

gimr

2025-03-31

```
# Set up the PNG file
png(filename = "function_plot.png", width = 800, height = 600)

# Define the range for z (avoiding z = 1 which is the asymptote)
z <- seq(0, 0.99, by = 0.01)

# Calculate the function values
f_z <- z / (1 - z)

# Create the plot
plot(z, f_z, type = "l", col = "blue", lwd = 2,
      main = "Plot of  $f(z) = z/(1-z)$  for z from 0 to 1",
      xlab = "z", ylab = "f(z)",
      xlim = c(0, 1), ylim = c(0, 100))

# Add a grid for better readability
grid()

# Add a vertical line at z = 1 to indicate the asymptote
abline(v = 1, lty = 2, col = "red")

# Add explanatory text
text(0.7, 80, "Vertical asymptote at z = 1", col = "red")

# Print confirmation message
cat("Plot saved as 'function_plot.png' in", getwd(), "\n")

## Plot saved as 'function_plot.png' in /Users/user/Dropbox/github_ML/final_paper

# Load necessary libraries
library(ggplot2)
library(ggpubr)
library(extrafont)

## Registering fonts with R

library(showtext)

## Loading required package: sysfonts

## Loading required package: showtextdb
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##
## Attaching package: 'showtextdb'

## The following object is masked from 'package:extrafont':
##
## font_install

# Add some modern fonts
font_add_google("Roboto", "roboto")
font_add_google("Montserrat", "montserrat")
showtext_auto()

# Create a modern football field visualization of kicker exogeneity - TALLER VERSION
create_modern_football_exogeneity_viz <- function() {
  # Set up the base plot with a football field appearance
  field_plot <- ggplot() +
    theme_void() +
    xlim(0, 100) +
    ylim(0, 120) + # Increased height from 100 to 120
    theme(
      plot.background = element_rect(fill = "#F5F5F7"),
      plot.margin = margin(25, 20, 25, 20), # Increased top and bottom margins
      text = element_text(family = "montserrat")
    )

  # Add a subtle pattern/texture to the background
  for (i in seq(5, 95, by = 5)) {
    field_plot <- field_plot +
      annotate("segment", x = i, y = 0, xend = i, yend = 120,
              color = "#EEEEEE", size = 0.3)
  }
  for (i in seq(5, 115, by = 5)) { # Extended grid lines vertically
    field_plot <- field_plot +
      annotate("segment", x = 0, y = i, xend = 100, yend = i,
              color = "#EEEEEE", size = 0.3)
  }

  # Add field markings with modern styling
  field_plot <- field_plot +
    # Field background with gradient - positioned lower to have more space at top
    annotate("rect", xmin = 10, xmax = 90, ymin = 20, ymax = 85,
            fill = "#4AA02C", color = NA, alpha = 0.7) +

    # Yard lines - repositioned
    annotate("segment", x = 10, y = 20, xend = 10, yend = 85, color = "white", size = 1) +
    annotate("segment", x = 90, y = 20, xend = 90, yend = 85, color = "white", size = 1) +
    annotate("segment", x = 20, y = 20, xend = 20, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 30, y = 20, xend = 30, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 40, y = 20, xend = 40, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 50, y = 20, xend = 50, yend = 85, color = "white", size = 1) +
