Consumer Sentiments VS. Economy Realities

Longitudinal Analysis of Changing Consumer Perceptions in Relation to Employment

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Socio-Economic Background

Exploratory Data Analysis Executive Summary

- **Project Objective**
- **Data Source**
- **Data Reliability**
- **THEME FOUND123**
- **Limitations of the Analysis**

Research Questions

-
-

Data Source and Assumptions

Data Cleaning Process

Notable Findings

Finding 1. Finding Theme

State the finding in a few lines (See Figure 1).

Finding 2. (See Figure 2).

Finding 3. (See Figure 3).

Limitations

Visualizations

Working repo could be fount at:

https://github.com/zzeng05/ZENG1-LIU2-727FINAL-scaVSeply.git

```
# Fetch SCA Data
cs_url <- "https://data.sca.isr.umich.edu/data-archive/mine.php#"


#function to fetch any sca table from data site
get_sca_table <- function(table_num,
                                from_year = 2008,
                                to_year   = 2025,
                                freq      = "monthly") {


  body_list <- list(
    table = as.character(table_num),
    format = "html",
    from   = as.character(from_year),
    to     = as.character(to_year),
    freq   = freq
  )


  res <- POST(cs_url, body = body_list, encode = "form")
  stop_for_status(res)


  page <- read_html(res)
```

```
  page %>%
    html_node("div.output table") %>%
    html_table(fill = TRUE)
}
```

```
#fetch & clean table1: Consumer Sentiment Index
CS <- get_sca_table(1) %>%
  # same logic as your cs_tables[[2]] cleaning
  rename(
    month_chr = X1,
    year_chr  = X2,
    cs_chr    = X3
  ) %>%
  slice(-1) %>%  # drop the header row inside the table
  mutate(
    month = as.integer(month_chr),
    year  = as.integer(year_chr),
    cs    = as.numeric(cs_chr),
    date  = ymd(sprintf("%04d-%02d-01", year, month))
  ) %>%
  arrange(date) %>%
  select(date, cs, year, month)

head(CS)
```

```
# A tibble: 6 x 4
  date          cs  year month
```

```
  <date>     <dbl> <int> <int>
1 2008-01-01  78.4  2008     1
2 2008-02-01  70.8  2008     2
3 2008-03-01  69.5  2008     3
4 2008-04-01  62.6  2008     4
5 2008-05-01  59.8  2008     5
6 2008-06-01  56.4  2008     6
```

```r
#fetch & clean table30: Expected Change in Unemployment During the Next Year
UNEPLY1 <- get_sca_table(30) %>%
  { setNames(., as.character(unlist(.[1, ]))) } %>%
  slice(-1) %>%
  mutate(
    Month = as.integer(Month),
    Year  = as.integer(Year)
  ) %>%
  mutate(
    across(
      -c(Month, Year),
      ~ suppressWarnings(as.numeric(.))
    ),
    date = as.Date(sprintf("%04d-%02d-01", Year, Month))
  ) %>%
  relocate(date)

head(UNEPLY1)
```

```
# A tibble: 6 x 8
  date       Month  Year  Less  Same  More `DK; NA` Relative
  <date>     <int> <int> <dbl> <dbl> <dbl>    <dbl>    <dbl>
1 2008-01-01     1  2008     6    46    47        1       59
2 2008-02-01     2  2008     9    41    50        0       59
3 2008-03-01     3  2008     7    38    55        0       52
4 2008-04-01     4  2008     5    36    59        0       46
5 2008-05-01     5  2008     3    41    56        0       47
6 2008-06-01     6  2008     5    31    64        0       41
```

