

AI & Chips

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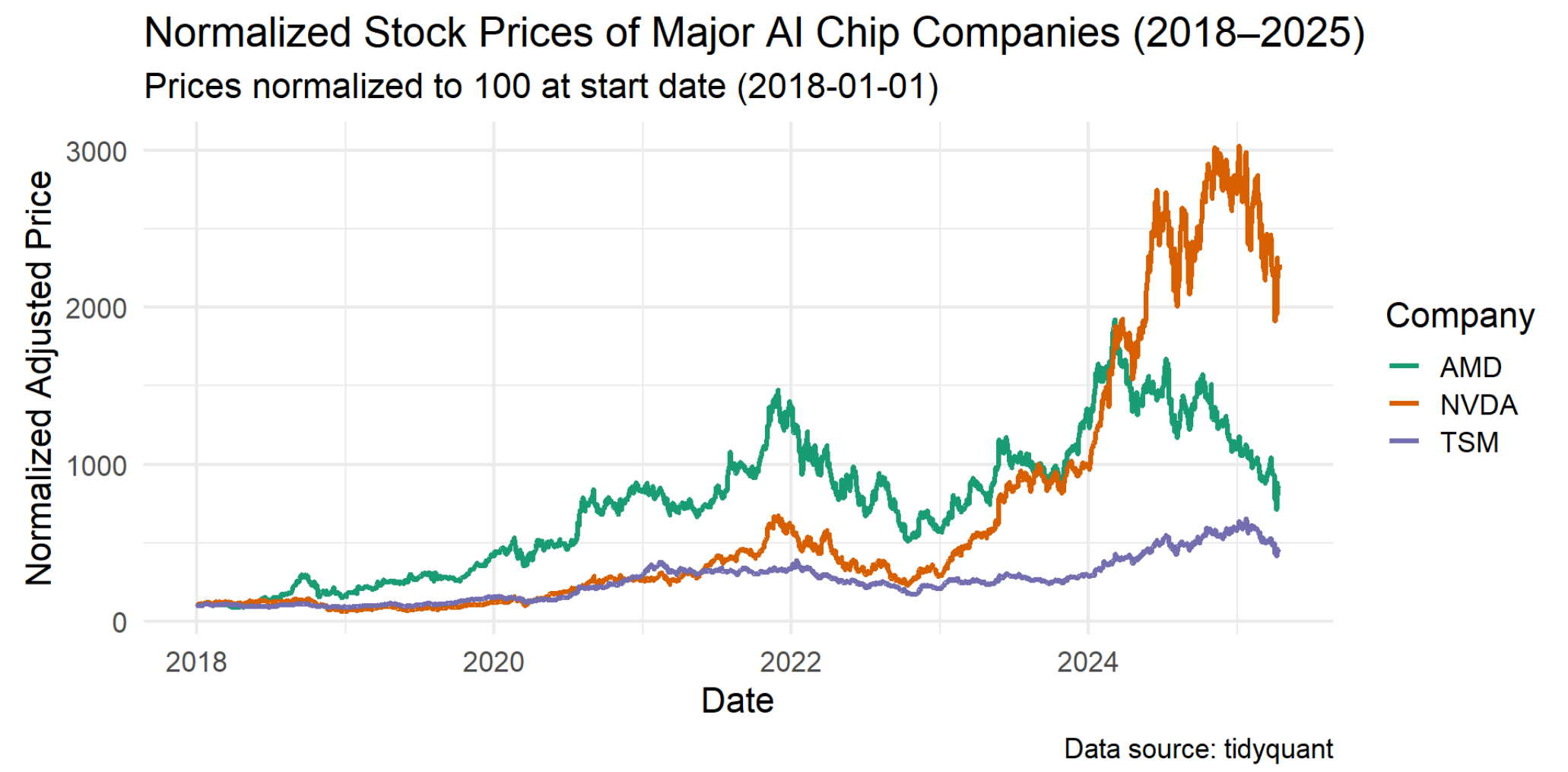
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```
# Gather the stock data
tickers <- c("NADA", "AMD", "TSM")
stock_data <- tq_get(tickers, from = "2018-01-01", to = Sys.Date(), get = "stock.prices")
# Normalize the prices by setting all prices to 100 on the first date
normalized_data <- stock_data %>%
  group_by(symbol) %>%
  # Average over 5 days
  mutate(normalized_price = adjusted / first(adjusted) * 100)
```

Stock Prices

This plot shows all 3 companies trend upwards, while Nvidia’s rise been the most pronounced, reflecting heightened investor enthusiasm fueled by the AI era. AMD showed moderate gain while TSMC remained stable, suggesting varying levels of sensitivity to AI market catalysts.