    annotate("segment", x = 60, y = 20, xend = 60, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 70, y = 20, xend = 70, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 80, y = 20, xend = 80, yend = 85, color = "white", size = 0.5) +

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# End zones with gradient - repositioned
annotate("rect", xmin = 0, xmax = 10, ymin = 20, ymax = 85,
         fill = "#D62728", alpha = 0.8) +
annotate("rect", xmin = 90, xmax = 100, ymin = 20, ymax = 85,
         fill = "#1F77B4", alpha = 0.8) +

# Modern field labels - repositioned
annotate("text", x = 5, y = 52.5, label = "END ZONE", color = "white",
         size = 3.2, angle = 90, fontface = "bold", family = "montserrat") +
annotate("text", x = 15, y = 15, label = "OWN 10", color = "#444444",
         size = 2.8, family = "roboto") +
annotate("text", x = 25, y = 15, label = "OWN 25", color = "#444444",
         size = 2.8, family = "roboto") +
annotate("text", x = 50, y = 15, label = "MIDFIELD", color = "#444444",
         size = 3.2, fontface = "bold", family = "montserrat") +
annotate("text", x = 75, y = 15, label = "OPP 25", color = "#444444",
         size = 2.8, family = "roboto") +
annotate("text", x = 85, y = 15, label = "OPP 10", color = "#444444",
         size = 2.8, family = "roboto") +
annotate("text", x = 95, y = 52.5, label = "END ZONE", color = "white",
         size = 3.2, angle = 90, fontface = "bold", family = "montserrat")

# Add title with modern styling - moved higher
field_plot <- field_plot +
  annotate("text", x = 50, y = 115,
         label = "Kicker Exogeneity by Field Position and Down",
         size = 5.2, hjust = 0.5, vjust = 0.5, fontface = "bold",
         family = "montserrat", color = "#333333")

# Add field position zones with gradient transparency - repositioned
field_plot <- field_plot +
  # Too far zone (own territory)
  annotate("rect", xmin = 10, xmax = 35, ymin = 20, ymax = 85,
         fill = "#60BD68", alpha = 0.2, color = NA) +
  # Middle field zone
  annotate("rect", xmin = 35, xmax = 65, ymin = 20, ymax = 85,
         fill = "#FAA43A", alpha = 0.2, color = NA) +
  # Too close zone (opponent territory/red zone)
  annotate("rect", xmin = 65, xmax = 90, ymin = 20, ymax = 85,
         fill = "#60BD68", alpha = 0.2, color = NA)

# Add modern zone labels with rounded corners - repositioned
field_plot <- field_plot +
  # Too far zone label
  annotate("rect", xmin = 10, xmax = 35, ymin = 86, ymax = 92,
         fill = "#60BD68", alpha = 0.8, color = NA) +
  annotate("text", x = 22.5, y = 89, label = "TOO FAR FOR FG",
         color = "white", fontface = "bold", size = 3.2, family = "montserrat") +

  # Middle field zone label
  annotate("rect", xmin = 35, xmax = 65, ymin = 86, ymax = 92,
         fill = "#FAA43A", alpha = 0.8, color = NA) +
  annotate("text", x = 50, y = 89, label = "POTENTIAL FG RANGE",

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        color = "white", fontface = "bold", size = 3.2, family = "montserrat") +

# Too close zone label
annotate("rect", xmin = 65, xmax = 90, ymin = 86, ymax = 92,
        fill = "#60BD68", alpha = 0.8, color = NA) +
