

# Tabling Challenges: pander vs zzt2fig

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This vignette presents a series of tabling challenges of varying difficulty, showing solutions in both pander and zzt2fig. Each challenge demonstrates the relative strengths and approaches of each package.

## Setup

```
library(pander)
library(zzt2fig)
```

## Standard Difficulty Challenges

### Challenge 1: Basic Data Frame

**Task:** Display a simple data frame with default formatting.

#### pander Solution

```
df <- mtcars[1:5, 1:4]
pander(df)
```

**Output** (Markdown):

```
-----
      &nbsp;      mpg  cyl  disp  hp
-----
**Mazda RX4**    21    6   160  110
**Mazda RX4 Wag** 21    6   160  110
**Datsun 710**   22.8   4   108   93
**Hornet 4 Drive** 21.4   6   258  110
**Hornet Sportabout** 18.7   8   360  175
-----
```

#### zzt2fig Solution

```
df <- mtcars[1:5, 1:4]
t2f(df, filename = "basic_table")
```

**Output:** Cropped PDF with LaTeX booktabs formatting.

**Comparison:** pander outputs markdown for inline display; zzt2fig produces publication-ready PDF files.

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## Challenge 2: Custom Column Alignment

**Task:** Create a table with left-aligned text and right-aligned numbers.

### pander Solution

```
df <- data.frame(
  Name = c("Alice", "Bob", "Charlie"),
  Score = c(95.5, 87.2, 91.8),
  Rank = c(1, 3, 2)
)

pander(df, justify = c("left", "right", "right"))
```

### zzt2fig Solution

```
df <- data.frame(
  Name = c("Alice", "Bob", "Charlie"),
  Score = c(95.5, 87.2, 91.8),
  Rank = c(1, 3, 2)
)

# Auto-detection (default)
t2f(df, filename = "aligned_table")

# Or explicit
t2f(df, filename = "aligned_table", align = c("l", "r", "r"))
```

**Comparison:** Both handle basic alignment. zzt2fig auto-detects based on column type.

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## Challenge 3: Table with Caption

**Task:** Add a caption to the table.

### pander Solution

```
df <- iris[1:5, ]

pander(df, caption = "First Five Rows of Iris Dataset")
```

**Output:** Caption appears below table with “Table:” prefix.

### zzt2fig Solution

```
df <- iris[1:5, ]

t2f(df,
```

```
filename = "iris_sample",
caption = "First Five Rows of Iris Dataset",
label = "tab:iris")
```

**Output:** LaTeX `\caption{}` with optional `\label{}` for cross-referencing.

**Comparison:** `zztab2fig` adds cross-reference labels; `pander` does not.

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## Challenge 4: Regression Model Output

**Task:** Display linear regression coefficients.

### pander Solution

```
model <- lm(mpg ~ cyl + hp + wt, data = mtcars)

pander(model)
```

**Output:**

	Estimate	Std. Error	t value	Pr(> t )
**(Intercept)**	38.75	1.787	21.69	3.043e-18
**cyl**	-0.9416	0.5509	-1.709	0.0985
**hp**	-0.01804	0.01188	-1.519	0.1400
**wt**	-3.167	0.7406	-4.276	0.0002073

### zztab2fig Solution

```
model <- lm(mpg ~ cyl + hp + wt, data = mtcars)

t2f(model,
  filename = "regression",
  include = c("estimate", "std.error", "p.value"),
  caption = "Linear Regression Results")
```

**Output:** Formatted coefficient table with selected statistics.

**Comparison:** Both handle `lm` objects natively. `zztab2fig` allows selecting which statistics to include.

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## Challenge 5: Highlighting Cells

**Task:** Emphasize specific cells in a table.

### pander Solution

```
df <- mtcars[1:5, 1:4]

# Emphasize row 2, column 1
pander(df, emphasize.strong.cells = which(df == df[2,1], arr.ind = TRUE))

# Or emphasize entire rows/columns
pander(df, emphasize.strong.rows = 2, emphasize.italics.cols = 3)
```