```
# Plot all in one plot
ggplot(normalized_data, aes(x = date, y = normalized_price, color = symbol)) +
  geom_line(linewidth = 1.2) +
  scale_color_brewer(palette = "Dark2", name = "Company") +
  labs(title = "Normalized Stock Prices of Major AI Chip Companies (2018-2025)",
       subtitle = "Prices normalized to 100 at start date (2018-01-01)",
       x = "Date", y = "Normalized Adjusted Price", caption = "Data source: tidyquant") +
  theme_minimal(base_size = 16) +
  theme(legend.position = "right")
```



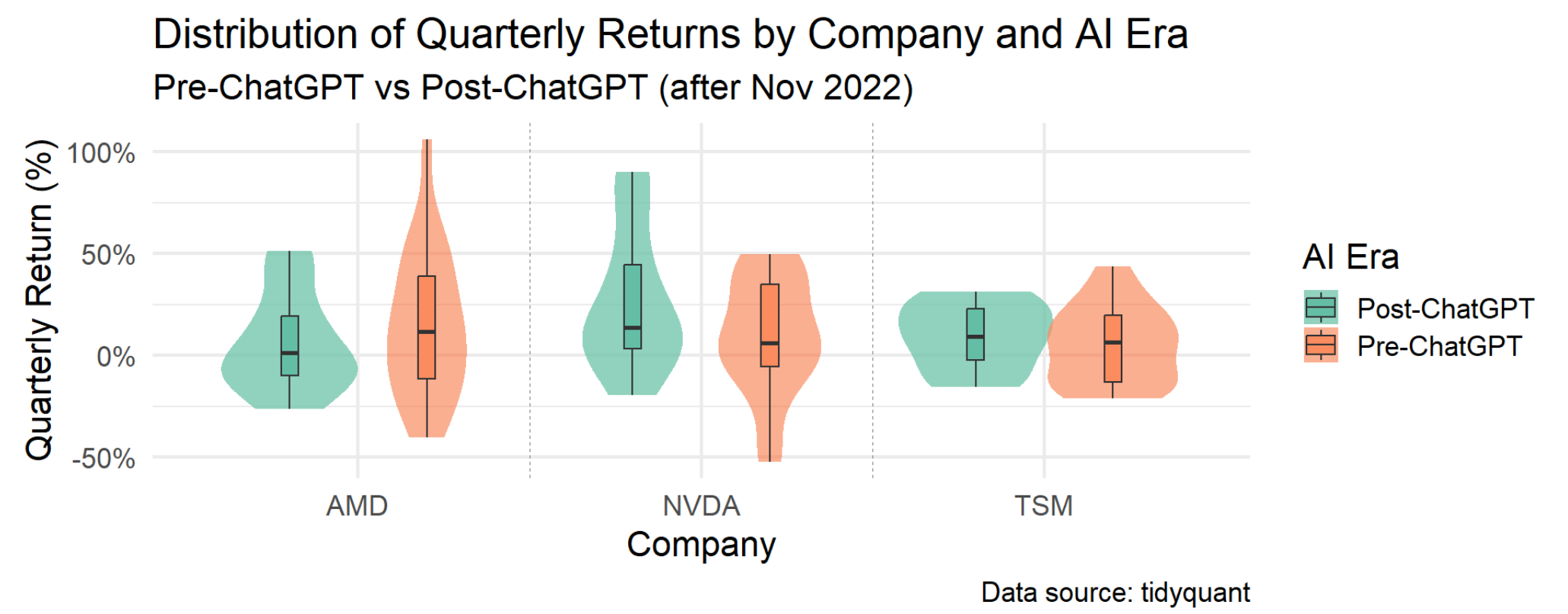
Quarterly Gains vs Losses

Violin and boxplots illustrate greater variance in Nvidia’s returns during the AI era, including higher upside potential. AMD shows tighter but improved return distribution; while TSMC remains unchanged pre vs post ChatGPT era.

