Stock Price Analysis

Department of Applied Mathematics and Statistics

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Lump Sum Strategy

Lump sum investing is an investment that you invest all at once into a diversified portfolio.

- This approach lets you deploy your capital right away, you'll be gladly got in early because any money you added after that would purchase shares at a higher price, which often proves advantageous over longer periods and gives you bang for your buck.
- However, if the market goes down from day one, your entire investment will go downhill as well, that could take years to recoup, and you'll miss a lot of opportunities to buy in at a better price.

Dollar-Cost Average (DCA)

Dollar-Cost Average (DCA) is an investment strategy in which an investor divides up the total amount to be invested across periodic purchases of a target asset.

- The periodic purchases occur regardless of the asset's price, and as a result, the investor buys more of the asset when prices are low and less when prices are high.
- This strategy aims to reduce the impact of market volatility on the overall purchase price of the asset.

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Dataset Description

The data is collected from **csx.com.kh**. It's a data of **Acleda Stock Price** from 25 May 2020 to 25 May 2023.

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Hypothesis Testing for Two Means

1. Are there significant differences in the average annual returns between Investment Strategy A and Investment Strategy B?

$+$ **Method 1 : Critical Region**

Since σ_1, σ_2 are unknown and $n \geq 30$

Test $H_0 : \mu_1 - \mu_2 = 0$ vs $H_a : \mu_1 - \mu_2 \neq 0$

We have

significance level $\alpha = 0.05$

$\bar{X} = -0.1317$

Hypothesis Testing for Two Means

$\bar{Y} = -0.0435$

$m = n = 735$

$s_1 = 0.133$

$s_2 = 0.0828$

Hypothesis Testing for Two Means

Test statistic Value

$$z = \frac{\bar{X} - \bar{Y} - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}} = \frac{-0.1317 + 0.0435}{\sqrt{\frac{0.133^2}{735} + \frac{0.0828^2}{735}}}$$

$$z = -15.26$$

$$z_{\frac{\alpha}{2}} = \phi^{-1}(1 - \tfrac{\alpha}{2}) = \phi^{-1}(0.975) = 1.96$$

Critical Region $C = \{z : |z| \geq z_{\frac{\alpha}{2}} = 1.96\}$

Hypothesis Testing for Two Means

Since $z \in C$, we decide to reject H_0 at $\alpha = 0.05$.

Thus, there is enough evidence to support the claim $\mu_1 \neq \mu_2$ and we can say there are significant differences in the average annual returns between Investment Strategy A and Investment Strategy B.

$+$ **Method 2 : Confidence Interval**

$$CI(\mu_1 - \mu_2) = \left[\bar{X} - \bar{Y} \pm z_{\frac{\alpha}{2}} \sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}\right] = [-0.11, -0.065]$$

Since $0 \notin CI$,

Therefore, we decide to reject the null hypothesis that $\mu_1 - \mu_2 = 0$

Hypothesis Testing for Two Means (Additional)

Test $H_0 : \mu_1 - \mu_2 = 0$ vs $H_a : \mu_1 - \mu_2 < 0$

we have $z = -15.26$

Critical Region $C = \{z : z \leq -z_\alpha\}$

$z_\alpha = z_{0.05} = \phi^{-1}(1 - \alpha) = \phi^{-1}(0.95) = 1.64$

Since $z \in C$, we decide to support the claim that $\mu_2 > \mu_1$

Hypothesis Testing for Two Variances

2. Does the distribution of risk (standard deviation of returns) vary significantly between the two investment strategies?

$+$ **Method 1 : Critical Region**

Test $H_0 : \sigma_1^2 = \sigma_2^2$ vs $H_a : \sigma_1^2 \neq \sigma_2^2$

We have

significance level $\alpha = 0.05$

$s_1 = 0.133$

$s_2 = 0.0828$

Hypothesis Testing for Two Variances

$m = n = 735$

Test statistic value $f = \dfrac{s_1^2}{s_2^2} = \dfrac{0.133^2}{0.0828^2} = 2.58$

Critical Region $C = \{f : f \geq F_{\frac{\alpha}{2},m-1,n-1}$ or $f \leq F_{1-\frac{\alpha}{2},m-1,n-1}\}$

$F_{\frac{\alpha}{2},m-1,n-1} = F_{0.025,734,734} = 1.15$

$F_{1-\frac{\alpha}{2},m-1,n-1} = F_{0.975,734,734} = 0.86$

Since $f \in C$, then H_0 is rejected.

Thus, we could say the distribution of risk (standard deviation of returns) vary significantly between the two investment strategies.

Hypothesis Testing for Two Variances

+ **Method 2 : Confidence Interval**

$$CI\left(\frac{\sigma_1}{\sigma_2}\right) = \left[\frac{s_1}{s_2} \cdot \frac{1}{\sqrt{F_{\frac{\alpha}{2},m-1,n-1}}}, \frac{s_1}{s_2} \cdot \sqrt{F_{\frac{\alpha}{2},m-1,n-1}}\right] = [1.49, 1.72]$$

Since $1 \notin CI$,

Therefore, we decide to reject the null hypothesis that $\sigma_1^2 = \sigma_2^2$

Hypothesis Testing for Two Variances (Additional)

Test $H_0 : \sigma_1^2 = \sigma_2^2$ vs $H_a : \sigma_1^2 - \sigma_2^2 > 0$

we have $f = 2.58$

Critical Region $C = \{f : f \geq F_{\alpha,m-1,n-1}\}$

$F_{\alpha,m-1,n-1} = F_{0.05,734,734} = 1.13$

Since $f \in C$, so we accept the claim that $\sigma_1^2 > \sigma_2^2$