Lecture 15

Inverse Normal Problems

The Inverse Problem

z

wanted to go backward

Inverse Problem Statement

$$Z$$

$$P(Z \leq z_0) = 0.5$$

$$z_0$$

How do we solve for z_0?

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-
- **use R!**

Using R to Find z_0

```r
qnorm(p = 0.5, mean = 0, sd = 1, lower.tail = TRUE)
```
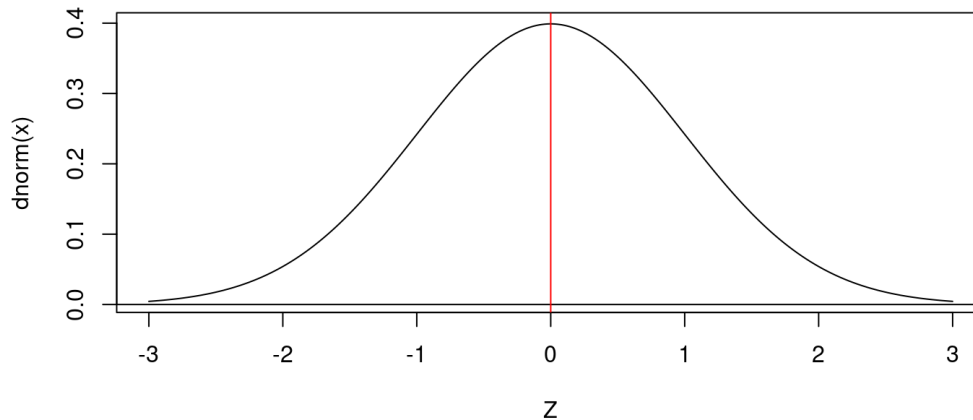
```
## [1] 0
```

$$z_0 = 0$$

```r
pnorm(q = 0, mean = 0, sd = 1, lower.tail = TRUE)
```

```
## [1] 0.5
```

Checking Again

```
x <- seq(from = -3, to = 3, by = 0.01)
plot(x, dnorm(x), type = "l", xlab = "Z")
abline(h = 0)
abline(v = 0, col = "red")
```
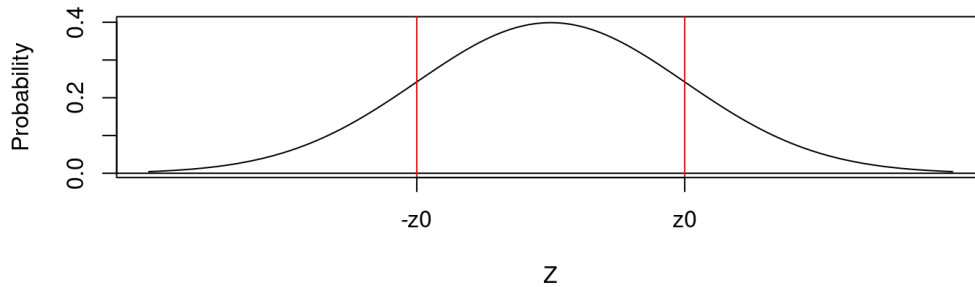
Practice

$$z_0 \qquad P(-z_0 \leq Z \leq z_0) = 0.3$$

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Practice

```
qnorm(p = 0.15, mean = 0, sd = 1, lower.tail = TRUE)
```

```
## [1] -1.036433
```

-z0   **lower.tail = TRUE**

```
qnorm(p = 0.15, mean = 0, sd = 1, lower.tail = FALSE)
```

```
## [1] 1.036433
```

z_0 **lower.tail = FALSE**

More Practice

Problem Type 1: Simple Left

$$z_0 \qquad P(-2 \leq Z \leq z_0) = 0.7$$

Problem Type 2: Simple Right

$$z_0 \qquad P(-z_0 \le Z \le 1.0) = 0.4$$

Problem Type 3: Symmetric, known

$$z_0 \qquad P(-z_0 \leq Z \leq z_0) = 0.4$$

Problem Type 4: Symmetric, Indirect information

$$-z_0 \qquad z_0$$

z_0

Problem Type 5: Not Symmetric, known

$$z_0 \qquad P(-2 \cdot z_0 \leq Z \leq z_0) = 0.6$$

Problem Type 6: Not Symmetric, Indirect information

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