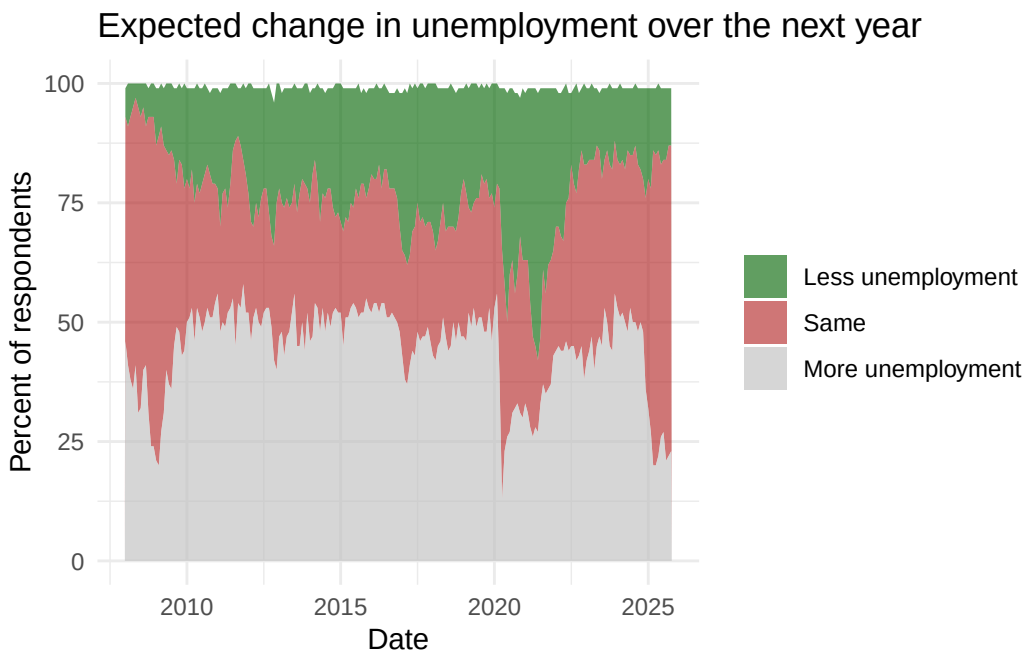
```r
UNEPLY_supp <- UNEPLY1 %>%
  transmute(
    date,
    less_unemp  = Less,
    same_unemp  = Same,
    more_unemp  = More,
    dk_unemp    = `DK; NA`,
    rel_unemp   = Relative,
    net_unemp_expect = less_unemp - more_unemp
  )

head(UNEPLY_supp)
```

```
# A tibble: 6 x 7
  date       less_unemp same_unemp more_unemp dk_unemp rel_unemp
  <date>          <dbl>      <dbl>      <dbl>    <dbl>     <dbl>
1 2008-01-01          6         46         47        1        59
```

```
2 2008-02-01          9         41         50         0         59
3 2008-03-01          7         38         55         0         52
4 2008-04-01          5         36         59         0         46
5 2008-05-01          3         41         56         0         47
6 2008-06-01          5         31         64         0         41
# i 1 more variable: net_unemp_expect <dbl>
```

```r
UNEPLY_long <- UNEPLY_supp %>%
  select(date, less_unemp, same_unemp, more_unemp) %>%
  pivot_longer(
    cols = -date,
    names_to  = "expectation",
    values_to = "share"
  )


ggplot(UNEPLY_long, aes(x = date, y = share, fill = expectation)) +
  geom_area(alpha = 0.618) +
  scale_fill_manual(
    values = c(
      less_unemp = "darkgreen",
      same_unemp = "grey",
      more_unemp = "firebrick"
    ),
    labels = c("Less unemployment", "Same", "More unemployment")
  ) +
  labs(
    title = "Expected change in unemployment over the next year",
```

```
    x     = "Date",
    y     = "Percent of respondents",
    fill  = NULL
  ) +
  theme_minimal()
```




```
# Fetch BLS Data


bls_key <- "554489bce3f14059aaa2dbb976d62372" #need to change back to path before submission


# BLS series IDs:
# - LNS14000000: Unemployment rate (CPS, seasonally adjusted)
# - CES0000000001: All employees, total nonfarm (CES, thousands, SA)
series_ids <- c("LNS14000000", "CES0000000001")
```

```r
# Request monthly data from 2008 to latest
res <- POST(
  url    = "https://api.bls.gov/publicAPI/v2/timeseries/data/",
  body   = list(
  seriesid        = series_ids,
  startyear       = "2008",
  endyear         = "2025",
  registrationkey = bls_key),
  encode = "json"
)

stop_for_status(res)

bls_list <- fromJSON(content(res, as = "text", encoding = "UTF-8"), simplifyDataFrame = TRUE)

# Transform BLS data to long format
series_tbl <- bls_list$Results$series

bls_long <- map_dfr(seq_len(nrow(series_tbl)), function(i) {
  series_id <- series_tbl$seriesID[i]
  dat       <- series_tbl$data[[i]]   #data.frame for the series

  as_tibble(dat) %>%
    transmute(
      series_id = series_id,
      year      = as.integer(year),
```

```
      period,
      value     = as.numeric(value)
    ) %>%
    # keep monthly observations (M01-M12)
    filter(str_starts(period, "M")) %>%
    mutate(
      month = as.integer(str_remove(period, "M")),
      date  = ymd(sprintf("%04d-%02d-01", year, month))
    )
})

head(bls_long)
```

```
# A tibble: 6 x 6
  series_id    year period value month date
  <chr>       <int> <chr>  <dbl> <int> <date>
1 LNS14000000  2025 M09      4.4     9 2025-09-01
2 LNS14000000  2025 M08      4.3     8 2025-08-01
3 LNS14000000  2025 M07      4.2     7 2025-07-01
4 LNS14000000  2025 M06      4.1     6 2025-06-01
5 LNS14000000  2025 M05      4.2     5 2025-05-01
6 LNS14000000  2025 M04      4.2     4 2025-04-01
```

```
# CPS unemployment rate
UNEPLOY_R <- bls_long %>%
  filter(series_id == "LNS14000000") %>%
```

```
  arrange(date) %>%
  transmute(
    date,
    unrate = value
  )


# CES total nonfarm employment & monthly job change
Job_V <- bls_long %>%
  filter(series_id == "CES0000000001") %>%
  arrange(date) %>%
  transmute(
    date,
    nonfarm_emp = value,
    job_change  = nonfarm_emp - lag(nonfarm_emp)
  )


head(UNEPLOY_R)
```

```
# A tibble: 6 x 2
  date       unrate
  <date>      <dbl>
1 2008-01-01    5
2 2008-02-01    4.9
3 2008-03-01    5.1
4 2008-04-01    5
5 2008-05-01    5.4
```