annotate("text", x = 77.5, y = 89, label = "TD PRIORITY ZONE",
        color = "white", fontface = "bold", size = 3.2, family = "montserrat")

# Add 3rd Down section with modern styling - repositioned with more space
field_plot <- field_plot +
# Background with shadow effect
annotate("rect", xmin = 15.8, xmax = 85.2, ymin = 39.8, ymax = 59.2,
        fill = "#00000022", color = NA) +
annotate("rect", xmin = 15, xmax = 85, ymin = 40, ymax = 59,
        fill = "white", color = NA, alpha = 0.95) +

# Title - with more space
annotate("text", x = 50, y = 55, label = "3RD DOWN",
        color = "#5DA5DA", fontface = "bold", size = 4.2, family = "montserrat") +

# Zone descriptions - with more space
annotate("text", x = 25, y = 50, label = "EXOGENOUS",
        color = "#60BD68", fontface = "bold", size = 3.6, family = "montserrat") +
annotate("text", x = 25, y = 45, label = "Kicker not relevant",
        color = "#444444", size = 2.8, family = "roboto") +

annotate("text", x = 50, y = 50, label = "NOT EXOGENOUS",
        color = "#F15854", fontface = "bold", size = 3.6, family = "montserrat") +
annotate("text", x = 50, y = 45, label = "Affects future 4th down decision",
        color = "#444444", size = 2.8, family = "roboto") +

annotate("text", x = 75, y = 50, label = "EXOGENOUS",
        color = "#60BD68", fontface = "bold", size = 3.6, family = "montserrat") +
annotate("text", x = 75, y = 45, label = "Kicker not relevant",
        color = "#444444", size = 2.8, family = "roboto")

# Add 4th Down section with modern styling - repositioned with more space
field_plot <- field_plot +
# Background with shadow effect
annotate("rect", xmin = 15.8, xmax = 85.2, ymin = 23.8, ymax = 37.2,
        fill = "#00000022", color = NA) +
annotate("rect", xmin = 15, xmax = 85, ymin = 24, ymax = 37,
        fill = "white", color = NA, alpha = 0.95) +

# Title - with more space
annotate("text", x = 50, y = 34, label = "4TH DOWN",
        color = "#F15854", fontface = "bold", size = 4.2, family = "montserrat") +

# Consistent description across all zones - with more space
annotate("text", x = 50, y = 29,
        label = "KICKER ALWAYS EXOGENOUS IN 'GO FOR IT' SITUATIONS",
        color = "#60BD68", fontface = "bold", size = 3.2, family = "montserrat") +
annotate("text", x = 50, y = 26,

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        label = "No future decisions after 4th down",
        color = "#444444", size = 2.8, family = "roboto")

# Add explanation text with modern styling - split into two separate boxes with increased height
field_plot <- field_plot +
  # 3rd down explanation box - taller and wider
  annotate("rect", xmin = 12.8, xmax = 49.8, ymin = 93.8, ymax = 108.2,
    fill = "#00000022", color = NA) +
  annotate("rect", xmin = 12, xmax = 49.5, ymin = 94, ymax = 108,
    fill = "#F8F8F8", color = NA, alpha = 0.9) +

  # 3rd down explanation text - more spaced out
  annotate("text", x = 30.75, y = 106,
    label = "3RD DOWN:",
    size = 3.2, hjust = 0.5, vjust = 0.5, fontface = "bold", family = "montserrat", color = "#333333") +
  annotate("text", x = 30.75, y = 102,
    label = "Kicker quality only matters",