### zztab2fig Solution

```
df <- mtcars[1:5, 1:4]

# Bold a column
t2f(df,
  filename = "emphasized",
  formatting = list(t2f_bold_col(1)))

# Conditional highlighting
fmt <- t2f_highlight(
  condition = function(x) as.numeric(x) > 20,
  background = "yellow!20"
)
```

**Comparison:** pander uses row/column indices; zztab2fig supports conditional formatting with LaTeX colors.

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## Advanced Challenges

### Challenge 6: Table Footnotes

**Task:** Add footnotes explaining abbreviations and significance levels.

#### pander Solution

```
df <- data.frame(
  Variable = c("BMI*", "SBP", "DBP"),
  Mean = c(27.5, 142.3, 88.2),
  SD = c(4.2, 18.5, 11.3)
)

pander(df, caption = "Clinical Measurements")
# Footnote must be added as separate text outside the table
cat("\n\n*BMI = Body Mass Index; SBP = Systolic Blood Pressure;
DBP = Diastolic Blood Pressure\n")
```

**Limitation:** pander has no native table footnote support. Footnotes must be added manually as separate text.

#### zztab2fig Solution

```
df <- data.frame(
  Variable = c("BMI", "SBP", "DBP"),
```

```

Mean = c(27.5, 142.3, 88.2),
SD = c(4.2, 18.5, 11.3)
)

# Add footnote marker to cell
df$Variable[1] <- t2f_mark("BMI", 1, "symbol")

fn <- t2f_footnote(
  general = "SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure.",
  symbol = "Body Mass Index (kg/m2).",
  threeparttable = TRUE
)

t2f(df,
  filename = "clinical_footnotes",
  caption = "Clinical Measurements",
  footnote = fn)

```

**Advantage:** zzt2f produces proper LaTeX footnotes within the table environment using threeparttable.

## Challenge 7: Spanning Column Headers

**Task:** Create grouped column headers (e.g., “Treatment” spanning two columns).

### pander Solution

```

df <- data.frame(
  Outcome = c("Score A", "Score B"),
  T_Mean = c(45.2, 38.7),
  T_SD = c(8.3, 6.2),
  C_Mean = c(42.1, 37.9),
  C_SD = c(7.9, 5.8)
)

# pander cannot create spanning headers
# Best approximation: rename columns
names(df) <- c("Outcome", "Treatment Mean", "Treatment SD",
               "Control Mean", "Control SD")
pander(df)

```

**Limitation:** pander does not support spanning (multi-column) headers.

### zzt2f Solution

```

df <- data.frame(
  Outcome = c("Score A", "Score B"),
  T_Mean = c(45.2, 38.7),
  T_SD = c(8.3, 6.2),
  C_Mean = c(42.1, 37.9),
  C_SD = c(7.9, 5.8)
)
names(df) <- c("Outcome", "Mean", "SD", "Mean", "SD")

```

```

hdr <- t2f_header_above(
  " " = 1,
  "Treatment" = 2,
  "Control" = 2
)

t2f(df,
  filename = "spanning_header",
  caption = "Outcomes by Group",
  header_above = hdr)

```

**Advantage:** zzt2fig creates proper LaTeX multicolumn headers with cmidrule separators.

---

## Challenge 8: Multi-Row Cells (Row Spanning)

**Task:** Merge cells vertically for hierarchical data.

### pander Solution

```

df <- data.frame(
  Category = c("Treatment", "Treatment", "Control", "Control"),
  Subgroup = c("Male", "Female", "Male", "Female"),
  N = c(45, 52, 48, 49),
  Response = c("72%", "68%", "45%", "42%")
)

# pander cannot merge rows - display as-is with repeated values
pander(df)