```
# Quarterly return calculation
quarterly_data <- stock_data %>%
  group_by(symbol) %>%
  tq_transmute(select = adjusted, mutate_fun = periodReturn, period = "quarterly", col_rename = "quarterly_return") %>%
  mutate(gpt_era = ifelse(date == as.Date("2022-11-30"), "Post-ChatGPT", "Pre-ChatGPT"))

# Determine where to place vertical lines between company groups (1.5, 2.5, ...)
vline_positions <- seq(1.5, length(unique(quarterly_data$symbol)) - 0.5, by = 1)

# Violin and boxplot
ggplot(quarterly_data, aes(x = symbol, y = quarterly_return, fill = gpt_era)) +
  geom_violin(alpha = 0.7, position = position_dodge(width = 0.8), color = NA) +
  geom_boxplot(alpha = 0.5, position = position_dodge(width = 0.8), outline.shape = NA) +
  geom_vline(intercept = vline_positions, color = "gray50", linetype = "dashed", linewidth = 0.3) +
  scale_x_continuous(labels = scales::percent_format(accuracy = 1)) +
  scale_fill_brewer(palette = "Set2", name = "AI Era") +
  labs(title = "Distribution of Quarterly Returns by Company and AI Era",
       subtitle = "Pre-ChatGPT vs Post-ChatGPT (after Nov 2022)",
       x = "Company", y = "Quarterly Return (%)", caption = "Data source: tidyquant") +
  theme_minimal(base_size = 16)
```



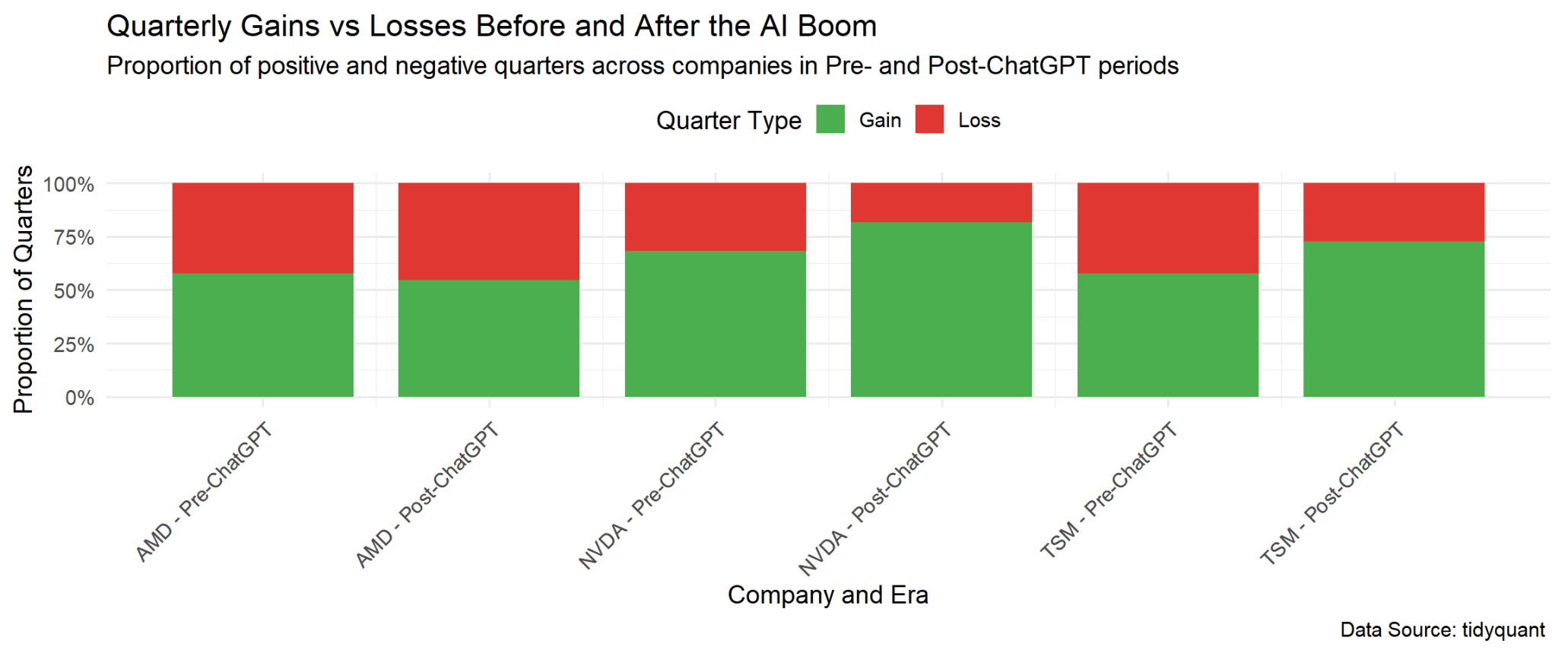
The AI Boom significantly boosted the performance of major AI chip companies, with Nvidia experiencing the most dramatic surge in returns and consistency

The Mosaic plot shows that after Chat-GPT, Nvidia experienced a clear shift toward more quarters of positive returns. TSMC also shows a significant shift towards it. While AMD remains the same pre vs post ChatGPT era.

