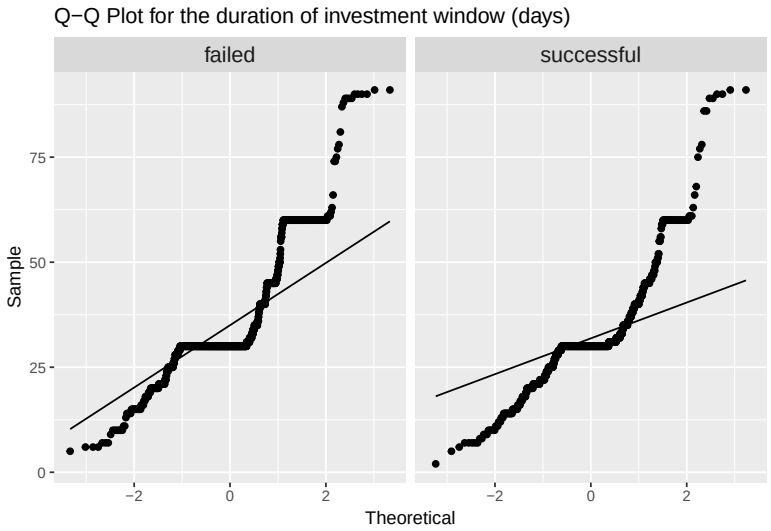
```
  scale_fill_discrete(name="State",
                      breaks=c("failed", "successful"),
                      labels=c("Failed", "Success")) +
  scale_color_discrete(name="State",
                       breaks=c("failed", "successful"),
                       labels=c("Failed", "Success"))+
  ggtitle("Histogram") +
  theme(legend.position="bottom")

category.box <- ggplot(kickstarter, aes(x = state, y = diff_date, color = state)) +
  geom_boxplot() +
  xlab("") +
  ylab("Days") +
  scale_color_discrete(name="State",
                       breaks=c("failed", "successful"),
                       labels=c("Failed", "Success")) +
  ggtitle("Boxplot") +
  theme(legend.position="bottom") +
  coord_flip()

grid.arrange(category.hist, category.box, ncol=2)
```




```
ggplot(kickstarter, aes(sample = diff_date)) +
  stat_qq() +
  stat_qq_line() +
  xlab("Theoretical") +
  ylab("Sample") +
  ggtitle("Q-Q Plot for the duration of investment window (days)") +
  facet_wrap(~state) +
  theme(strip.text.x = element_text(size=13))
```



Confidence Interval

```
N <- 10^4

mean.diff <- mean(failed)-mean(successful)
se <- sqrt(var(failed)/length(failed)+var(successful)/length(successful))

boot.perc <- numeric(N)
Tstar <- numeric(N)

for (i in 1:N){
  failedBoot <- sample(failed, length(failed), replace=TRUE)
  successfulBoot <- sample(successful, length(successful), replace = TRUE)
  SEstar <- sqrt(var(failedBoot)/length(failedBoot)+var(successfulBoot)/length(successfulBoot))
  meanDiffBoot <- mean(failedBoot)-mean(successfulBoot)
  Tstar[i] <- (meanDiffBoot-mean.diff)/SEstar
  boot.perc[i] <- meanDiffBoot
}

formula.t.CI <- t.test(diff_date~state, data = kickstarter)$conf
boot.perc.CI <- quantile(boot.perc, c(0.025,0.975))
boot.t.CI <- mean.diff-quantile(Tstar, c(0.975,0.025))*se
```

Formula t CI (95%): (2.07, 4.357)
Bootstrap percentile CI (95%): (2.081, 4.346)
Bootstrap t CI (95%): (2.069, 4.324)

Hypothesis Testing

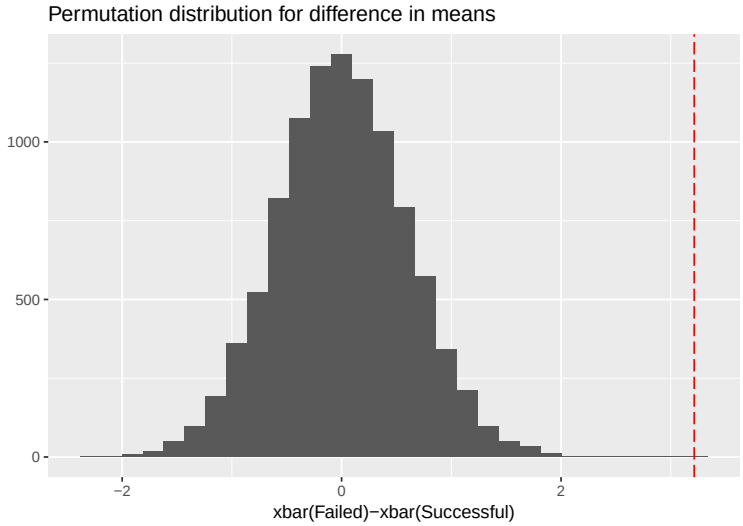
$$H_0 : \mu_{investment\ window,\ failed} = \mu_{investment\ window,\ successful}$$

$$H_\alpha : \mu_{investment\ window,\ failed} \neq \mu_{investment\ window,\ successful}$$

```
pooled.data <- unlist(kickstarter$diff_date)
perm <- numeric(N)
```

```r
for (i in 1:N){
  index <- sample(length(pooled.data), size = length(failed), replace = FALSE)
  perm[i] <- mean(pooled.data[index])-mean(pooled.data[-index])
}

ggplot(data.frame(perm), aes(x = perm)) +
  geom_histogram(bins = 30) +
  xlab("xbar(Failed)-xbar(Successful)") +
  ylab("") +
  geom_vline(xintercept=mean.diff, color = "red", linetype = "longdash") +
  ggtitle("Permutation distribution for difference in means")
```




```r
p.perm <- (sum(perm >= mean.diff)+1)/(N+1)*2
p.t <- t.test(diff_date~state, data = kickstarter)$p.value
```

p-value (perm): $1.9998 \cdot 10^{-4}$
p-value (t): $4.0121047 \cdot 10^{-8}$