```

**Limitation:** pander does not support multi-row (vertically merged) cells.

### zzt2fig Solution

```

df <- data.frame(
  Category = c("Treatment", "Treatment", "Control", "Control"),
  Subgroup = c("Male", "Female", "Male", "Female"),
  N = c(45, 52, 48, 49),
  Response = c("72%", "68%", "45%", "42%")
)

t2f(df,
  filename = "multirow",
  caption = "Response by Group and Sex",
  collapse_rows = t2f_collapse_rows(
    columns = 1,
    valign = "middle",
    latex_hline = "major"
  ))

```

**Advantage:** zzt2fig automatically merges repeated values using LaTeX multirow.

---

## Challenge 9: Decimal Point Alignment

**Task:** Align numbers on the decimal point for easy comparison.

### pander Solution

```
df <- data.frame(
  Item = c("A", "B", "C"),
  Value1 = c(1.5, 123.45, 12.345),
  Value2 = c(0.001, 10.1, 1000.01)
)

# pander uses right-alignment for numbers
# No decimal alignment available
pander(df, justify = c("left", "right", "right"))
```

**Limitation:** pander supports left/center/right alignment only, not decimal alignment.

### zztab2fig Solution

```
df <- data.frame(
  Item = c("A", "B", "C"),
  Value1 = c(1.5, 123.45, 12.345),
  Value2 = c(0.001, 10.1, 1000.01)
)

t2f(df,
  filename = "decimal_aligned",
  align = list(
    "l",
    t2f_siunitx(table_format = "3.3"),
    t2f_siunitx(table_format = "4.2")
  )
))
```

**Advantage:** zztab2fig uses siunitx for true decimal alignment.

---

## Challenge 10: Multi-Page Tables

**Task:** Create a table that spans multiple pages with repeated headers.

### pander Solution

```
df <- mtcars[rep(1:32, 3), ] # 96 rows

# pander splits wide tables but not long tables
# For long tables, output continues without repeated headers
pander(df)
```

**Limitation:** pander splits wide tables horizontally but does not handle multi-page tables with repeated headers.

### zztab2fig Solution

```
df <- mtcars[rep(1:32, 3), ] # 96 rows

t2f(df,
  filename = "multipage",
  caption = "Complete mtcars Dataset (Repeated)",
  longtable = TRUE)
```

**Advantage:** zztab2fig uses LaTeX longtable for proper page breaks with repeated headers.

---

## Challenge 11: Journal-Specific Formatting

**Task:** Format table according to NEJM (New England Journal of Medicine) style guidelines.

### pander Solution

```
df <- data.frame(
  Characteristic = c("Age", "Male sex", "BMI"),
  Treatment = c("65.2 (8.4)", "58%", "27.3 (4.1)"),
  Placebo = c("64.8 (8.1)", "56%", "27.1 (3.9)")
)

# pander has no journal-specific themes
# Manual formatting required
panderOptions("table.style", "rmarkdown")
pander(df, caption = "Baseline Characteristics")
```

### zztab2fig Solution

```
df <- data.frame(
  Characteristic = c("Age", "Male sex", "BMI"),
  Treatment = c("65.2 (8.4)", "58%", "27.3 (4.1)"),
  Placebo = c("64.8 (8.1)", "56%", "27.1 (3.9)")
)

t2f(df,
  filename = "nejm_table",
  caption = "Baseline Characteristics",
  theme = "nejm")
```

**Advantage:** zztab2fig includes built-in themes for NEJM, APA, and Nature journals.

---

## Challenge 12: Model Comparison Table

**Task:** Display multiple regression models side by side with significance stars.

### pander Solution

```
m1 <- lm(mpg ~ cyl, data = mtcars)
m2 <- lm(mpg ~ cyl + hp, data = mtcars)
```



```

m3 <- lm(mpg ~ cyl + hp + wt, data = mtcars)

# pander displays one model at a time
pander(m1)
pander(m2)
pander(m3)

# Side-by-side comparison requires manual construction

