

Statistics 2.3.1 Exercises 1-3

Unemployment Rates

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Problem

Using the unemployment rate data from 1995 for EEC members and nonmembers as provided in Section 2.3.1, I'll analyze patterns through dot plots and compare unemployment rates between these groups. The data includes:

Members of European Economic Community (EEC): 13% (Belgium), 10% (Denmark), 11.6% (France), 9.4% (Germany), 9.5% (Greece), 13.2% (Ireland), 12% (Italy), 8.4% (Netherlands), 7.2% (Portugal), 22.9% (Spain), 8.2% (UK).

Nonmembers of the EEC: 8.5% (Australia), 4.6% (Austria), 9.5% (Canada), 17.2% (Finland), 5% (Iceland), 3.1% (Japan), 5% (Norway), 6.4% (New Zealand), 7.5% (Sweden), 4.2% (Switzerland), 5.6% (United States).

I'll create dot plots to visualize and compare these unemployment patterns.

Data Preparation

First, I'll create vectors with the unemployment rates and country names:

```
# EEC members data
eec_countries <- c("Belgium", "Denmark", "France", "Germany", "Greece", "Ireland",
                  "Italy", "Netherlands", "Portugal", "Spain", "UK")
eec_rates <- c(13, 10, 11.6, 9.4, 9.5, 13.2, 12, 8.4, 7.2, 22.9, 8.2)

# Non-EEC members data
non_eec_countries <- c("Australia", "Austria", "Canada", "Finland", "Iceland", "Japan",
                      "Norway", "New Zealand", "Sweden", "Switzerland", "USA")
non_eec_rates <- c(8.5, 4.6, 9.5, 17.2, 5, 3.1, 5, 6.4, 7.5, 4.2, 5.6)

# Sorting the data to minimize label overlapping
eec_order <- order(eec_rates)
sorted_eec_rates <- eec_rates[eec_order]
sorted_eec_countries <- eec_countries[eec_order]

non_eec_order <- order(non_eec_rates)
sorted_non_eec_rates <- non_eec_rates[non_eec_order]
sorted_non_eec_countries <- non_eec_countries[non_eec_order]
```

Exercise 1: Dot Plot for EEC Members

Then we have to create a dot plot showing unemployment rates for EEC members, here I use margins for better label placement and additional connecting lines for readability:

```
# Set up a better plotting environment with even more space for labels
par(mar = c(9, 4, 3, 2)) # Increase bottom margin further for rotated labels

# Create an improved dot plot for EEC members
plot(sorted_eec_rates, rep(1, length(sorted_eec_rates)),
      xlim = c(5, 25), # Focus on the relevant range
      ylim = c(0.7, 1.3),
      xlab = "", ylab = "", yaxt = "n",
      main = "Unemployment Rates in EEC Countries (1995)",
      pch = 19, cex = 1.2, col = "darkblue")

# Add x-axis label with space
mtext("Unemployment Rate (%)", side = 1, line = 7.5)
```

```

# Add gridlines
abline(v = seq(5, 25, by = 5), lty = 3, col = "lightgray")
abline(h = 1, lwd = 2)

# Add country labels with rotation and proper vertical offset
# Stagger the labels (odd-numbered labels higher, even-numbered labels lower)
label_y_positions <- rep(c(0.98, 0.89), length=length(sorted_eec_rates))

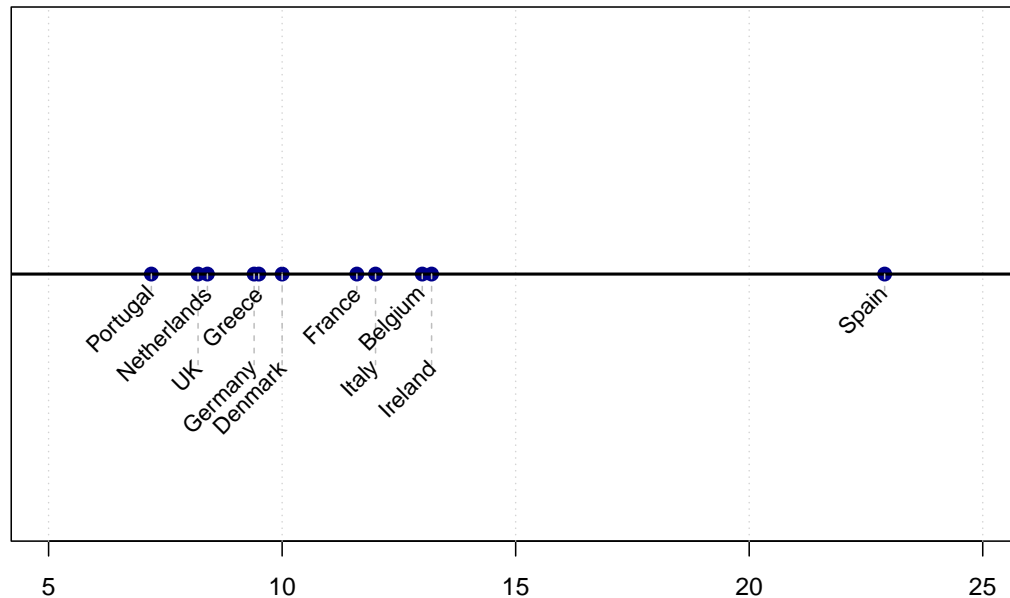
# Add connecting lines from dots to labels
for (i in 1:length(sorted_eec_rates)) {
  segments(sorted_eec_rates[i], 1, sorted_eec_rates[i], label_y_positions[i],
           col = "gray", lty = 2)
}

# Add the labels
text(sorted_eec_rates, label_y_positions, labels = sorted_eec_countries,
     srt = 45, adj = 1, cex = 0.9)

# Add a caption
mtext("Spain stands out as a high-unemployment outlier.", side = 1, line = 3, cex = 0.8)