    size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
  annotate("text", x = 30.75, y = 99,
    label = "in middle field where it affects",
    size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
  annotate("text", x = 30.75, y = 96,
    label = "future 4th down decisions",
    size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +

  # 4th down explanation box - taller and wider
  annotate("rect", xmin = 50.2, xmax = 88.2, ymin = 93.8, ymax = 108.2,
    fill = "#00000022", color = NA) +
  annotate("rect", xmin = 50.5, xmax = 88, ymin = 94, ymax = 108,
    fill = "#F8F8F8", color = NA, alpha = 0.9) +

  # 4th down explanation text - more spaced out
  annotate("text", x = 69.25, y = 106,
    label = "4TH DOWN:",
    size = 3.2, hjust = 0.5, vjust = 0.5, fontface = "bold", family = "montserrat", color = "#333333") +
  annotate("text", x = 69.25, y = 102,
    label = "Kicker is always exogenous",
    size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
  annotate("text", x = 69.25, y = 99,
    label = "in 'go for it' situations because",
    size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
  annotate("text", x = 69.25, y = 96,
    label = "no future downs remain",
    size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333")

# Add footer with more subtle styling - repositioned
field_plot <- field_plot +
  annotate("text", x = 50, y = 7,
    label = "Kicker exogeneity is critical for unbiased causal inference in the GIMR model",
    size = 2.8, hjust = 0.5, vjust = 0.5, fontface = "italic",
    family = "roboto", color = "#666666")

return(field_plot)

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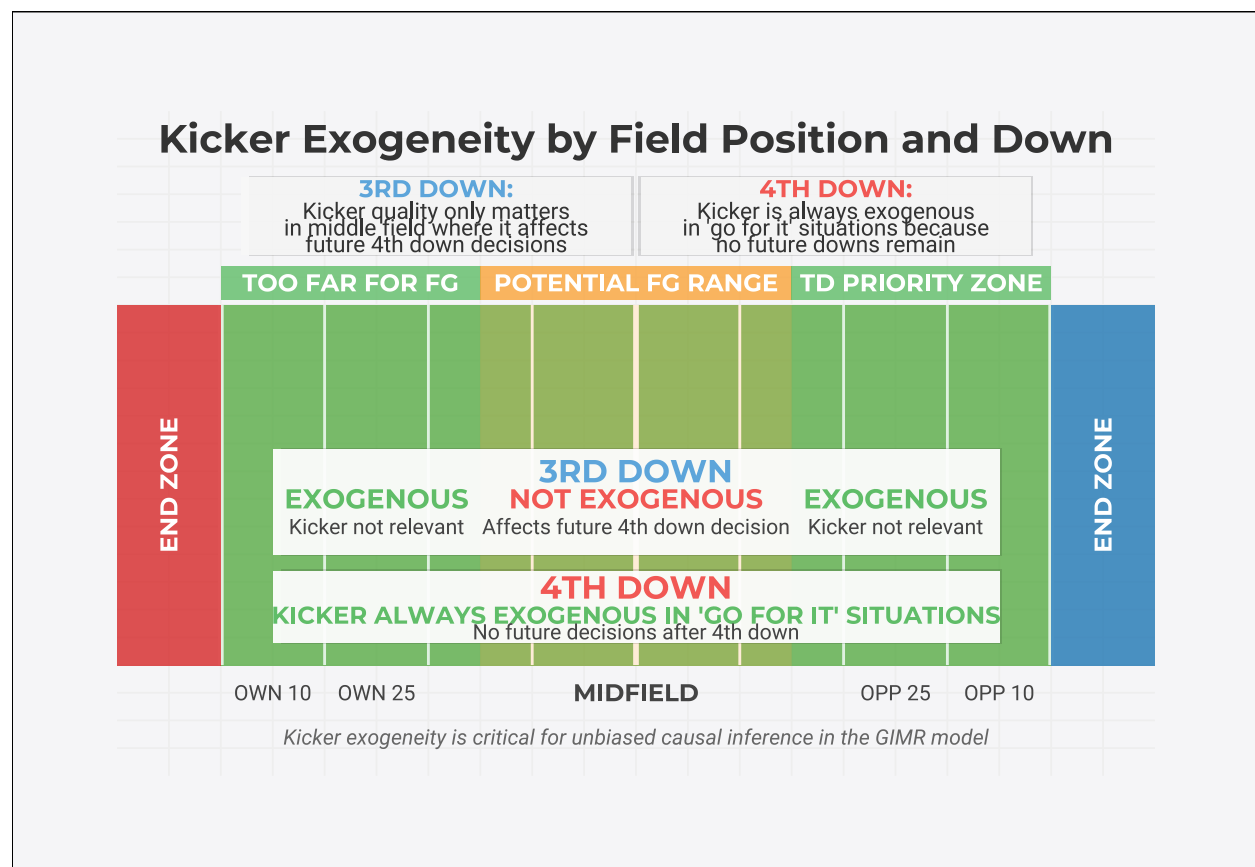
}

# Create the visualization
modern_exogeneity_field_viz <- create_modern_football_exogeneity_viz()

## Warning: Using 'size' aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use 'linewidth' instead.
## This warning is displayed once every 8 hours.
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was
## generated.

# Display the plot
print(modern_exogeneity_field_viz)

```



```

# Save the plot with taller dimensions
# Load necessary libraries
library(ggplot2)
library(ggpubr)
library(extrafont)
library(showtext)

# Add some modern fonts
font_add_google("Roboto", "roboto")
font_add_google("Montserrat", "montserrat")

```

```

showtext_auto()

# Create a modern football field visualization of kicker exogeneity - TALLER VERSION
create_modern_football_exogeneity_viz <- function() {
  # Set up the base plot with a football field appearance
  field_plot <- ggplot() +
    theme_void() +
    xlim(0, 100) +
    ylim(0, 120) + # Increased height from 100 to 120
    theme(
      plot.background = element_rect(fill = "#F5F5F7"),
      plot.margin = margin(25, 20, 25, 20), # Increased top and bottom margins
      text = element_text(family = "montserrat")
    )

  # Add a subtle pattern/texture to the background
  for (i in seq(5, 95, by = 5)) {
    field_plot <- field_plot +
      annotate("segment", x = i, y = 0, xend = i, yend = 120,
              color = "#EEEEEE", size = 0.3)
  }
  for (i in seq(5, 115, by = 5)) { # Extended grid lines vertically