```
# Categorize each quarterly return as gain or loss
mosaic_data <- quarterly_data %>%
  mutate(return_type = ifelse(quarterly_return >= 0, "Gain", "Loss"),
         gpt_era = factor(gpt_era, levels = c("Pre-ChatGPT", "Post-ChatGPT")),
         return_type = factor(return_type, levels = c("Gain", "Loss"))) %>%
  count(symbol, gpt_era, return_type) %>%
  group_by(symbol, gpt_era) %>%
  mutate(freq = n / sum(n)) %>%
  ungroup()

# Add unique company era label
mosaic_plot_data <- mosaic_data %>%
  mutate(company_era = paste(symbol, gpt_era, sep = "-"))
  company_era = factor(company_era, levels = unique(paste(symbol, gpt_era, sep = "-"))) %>%
  group_by(company_era) %>%
  mutate(start = cumsum(lag(freq, default = 0)), y_end = y_start + freq) %>%
  ungroup() %>%
  mutate(x_num = as.numeric(company_era), xmin = x_num - 0.4, xmax = x_num + 0.4)

# Plot
ggplot(mosaic_plot_data) +
  geom_rect(aes(xmin = xmin, xmax = xmax, ymin = y_start, ymax = y_end, fill = return_type)) +
  scale_x_continuous(breaks = mosaic_plot_data$x_num_labels = mosaic_plot_data$company_era, name = "Company and Era") +
  scale_y_continuous(name = "Proportion of Quarters", labels = scales::percent_format(accuracy = 1), limits = c(0, 1)) +
  scale_fill_manual(values = c("Gain" = "#4CAF50", "Loss" = "#E53935"), name = "Quarter Type") +
  labs(title = "Quarterly Gains vs Losses Before and After the AI Boom",
       subtitle = "Proportion of positive and negative quarters across companies in Pre- and Post-ChatGPT periods",
       caption = "Data Source: tidyquant") +
  theme_minimal(base_size = 16) +
  theme(legend.position = "top", axis.text.x = element_text(angle = 45, hjust = 1))
```



Performance Summary

Nvidia leads with the highest average return and increase in gain frequency post-ChatGPT. TSMC improved across most metrics, while AMD exhibited a slight decline in performance consistency. It is clear that Nvidia’s post-AI boom momentum far exceeded its peers in both volatility and reward.