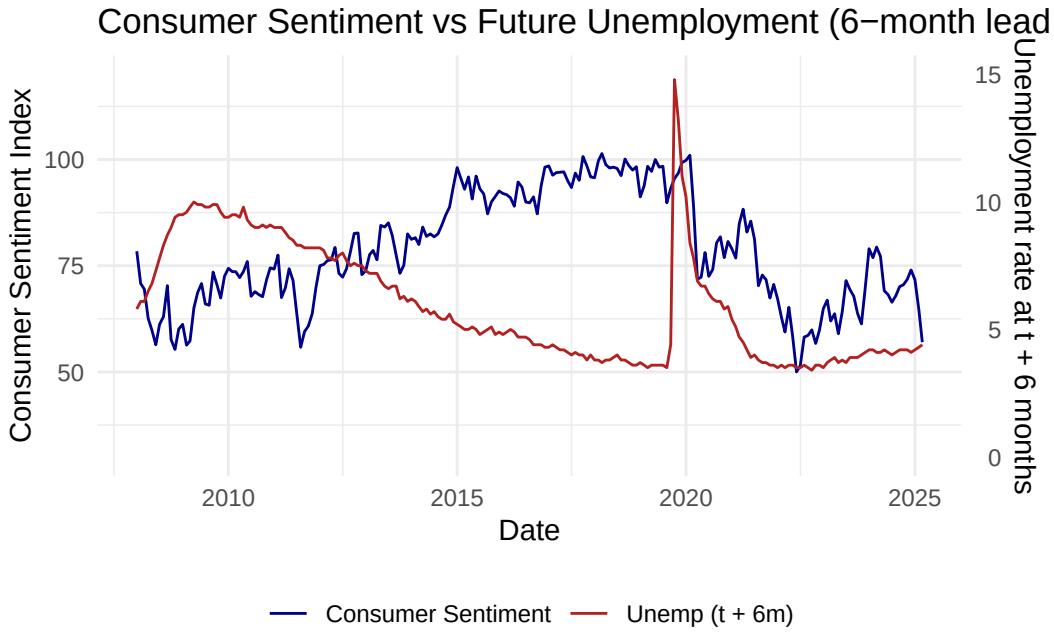
```
6 2008-06-01    5.6
```

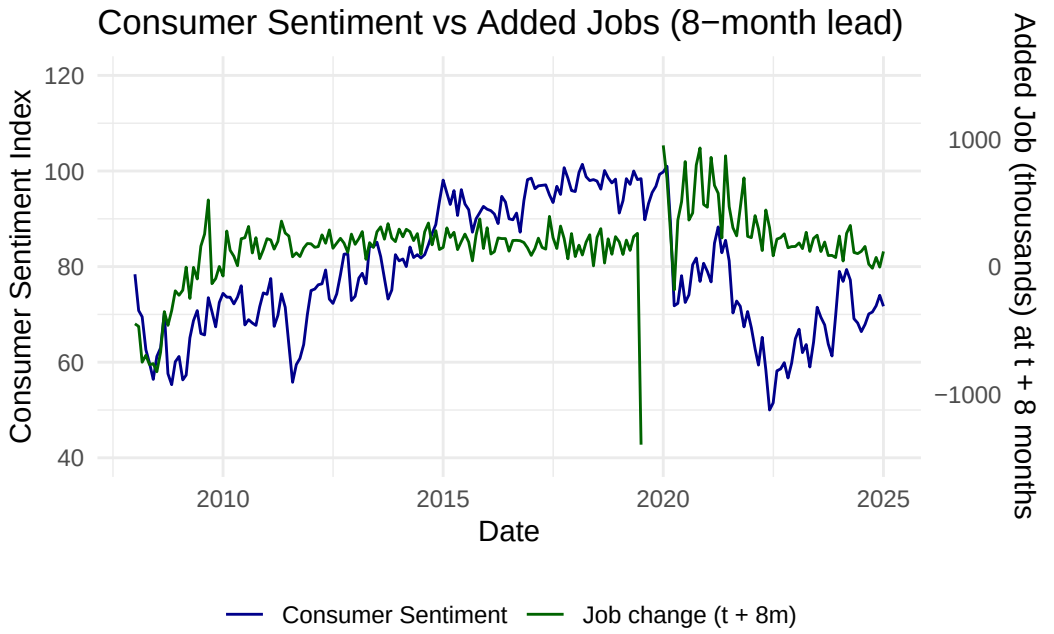
```
head(Job_V)
```

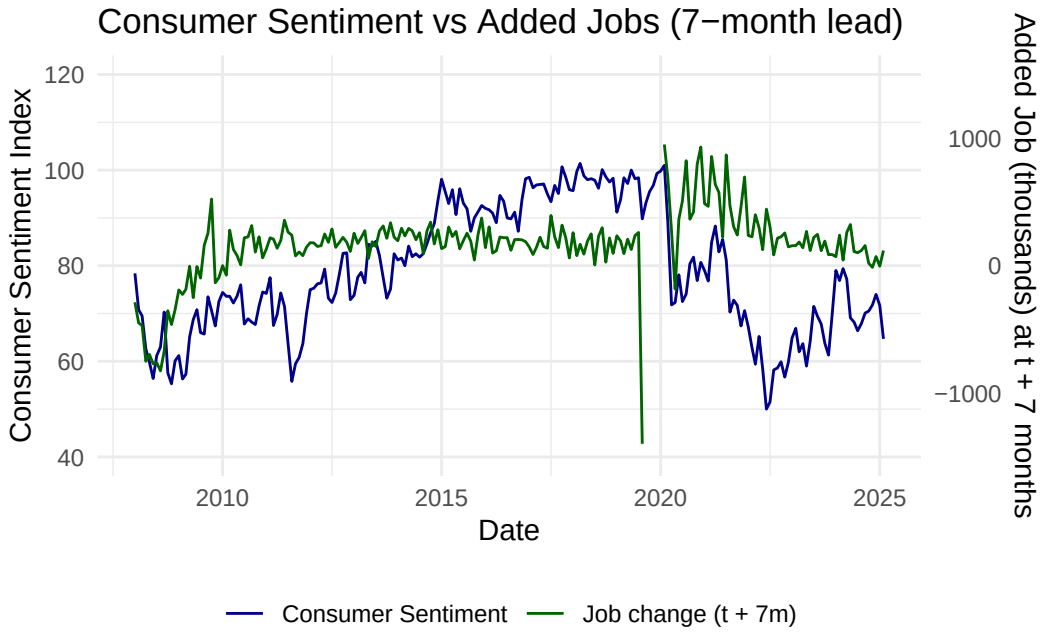
```
# A tibble: 6 x 3
  date       nonfarm_emp job_change
  <date>           <dbl>      <dbl>
1 2008-01-01      138391         NA