    field_plot <- field_plot +
      annotate("segment", x = 0, y = i, xend = 100, yend = i,
              color = "#EEEEEE", size = 0.3)
  }

  # Add field markings with modern styling
  field_plot <- field_plot +
    # Field background with gradient - positioned lower to have more space at top
    annotate("rect", xmin = 10, xmax = 90, ymin = 20, ymax = 85,
            fill = "#4AA02C", color = NA, alpha = 0.7) +

    # Yard lines - repositioned
    annotate("segment", x = 10, y = 20, xend = 10, yend = 85, color = "white", size = 1) +
    annotate("segment", x = 90, y = 20, xend = 90, yend = 85, color = "white", size = 1) +
    annotate("segment", x = 20, y = 20, xend = 20, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 30, y = 20, xend = 30, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 40, y = 20, xend = 40, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 50, y = 20, xend = 50, yend = 85, color = "white", size = 1) +
    annotate("segment", x = 60, y = 20, xend = 60, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 70, y = 20, xend = 70, yend = 85, color = "white", size = 0.5) +
    annotate("segment", x = 80, y = 20, xend = 80, yend = 85, color = "white", size = 0.5) +

    # End zones with gradient - repositioned
    annotate("rect", xmin = 0, xmax = 10, ymin = 20, ymax = 85,
            fill = "#D62728", alpha = 0.8) +
    annotate("rect", xmin = 90, xmax = 100, ymin = 20, ymax = 85,
            fill = "#1F77B4", alpha = 0.8) +

    # Modern field labels - repositioned
    annotate("text", x = 5, y = 52.5, label = "END ZONE", color = "white",
            size = 3.2, angle = 90, fontface = "bold", family = "montserrat") +

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annotate("text", x = 15, y = 15, label = "OWN 10", color = "#444444",
        size = 2.8, family = "roboto") +
annotate("text", x = 25, y = 15, label = "OWN 25", color = "#444444",
        size = 2.8, family = "roboto") +
annotate("text", x = 50, y = 15, label = "MIDFIELD", color = "#444444",
        size = 3.2, fontface = "bold", family = "montserrat") +
annotate("text", x = 75, y = 15, label = "OPP 25", color = "#444444",
        size = 2.8, family = "roboto") +
annotate("text", x = 85, y = 15, label = "OPP 10", color = "#444444",
        size = 2.8, family = "roboto") +
annotate("text", x = 95, y = 52.5, label = "END ZONE", color = "white",
        size = 3.2, angle = 90, fontface = "bold", family = "montserrat")

# Add title with modern styling - moved higher
field_plot <- field_plot +
  annotate("text", x = 50, y = 115,
        label = "Kicker Exogeneity by Field Position and Down",
        size = 5.2, hjust = 0.5, vjust = 0.5, fontface = "bold",
        family = "montserrat", color = "#333333")

# Add field position zones with gradient transparency - repositioned
field_plot <- field_plot +
  # Too far zone (own territory)
  annotate("rect", xmin = 10, xmax = 35, ymin = 20, ymax = 85,
        fill = "#60BD68", alpha = 0.2, color = NA) +
  # Middle field zone
  annotate("rect", xmin = 35, xmax = 65, ymin = 20, ymax = 85,
        fill = "#FAA43A", alpha = 0.2, color = NA) +