```

Unemployment Rates in EEC Countries (1995)



Spain stands out as a high-unemployment outlier.

Unemployment Rate (%)

Commentary on EEC Dot Plot

Looking at the dot plot for EEC members, Spain clearly stands out as a high-unemployment outlier with a rate of 22.9%. Most other EEC countries have unemployment rates between 7% and 13%, forming several clusters:

- A higher cluster (12-13.2%): Belgium, Ireland, and Italy
- A middle cluster (10-11.6%): Denmark and France
- A lower-middle cluster (8.2-9.5%): Germany, Greece, Netherlands, and UK
- The lowest rate: Portugal at 7.2%

The distribution is spread out with Spain creating a long right tail. This suggests significant economic differences existed among EEC members in 1995.

Exercise 2: Dot Plot for Non-EEC Countries

Now let's create a similar dot plot for non-EEC countries:

```
# Set up plotting environment
par(mar = c(9, 4, 3, 2)) # Increase bottom margin for rotated labels

# Create an improved dot plot for non-EEC members
plot(sorted_non_eec_rates, rep(1, length(sorted_non_eec_rates)),
     xlim = c(0, 20), # Focus on the relevant range
     ylim = c(0.7, 1.3),
     xlab = "", ylab = "", yaxt = "n",
     main = "Unemployment Rates in Non-EEC Countries (1995)",
     pch = 19, cex = 1.2, col = "darkred")

# Add x-axis label with space
mtext("Unemployment Rate (%)", side = 1, line = 7.5)

# Add gridlines
abline(v = seq(0, 20, by = 5), lty = 3, col = "lightgray")
abline(h = 1, lwd = 2)

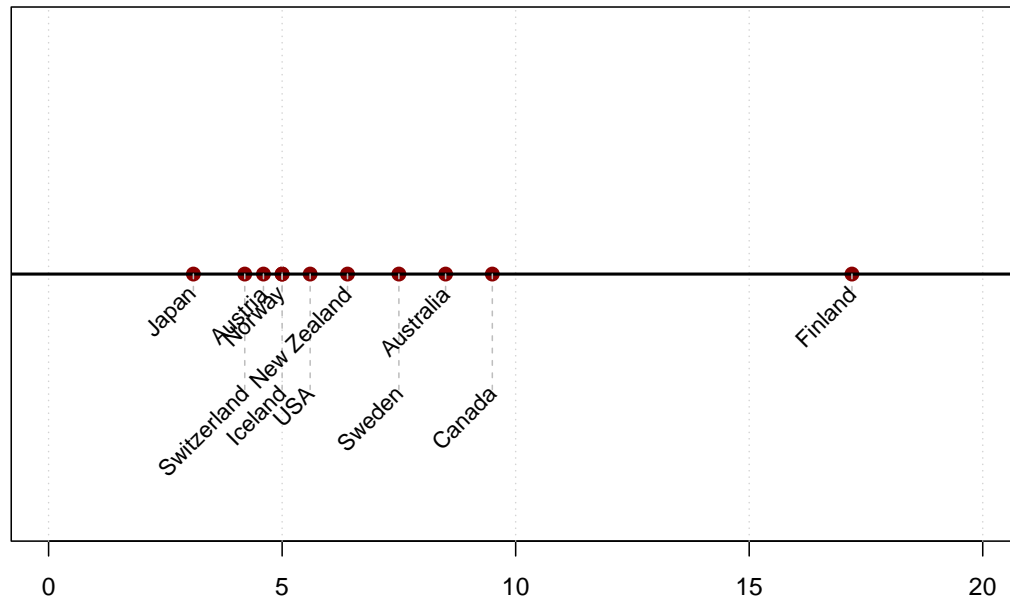
# Add country labels with staggered positions to avoid overlap
label_y_positions <- rep(c(0.98, 0.86), length=length(sorted_non_eec_rates))

# Add connecting lines from dots to labels
for (i in 1:length(sorted_non_eec_rates)) {
  segments(sorted_non_eec_rates[i], 1, sorted_non_eec_rates[i], label_y_positions[i],
           col = "gray", lty = 2)
}

# Add the labels
text(sorted_non_eec_rates, label_y_positions, labels = sorted_non_eec_countries,
     srt = 45, adj = 1, cex = 0.95)

# Add a caption
mtext("Finland stands out as a high-unemployment outlier.", side = 1, line = 3, cex = 0.8)
```