2 2008-02-01      138327        -64
3 2008-03-01      138257        -70
4 2008-04-01      138038       -219
5 2008-05-01      137851       -187
6 2008-06-01      137698       -153
```

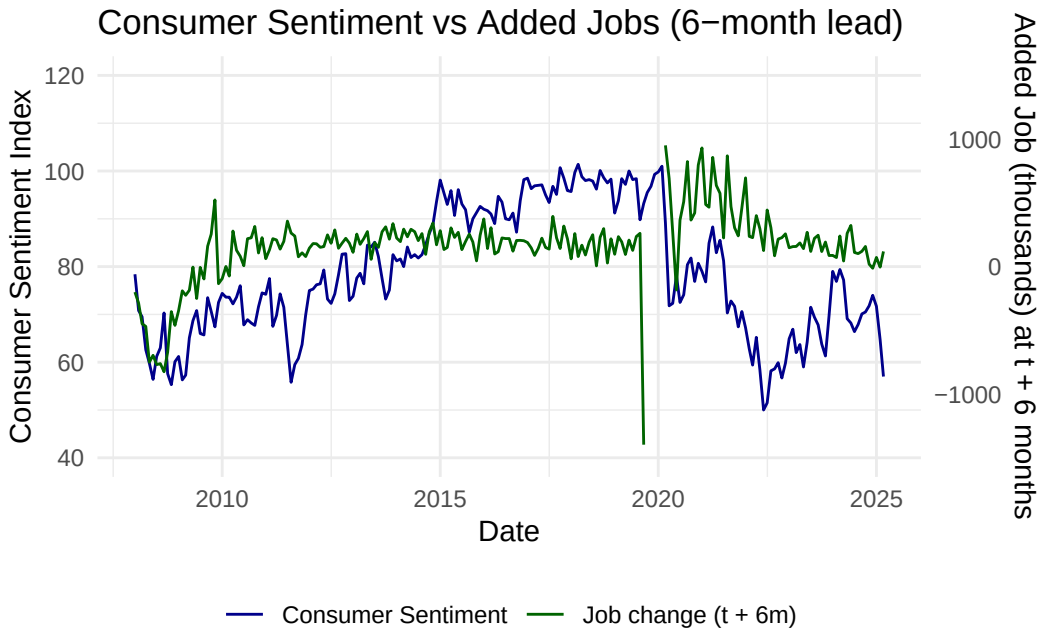
Figure 1. Lagged Time-Series of Consumer Sentiment and Unemployment Rate/Job Change