  # Too close zone (opponent territory/red zone)
  annotate("rect", xmin = 65, xmax = 90, ymin = 20, ymax = 85,
        fill = "#60BD68", alpha = 0.2, color = NA)

# Add modern zone labels with rounded corners - repositioned
field_plot <- field_plot +
  # Too far zone label
  annotate("rect", xmin = 10, xmax = 35, ymin = 86, ymax = 92,
        fill = "#60BD68", alpha = 0.8, color = NA) +
  annotate("text", x = 22.5, y = 89, label = "TOO FAR FOR FG",
        color = "white", fontface = "bold", size = 3.2, family = "montserrat") +

  # Middle field zone label
  annotate("rect", xmin = 35, xmax = 65, ymin = 86, ymax = 92,
        fill = "#FAA43A", alpha = 0.8, color = NA) +
  annotate("text", x = 50, y = 89, label = "POTENTIAL FG RANGE",
        color = "white", fontface = "bold", size = 3.2, family = "montserrat") +

  # Too close zone label
  annotate("rect", xmin = 65, xmax = 90, ymin = 86, ymax = 92,
        fill = "#60BD68", alpha = 0.8, color = NA) +
  annotate("text", x = 77.5, y = 89, label = "TD PRIORITY ZONE",
        color = "white", fontface = "bold", size = 3.2, family = "montserrat")

# Add 3rd Down section with modern styling - repositioned with more space

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field_plot <- field_plot +
  # Background with shadow effect
  annotate("rect", xmin = 15.8, xmax = 85.2, ymin = 39.8, ymax = 59.2,
    fill = "#00000022", color = NA) +
  annotate("rect", xmin = 15, xmax = 85, ymin = 40, ymax = 59,
    fill = "white", color = NA, alpha = 0.95) +

  # Title - with more space
  annotate("text", x = 50, y = 55, label = "3RD DOWN",
    color = "#5DA5DA", fontface = "bold", size = 4.2, family = "montserrat") +

  # Zone descriptions - with more space
  annotate("text", x = 25, y = 50, label = "EXOGENOUS",
    color = "#60BD68", fontface = "bold", size = 3.6, family = "montserrat") +
  annotate("text", x = 25, y = 45, label = "Kicker not relevant",
    color = "#444444", size = 2.8, family = "roboto") +

  annotate("text", x = 50, y = 50, label = "NOT EXOGENOUS",
    color = "#F15854", fontface = "bold", size = 3.6, family = "montserrat") +
  annotate("text", x = 50, y = 45, label = "Affects future 4th down decision",
    color = "#444444", size = 2.8, family = "roboto") +

  annotate("text", x = 75, y = 50, label = "EXOGENOUS",
    color = "#60BD68", fontface = "bold", size = 3.6, family = "montserrat") +
  annotate("text", x = 75, y = 45, label = "Kicker not relevant",
    color = "#444444", size = 2.8, family = "roboto")

# Add 4th Down section with modern styling - repositioned with more space
field_plot <- field_plot +
  # Background with shadow effect
  annotate("rect", xmin = 15.8, xmax = 85.2, ymin = 23.8, ymax = 37.2,
    fill = "#00000022", color = NA) +
  annotate("rect", xmin = 15, xmax = 85, ymin = 24, ymax = 37,
    fill = "white", color = NA, alpha = 0.95) +

  # Title - with more space
  annotate("text", x = 50, y = 34, label = "4TH DOWN",
    color = "#F15854", fontface = "bold", size = 4.2, family = "montserrat") +

  # Consistent description across all zones - with more space
  annotate("text", x = 50, y = 29,