```
# Summarize performance by stock and era
summary_table <- quarterly_data %>%
  mutate(return_type = ifelse(quarterly_return >= 0, "Gain", "Loss"),
         gpt_era = factor(gpt_era, levels = c("Pre-ChatGPT", "Post-ChatGPT"))) %>%
  group_by(symbol, gpt_era) %>%
  summarise(avg_return = mean(quarterly_return, na.rm = TRUE),
            pct_gain = sum(return_type == "Gain") / n(),
            max_drawdown = min(quarterly_return, na.rm = TRUE),
            volatility = sd(quarterly_return, na.rm = TRUE),
            total_quarters = n(), groups = "drop") %>%
  group_by(symbol) %>%
  mutate(pre_avg = pct_gain[gpt_era == "Pre-ChatGPT"],
         pct_gain_color = if_else(gpt_era == "Pre-ChatGPT", "#F08080", "#4CAF50", if_else(pct_gain > max_pre, "#4CAF50", "#E53935")),
         pre_avg = avg_return[gpt_era == "Pre-ChatGPT"],
         avg_return_arrow = if_else(gpt_era == "Pre-ChatGPT", "",
                                   if_else(avg_return > pre_avg,
                                           "span style='color:#4CAF50;'>▲/span",
                                           "span style='color:#E53935;'>▼/span"))) %>%
  ungroup()

# Generate gt table
summary_table %>%
  gt() %>%
  tab_header(title = md("Performance Summary Before and After the AI Boom"),
            subtitle = md("Pre and Post-ChatGPT Comparison")) %>%
  cols_label(symbol = "Company", gpt_era = "Era", avg_return = "Avg Return",
            pct_gain = "% Gain Quarters", max_drawdown = "Max Drawdown",
            volatility = "Volatility", total_quarters = "Quarters") %>%
  data_color(columns = c(pct_gain, fn = function(s) { summary_table$pct_gain_color }) %>%
  fn = percent(columns = c(avg_return, pct_gain, max_drawdown, volatility), decimals = 1)) %>%
  text_transform(locations = cells_body(columns = avg_return)) %>%
  fn = function(s) { paste0(s, summary_table$avg_return_arrow) }) %>%
  cols_hide((max_pre, pct_gain_color, pre_avg, avg_return_arrow)) %>%
  cols_align("center", columns = c(symbol, gpt_era, pct_gain, max_drawdown, volatility, total_quarters)) %>%
  tab_source_note(md("Data Source: tidyquant"))
```

Performance Summary Before and After the AI Boom						
Pre and Post-ChatGPT Comparison						
Company	Era	Avg Return	% Gain Quarters	Max Drawdown	Volatility	Quarters
AMD	Pre-ChatGPT	14.9%	57.9%	−40.2%	36.5%	19
AMD	Post-ChatGPT	6.2% ▼	54.5%	−26.4%	24.6%	11
NVDA	Pre-ChatGPT	9.2%	68.4%	−52.4%	28.8%	19
NVDA	Post-ChatGPT	26.5% ▲	81.8%	−19.3%	35.2%	11
TSM	Pre-ChatGPT	5.1%	57.9%	−21.2%	18.9%	19
TSM	Post-ChatGPT	9.4% ▲	72.7%	−15.6%	16.4%	11

Data Source: tidyquant

References

This analysis was conducted using several R packages. Data acquisition and transformation were performed with **tidyquant**, **dplyr**, and **tidyverse**. Visualizations were created using **ggplot2**, **viridis**, and **ggforce**. Summary tables were built with **gt**. The poster itself was developed using **posterdown**, **rmarkdown**, and **pagedown**.