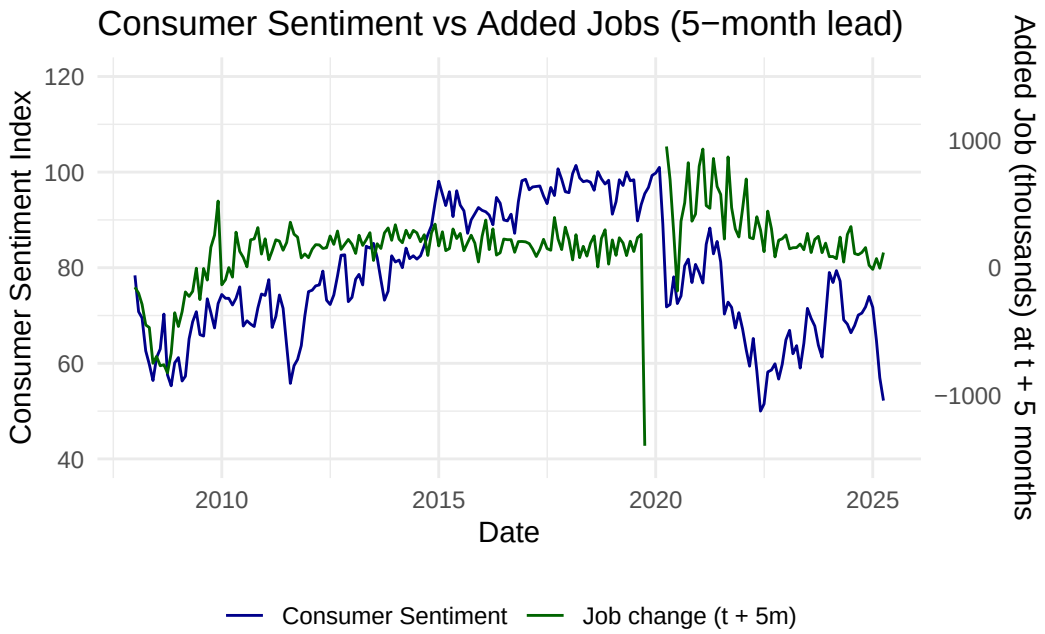
```
# A tibble: 6 x 5
  date          cs unrate nonfarm_emp job_change
  <date>     <dbl>  <dbl>       <dbl>      <dbl>
1 2008-01-01  78.4    5        138391         NA
2 2008-02-01  70.8    4.9      138327        -64
3 2008-03-01  69.5    5.1      138257        -70
4 2008-04-01  62.6    5        138038       -219
5 2008-05-01  59.8    5.4      137851       -187
6 2008-06-01  56.4    5.6      137698       -153
```

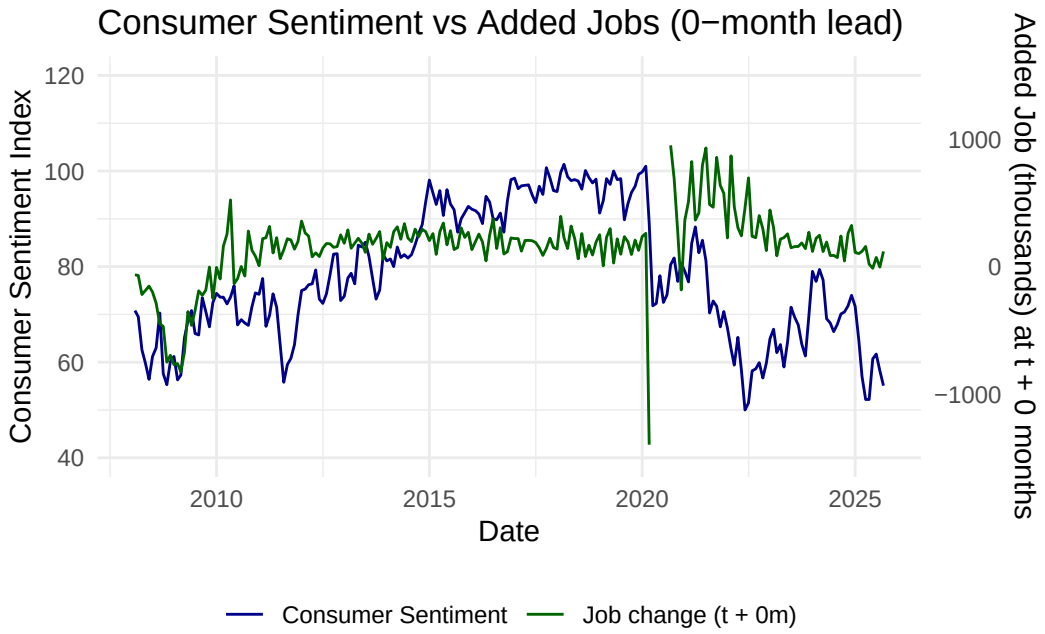

Consumer Sentiment vs Future Unemployment (6−month lead
Consumer Sentiment Index
100
75
50
15
10
5
0
Unemployment rate at t + 6 months
2010
2015
2020
2025
Date
Consumer Sentiment
Unemp (t + 6m)