Unemployment Rates in Non-EEC Countries (1995)



Finland stands out as a high-unemployment outlier.

Unemployment Rate (%)

Commentary on Non-EEC Dot Plot

The non-EEC countries show a different pattern from the EEC members. Finland stands out as a high-unemployment outlier at 17.2%, similar to Spain's position in the EEC plot. However, most non-EEC countries have unemployment rates below 8%, suggesting a lower rate of unemployment than in the EEC group.

The clusters appear as: - High outlier: Finland (17.2%) - Upper-middle: Canada (9.5%) and Australia (8.5%) - Middle range: Sweden (7.5%) and New Zealand (6.4%) - Lower range (3.1-5.6%): Austria, Iceland, Japan, Norway, Switzerland, and USA

Japan has the lowest unemployment rate at 3.1%. The distribution is more concentrated toward the lower end than the EEC plot, with only Finland having a notably high rate. This suggests that most non-EEC countries had relatively low unemployment in 1995.

Exercise 3: Combined Comparison Plot

To compare both groups directly, I'll create a plot showing both EEC and non-EEC countries on the same scale:

```
# Create a clear comparative plot
plot(1, 1, type = "n", xlim = c(0, 25), ylim = c(0, 3),
     xlab = "Unemployment Rate (%)", ylab = "", yaxt = "n",
     main = "Comparison of Unemployment Rates (1995)")

# Add horizontal grid lines and vertical reference lines
abline(h = 1, lwd = 1.5)
abline(h = 2, lwd = 1.5)
abline(v = seq(0, 25, by = 5), lty = 3, col = "lightgray")

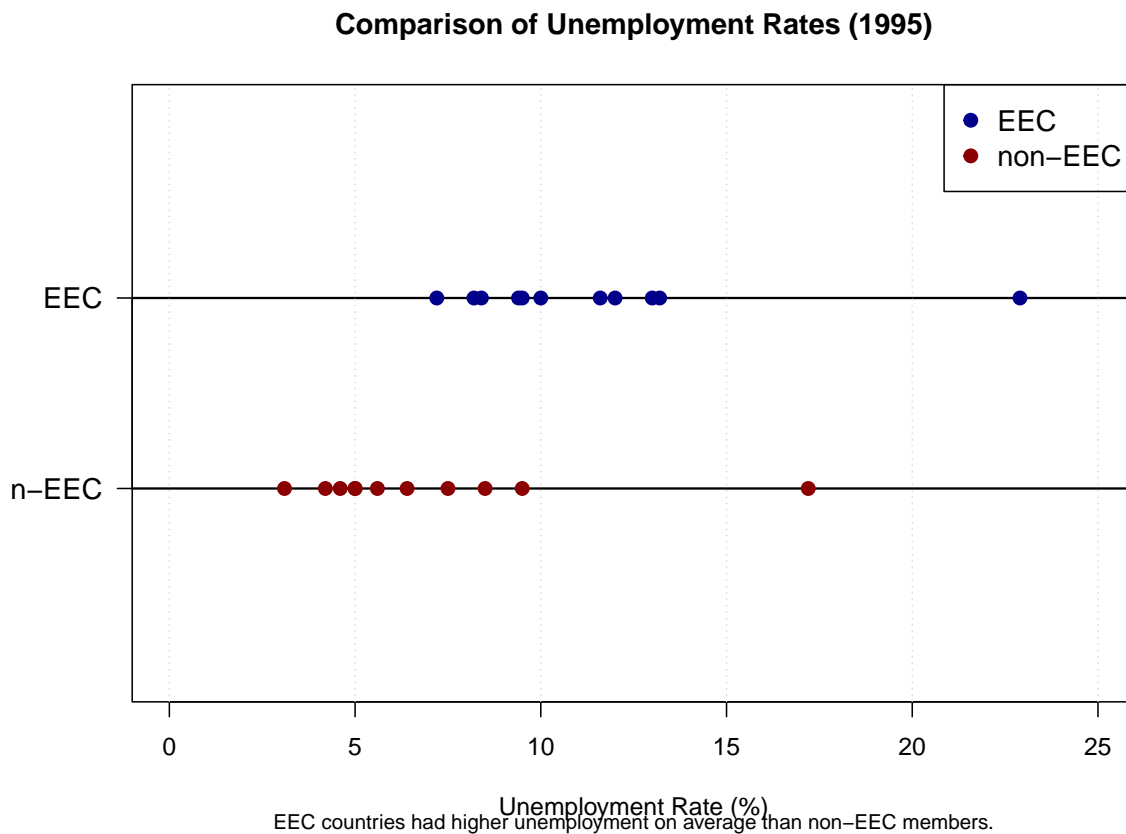
# Add points for EEC countries
points(eec_rates, rep(2, length(eec_rates)), pch = 19, cex = 1.2, col = "darkblue")

# Add points for non-EEC countries
points(non_eec_rates, rep(1, length(non_eec_rates)), pch = 19, cex = 1.2, col = "darkred")

# Add axis labels with better positioning
axis(2, at = c(1, 2), labels = c("non-EEC", "EEC"), las = 1, cex.axis = 1.2)

# Add a legend
legend("topright", legend = c("EEC", "non-EEC"),
      col = c("darkblue", "darkred"), pch = 19, cex = 1.2, pt.cex = 1.2)

# Add a caption
mtext("EEC countries had higher unemployment on average than non-EEC members.",
      side = 1, line = 3.5, cex = 0.8)
```



Commentary on Comparison Plot

Plotting both groups on the same scale reveals several important patterns:

1. **Overall distribution:** EEC countries generally had higher unemployment rates than non-EEC countries in 1995. Looking at the dots, we can see more EEC countries clustered in the 8-13% range, while most non-EEC countries fall in the 3-8% range.