```

**Limitation:** pander has no built-in model comparison functionality.

#### zztab2fig Solution

```

m1 <- lm(mpg ~ cyl, data = mtcars)
m2 <- lm(mpg ~ cyl + hp, data = mtcars)
m3 <- lm(mpg ~ cyl + hp + wt, data = mtcars)

t2f_regression(
  Model1 = m1,
  Model2 = m2,
  Model3 = m3,
  stars = TRUE,
  filename = "model_comparison"
)

```

**Advantage:** zztab2fig provides t2f\_regression() for publication-ready model comparison tables.

## Challenge 13: Figure Placement in LaTeX

**Task:** Include a table as a float with specific positioning.

#### pander Solution

```

df <- mtcars[1:5, 1:4]

# pander outputs markdown - LaTeX float control not applicable
pander(df)

# For LaTeX output, user must manually wrap in figure environment

```

**Limitation:** pander targets markdown; LaTeX float control requires manual intervention.

#### zztab2fig Solution

```

df <- mtcars[1:5, 1:4]

# Generate cropped PDF
t2f(df, filename = "float_demo", sub_dir = "tables")

# Include with float positioning
t2f_include("tables/float_demo",
  caption = "Sample Data",

```

```
label = "fig:sample",
position = "htbp")
```

**Advantage:** zzt2fig provides helper functions for all LaTeX placement options (float, inline, margin, wrap).

## Challenge 14: Combining Multiple Features

**Task:** Create a complex table with footnotes, spanning headers, multi-row cells, and NEJM styling.

### pander Solution

```
# This combination is not achievable in pander
# Would require extensive manual LaTeX coding
```

**Limitation:** pander cannot combine these advanced features.

### zzt2fig Solution

```
df <- data.frame(
  Endpoint = c("Primary", "Primary", "Secondary", "Secondary"),
  Timepoint = c("Week 26", "Week 52", "Week 26", "Week 52"),
  N = c(245, 232, 245, 232),
  Difference = c(-0.42, -0.58, -0.28, -0.35),
  P = c("0.008", "0.002", "0.045", "0.018")
)

# Add footnote markers
df$Difference <- sapply(seq_len(nrow(df)), function(i) {
  p <- as.numeric(df$P[i])
  if (p < 0.01) t2f_mark(as.character(df$Difference[i]), 2, "symbol")
  else if (p < 0.05) t2f_mark(as.character(df$Difference[i]), 1, "symbol")
  else as.character(df$Difference[i])
})

hdr <- t2f_header_above(" " = 2, "Results" = 3)

fn <- t2f_footnote(
  general = "Negative values favor treatment.",
  symbol = c("p < 0.05", "p < 0.01")
)

t2f(df,
  filename = "complex_table",
  caption = "Efficacy Results by Endpoint and Timepoint",
  caption_short = "Efficacy Results",
  header_above = hdr,
  collapse_rows = t2f_collapse_rows(1, valign = "top"),
  footnote = fn,
  theme = "nejm")
```

## Summary Comparison

Feature	pander	zztab2fig
Basic tables	Yes	Yes
Column alignment	L/C/R	L/C/R + decimal
Captions	Yes	Yes + short captions
Cross-reference labels	No	Yes
Table footnotes	No	Yes (4 notation types)
Spanning headers	No	Yes
Multi-row cells	No	Yes
Multi-page tables	No	Yes (longtable)
Journal themes	No	Yes (NEJM, APA, Nature)
Model comparison	No	Yes
LaTeX float control	No	Yes
Margin placement	No	Yes
Output formats	Markdown	PDF, PNG, SVG, TEX

## When to Use Each Package

### Choose pander when:

- Working in R Markdown targeting HTML/Word output
- Need quick inline display of many R object types
- Document will be processed through Pandoc
- Simple tables without advanced formatting

### Choose zztab2fig when:

- Creating publication-ready tables for journals
- Need footnotes, spanning headers, or multi-row cells
- Working with LaTeX documents
- Require decimal alignment
- Need consistent journal-specific styling
- Creating cropped PDF tables for inclusion in documents