Consumer Sentiment vs Added Jobs (8−month lead)
Consumer Sentiment Index
120
100
80
60
40
1000
0
−1000
Added Job (thousands) at t + 8 months
2010
2015
2020
2025
Date
Consumer Sentiment
Job change (t + 8m)


Consumer Sentiment vs Added Jobs (7−month lead)
Consumer Sentiment Index
Added Job (thousands) at t + 7 months
120
100
80
60
40
1000
0
−1000
2010
2015
2020
2025
Date
Consumer Sentiment
Job change (t + 7m)


Consumer Sentiment vs Added Jobs (6−month lead)
Consumer Sentiment Index
Added Job (thousands) at t + 6 months
120
100
80
60
40
1000
0
−1000
2010
2015
2020
2025
Date
Consumer Sentiment
Job change (t + 6m)






```
## Main dual-axis plot: CS vs future job creation
## with unemployment extremes overlaid (no separate y-axis)

lag_months  <- 3                    # choose 3, 6, or 12
```

```r
cs_limits   <- c(40, 120)          # left axis (CS)
jobs_limits <- c(-1000, 1000)      # right axis (job change, thousands)
unemp_limits <- c(2, 12)           # used only for scaling unemployment vertically

df <- macro %>%
  arrange(date) %>%
  mutate(
    jobchg_lead = lead(job_change, lag_months),
    unrate_lead = lead(unrate,      lag_months)
  ) %>%
  filter(!is.na(cs), !is.na(jobchg_lead), !is.na(unrate_lead))

# unpack limits
cs_min   <- cs_limits[1];  cs_max <- cs_limits[2]
jb_min   <- jobs_limits[1]; jb_max <- jobs_limits[2]
ur_min   <- unemp_limits[1]; ur_max <- unemp_limits[2]

cs_range <- cs_max - cs_min
jb_range <- jb_max - jb_min
ur_range <- ur_max - ur_min

# scale job change & unemployment into CS vertical space for plotting
df <- df %>%
  mutate(
    jobchg_scaled = cs_min + (jobchg_lead - jb_min) * (cs_range / jb_range),
    unrate_scaled = cs_min + (unrate_lead - ur_min) * (cs_range / ur_range)
```

```
  )

# pick a few extreme unemployment values (e.g., 3 highest & 3 lowest)
top3 <- df %>% slice_max(order_by = unrate_lead, n = 3)
bottom3 <- df %>% slice_min(order_by = unrate_lead, n = 3)

unemp_extremes <- bind_rows(top3, bottom3) %>%
  arrange(date) %>%
  distinct(date, .keep_all = TRUE)

# legend labels
cs_label    <- "Consumer Sentiment"
job_label   <- paste0("Job change (t + ", lag_months, "m)")
unemp_label <- "Unemployment (no axis)"

ggplot(df, aes(x = date)) +
  # main series: Consumer Sentiment (left axis)
  geom_line(aes(y = cs, color = cs_label), linewidth = 0.7) +

  # main series: job creation (right axis, scaled onto CS scale)
  geom_line(aes(y = jobchg_scaled, color = job_label),
            linewidth = 0.7) +

  # overlay unemployment (same lag), no axis - dashed grey line
  geom_line(aes(y = unrate_scaled, color = unemp_label),
            linewidth = 0.4, alpha = 0.5, linetype = "dashed") +
```

```r
# label only extreme high/low unemployment months
geom_point(
  data = unemp_extremes,
  aes(y = unrate_scaled),
  color = "black", size = 1.8
) +
geom_text(
  data = unemp_extremes,
  aes(y = unrate_scaled,
      label = sprintf("%.1f%%", unrate_lead)),
  vjust = -0.4,
  size  = 3,
  color = "black"
) +

# dual y-axes: left = CS, right = job change
scale_y_continuous(
  name   = "Consumer Sentiment Index",
  limits = cs_limits,
  sec.axis = sec_axis(
    trans = ~ (.- cs_min) * (jb_range / cs_range) + jb_min,
    name  = paste0("Monthly change in nonfarm employment (thousands), t + ",
                   lag_months, " months")
  )
) +
```

```
  scale_color_manual(
    values = setNames(
      c("steelblue", "darkgreen", "grey50"),
      c(cs_label, job_label, unemp_label)
    )
  ) +
  labs(
    title = paste0("Consumer Sentiment vs Future Job Creation (", lag_months, "-month lead)"
    subtitle = "Unemployment rate at the same horizon is shown as a dashed line; extremes ar
    x = "Date",
    color = NULL
  ) +
  theme_minimal() +
  theme(
    legend.position = "bottom"
  )
```

Warning: Removed 2 rows containing missing values or values outside the scale range (`geom_point()`).