2. **Outliers:** Both groups have significant outliers - Spain (22.9%) for EEC countries and Finland (17.2%) for non-EEC countries. These outliers indicate that factors beyond EEC membership strongly influenced unemployment in some countries.
3. **Spread:** The EEC countries show a wider spread of unemployment rates, suggesting more economic diversity within the community despite shared policies.
4. **Concentration:** Non-EEC countries have a stronger concentration toward lower unemployment rates, with 7 of 11 countries below 7%, while only 2 of 11 EEC countries fall below that threshold.

5. **Central tendency:** The median unemployment rate for EEC countries appears to be around 10%, while for non-EEC countries it's closer to 5-6%.

This comparative visualization suggests that while EEC membership in 1995 was associated with somewhat higher unemployment rates on average, the presence of outliers in both groups indicates that national economic circumstances and policies likely played a more significant role than membership status alone.

The similar spreads in both groups (ignoring the extreme outliers) suggest that while the central tendencies differ, both EEC and non-EEC countries experienced varied economic conditions in 1995.

Conclusion

The dot plots reveal that EEC countries had higher unemployment on average than non-EEC members in 1995. Both groups had outliers (Spain and Finland), but the overall pattern shows more non-EEC countries with lower unemployment rates. This could be related to various factors:

1. Different economic policies between EEC and non-EEC countries
2. Potentially different stages of economic development
3. The influence of EEC monetary and trade policies
4. Specific national circumstances affecting outlier countries like Spain and Finland

The comparison demonstrates the usefulness of dot plots for revealing patterns in data. By plotting against the same scale, we can easily compare the distributions of unemployment between these two groups of countries, seeing both the central tendencies and the outliers.

This simple visualization technique effectively shows that while EEC membership might have been associated with higher unemployment levels in 1995, individual country factors were still significant determinants of unemployment rates.