    label = "KICKER ALWAYS EXOGENOUS IN 'GO FOR IT' SITUATIONS",
    color = "#60BD68", fontface = "bold", size = 3.2, family = "montserrat") +
  annotate("text", x = 50, y = 26,
    label = "No future decisions after 4th down",
    color = "#444444", size = 2.8, family = "roboto")

# Add explanation text with modern styling - split into two separate boxes with increased height
field_plot <- field_plot +
  # 3rd down explanation box - taller and wider
  annotate("rect", xmin = 12.8, xmax = 49.8, ymin = 93.8, ymax = 108.2,
    fill = "#00000022", color = NA) +
  annotate("rect", xmin = 12, xmax = 49.5, ymin = 94, ymax = 108,

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        fill = "#F8F8F8", color = NA, alpha = 0.9) +

# 3rd down explanation text - more spaced out
annotate("text", x = 30.75, y = 106,
        label = "3RD DOWN:",
        size = 3.2, hjust = 0.5, vjust = 0.5, fontface = "bold", family = "montserrat", color = "#333333") +
annotate("text", x = 30.75, y = 102,
        label = "Kicker quality only matters",
        size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
annotate("text", x = 30.75, y = 99,
        label = "in middle field where it affects",
        size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
annotate("text", x = 30.75, y = 96,
        label = "future 4th down decisions",
        size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +

# 4th down explanation box - taller and wider
annotate("rect", xmin = 50.2, xmax = 88.2, ymin = 93.8, ymax = 108.2,
        fill = "#00000022", color = NA) +
annotate("rect", xmin = 50.5, xmax = 88, ymin = 94, ymax = 108,
        fill = "#F8F8F8", color = NA, alpha = 0.9) +

# 4th down explanation text - more spaced out
annotate("text", x = 69.25, y = 106,
        label = "4TH DOWN:",
        size = 3.2, hjust = 0.5, vjust = 0.5, fontface = "bold", family = "montserrat", color = "#333333") +
annotate("text", x = 69.25, y = 102,
        label = "Kicker is always exogenous",
        size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
annotate("text", x = 69.25, y = 99,
        label = "in 'go for it' situations because",
        size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333") +
annotate("text", x = 69.25, y = 96,
        label = "no future downs remain",
        size = 3.0, hjust = 0.5, vjust = 0.5, family = "roboto", color = "#333333")

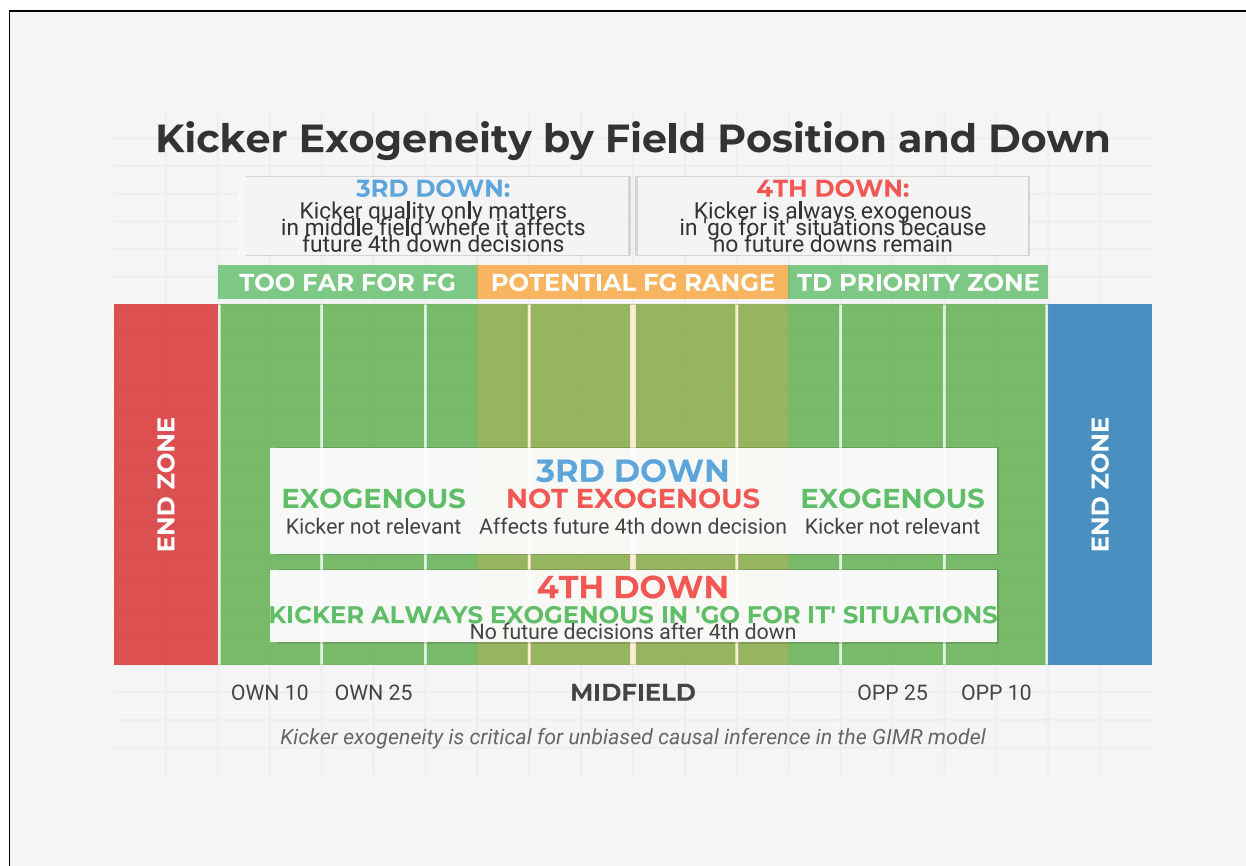
# Add footer with more subtle styling - repositioned
field_plot <- field_plot +
    annotate("text", x = 50, y = 7,
            label = "Kicker exogeneity is critical for unbiased causal inference in the GIMR model",
            size = 2.8, hjust = 0.5, vjust = 0.5, fontface = "italic",
            family = "roboto", color = "#666666")

return(field_plot)
}

# Create the visualization
modern_exogeneity_field_viz <- create_modern_football_exogeneity_viz()

# Display the plot
print(modern_exogeneity_field_viz)

```



```
# Save the plot with exact dimensions to match the console view
ggsave("kicker_exogeneity_decision_tree.png",
  plot = modern_exogeneity_field_viz,
  width = 12,
  height = 10,
  dpi = 300,
  scale = 1,
  limitsize = FALSE)
```