Warning: Removed 2 rows containing missing values or values outside the scale range (`geom_text()`).

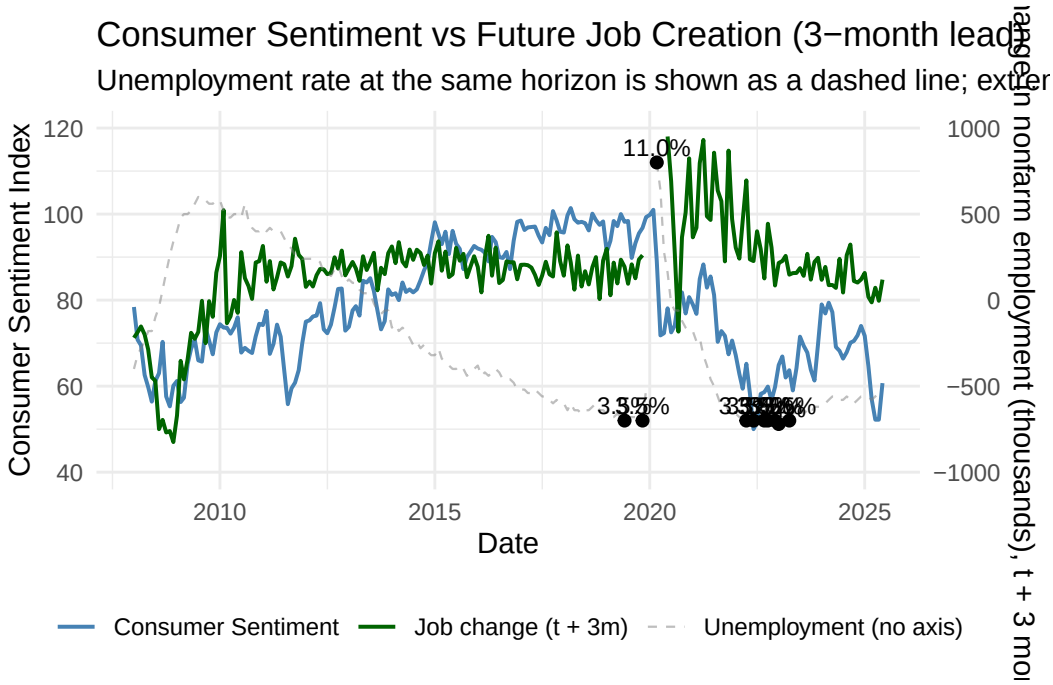

Consumer Sentiment vs Future Job Creation (3−month lead)
Unemployment rate at the same horizon is shown as a dashed line; exter
Consumer Sentiment Index
120
100
80
60
40
1000
500
0
−500
−1000
11.0%
2010
2015
2020
2025
Date
Consumer Sentiment
Job change (t + 3m)
Unemployment (no axis)

Figure 2. Scatter: net expectations vs subsequent unemployment change

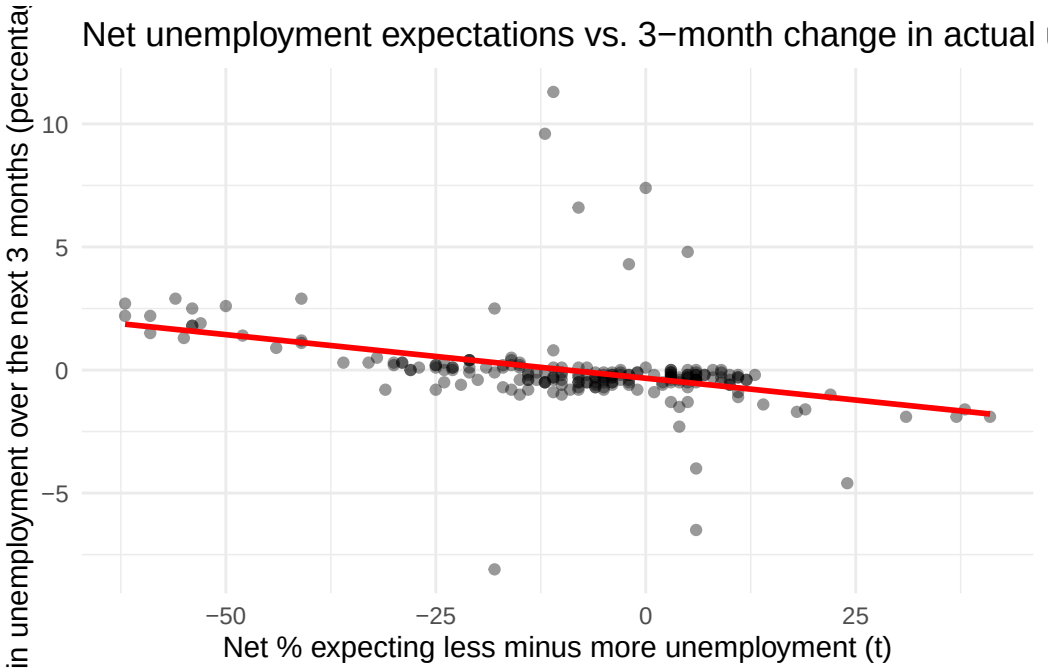
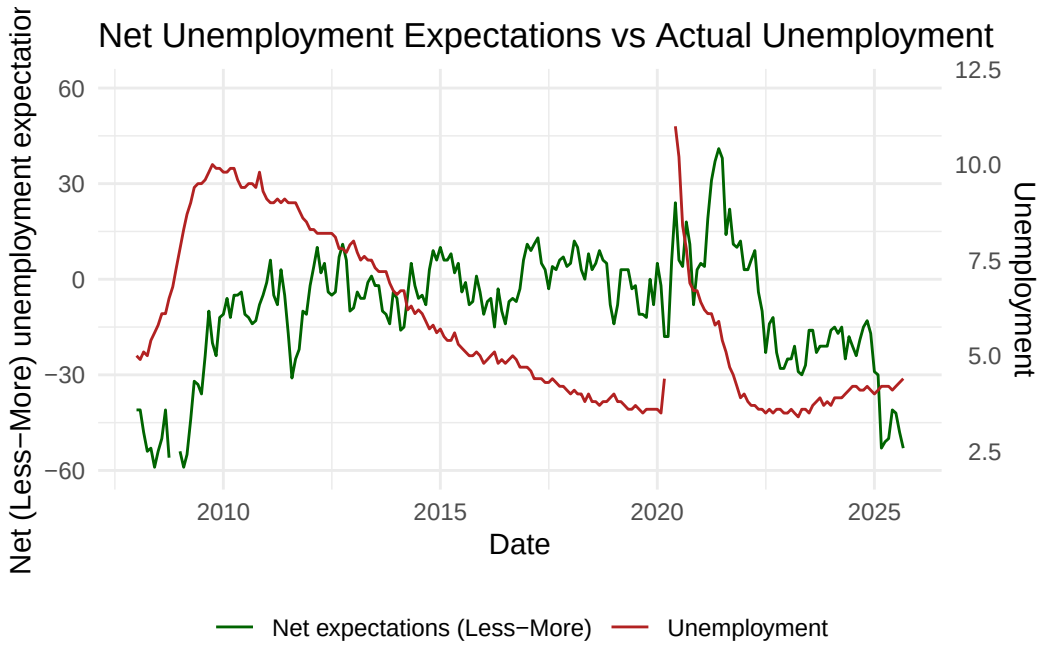


Figure 3. Time series: net expectations vs actual unemployment (dual axis)

```
plot_expect_vs_unemp_dual <- function(data_macro2,
                                      cs_limits   = c(-60, 60),   # for net expectations
                                      unemp_limits= c(2, 12)) {

  df <- data_macro2 %>%
    filter(!is.na(net_unemp_expect), !is.na(unrate)) %>%
    arrange(date)

  ex_min <- cs_limits[1]
```

```r
ex_max <- cs_limits[2]
ur_min <- unemp_limits[1]
ur_max <- unemp_limits[2]

ex_rng <- ex_max - ex_min
ur_rng <- ur_max - ur_min

df <- df %>%
  mutate(
    unrate_scaled = ex_min + (unrate - ur_min) * (ex_rng / ur_rng)
  )

ggplot(df, aes(x = date)) +
  geom_line(aes(y = net_unemp_expect, color = "Net expectations (Less-More)")) +
  geom_line(aes(y = unrate_scaled,    color = "Unemployment")) +
  scale_y_continuous(
    name   = "Net (Less-More) unemployment expectations",
    limits = cs_limits,
    sec.axis = sec_axis(
      trans = ~ (.- ex_min) * (ur_rng / ex_rng) + ur_min,
      name  = "Unemployment"
    )
  ) +
  scale_color_manual(
    values = setNames(
      c("darkgreen", "firebrick"),
```

```
        c("Net expectations (Less-More)", "Unemployment")
      )
    ) +
    labs(
      title = "Net Unemployment Expectations vs Actual Unemployment",
      x     = "Date",
      color = NULL
    ) +
    theme_minimal() +
    theme(legend.position = "bottom")
}

plot_expect_vs_unemp_dual(macro2)
```



Indications

Strengthening Tenant Protections.

Conclusion & Outlook

References

https://data.sca.isr.umich.edu/data-archive/mine.php

https://www.bls.gov/cps

https://www.bls.gov/ces