

# Sensitive Test

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```
library(data.table)
```

```
## Warning: package 'data.table' was built under R version 4.3.3
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.3.3
```

```
# % Return at Different Pressure Settings
```

```
return_dt <- data.table(  
  abuse_ratio = c(0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9),  
  lambda_0.1 = c(4.76473, 5.04958, 4.71596, 2.84991, 2.18284, 1.6512, 1.06770, 0.87888, -0.44871, -3.11505),  
  lambda_0.2 = c(6.06275, 3.56516, 3.39372, -5.16797, -0.08512, -1.56226, -3.31014, -3.11505, -7.32227, -14.23333),  
  lambda_0.3 = c(5.24833, 2.26873, -0.91624, -1.39935, -2.96998, -5.21708, -7.03568, -9.12327, -14.23333, -20.88889),  
  lambda_0.4 = c(3.98635, 0.80165, -0.39472, -2.91047, -5.94576, -9.86191, -12.1923, -17.9295, -20.88889, -27.36364),  
  lambda_0.5 = c(3.87400, 0.63042, -2.10115, -4.50369, -8.90094, -12.1673, -16.0381, -18.7089, -27.36364, -34.33333),  
  lambda_0.6 = c(3.09900, 0.32567, -4.01964, -8.44136, -11.9264, -16.6746, -21.7277, -24.4353, -34.33333, -40.72727),  
  lambda_0.7 = c(3.60528, 0.53412, -6.47903, -9.31158, -14.5637, -19.7869, -22.9624, -28.1903, -40.72727, -46.51515),  
  lambda_0.8 = c(3.26188, -0.52581, -7.55500, -12.7652, -16.0634, -22.5785, -26.8280, -32.6669, -46.51515, -52.60317),  
  lambda_0.9 = c(4.09142, 0.82856, -8.57397, -13.7512, -19.8439, -25.1562, -30.4616, -37.9605, -52.60317, -58.69565)  
)
```

```
# % Standard Deviation at Different Pressure Settings
```

```
sd_dt <- data.table(  
  abuse_ratio = c(0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9),  
  lambda_0.1 = c(43.7538, 41.5666, 42.0065, 42.8553, 42.7181, 43.8668, 43.3496, 44.2436, 45.6755, 50.0000),  
  lambda_0.2 = c(41.9749, 42.7653, 41.3599, 198.625, 42.8371, 43.3251, 44.8455, 43.7528, 47.9238, 53.0000),  
  lambda_0.3 = c(42.9851, 42.3916, 50.0412, 45.7494, 42.4351, 44.0311, 44.2513, 44.6331, 51.1880, 56.0000),  
  lambda_0.4 = c(42.8058, 41.5718, 40.8170, 42.2755, 42.0963, 54.3918, 58.2550, 118.6425, 51.5654, 61.0000),  
  lambda_0.5 = c(42.9635, 42.1541, 40.7934, 40.0070, 41.7231, 40.4179, 43.2834, 42.5524, 50.6880, 188.0000),  
  lambda_0.6 = c(43.8749, 40.3778, 41.5486, 42.4104, 42.7635, 41.4917, 53.6246, 42.8549, 50.2566, 56.0000),  
  lambda_0.7 = c(42.3506, 39.8282, 40.8640, 41.1597, 40.7469, 40.8893, 39.8253, 39.5828, 49.8207, 54.0000),  
  lambda_0.8 = c(43.4310, 39.6847, 41.1322, 40.9887, 37.4769, 39.5600, 39.7511, 39.6098, 46.4905, 50.0000),  
  lambda_0.9 = c(44.2391, 40.3015, 40.0298, 40.2006, 39.0265, 37.0917, 37.8211, 37.5083, 43.3250, 45.0000)  
)
```

```
return_long <- melt(return_dt,  
  id.vars = "abuse_ratio",  
  variable.name = "lambda", value.name = "return"  
)  
sd_long <- melt(sd_dt,
```

```

    id.vars = "abuse_ratio",
    variable.name = "lambda", value.name = "sd"
  )

  # Merge two datasets
  plot_data <- merge(return_long, sd_long, by = c("abuse_ratio", "lambda"))

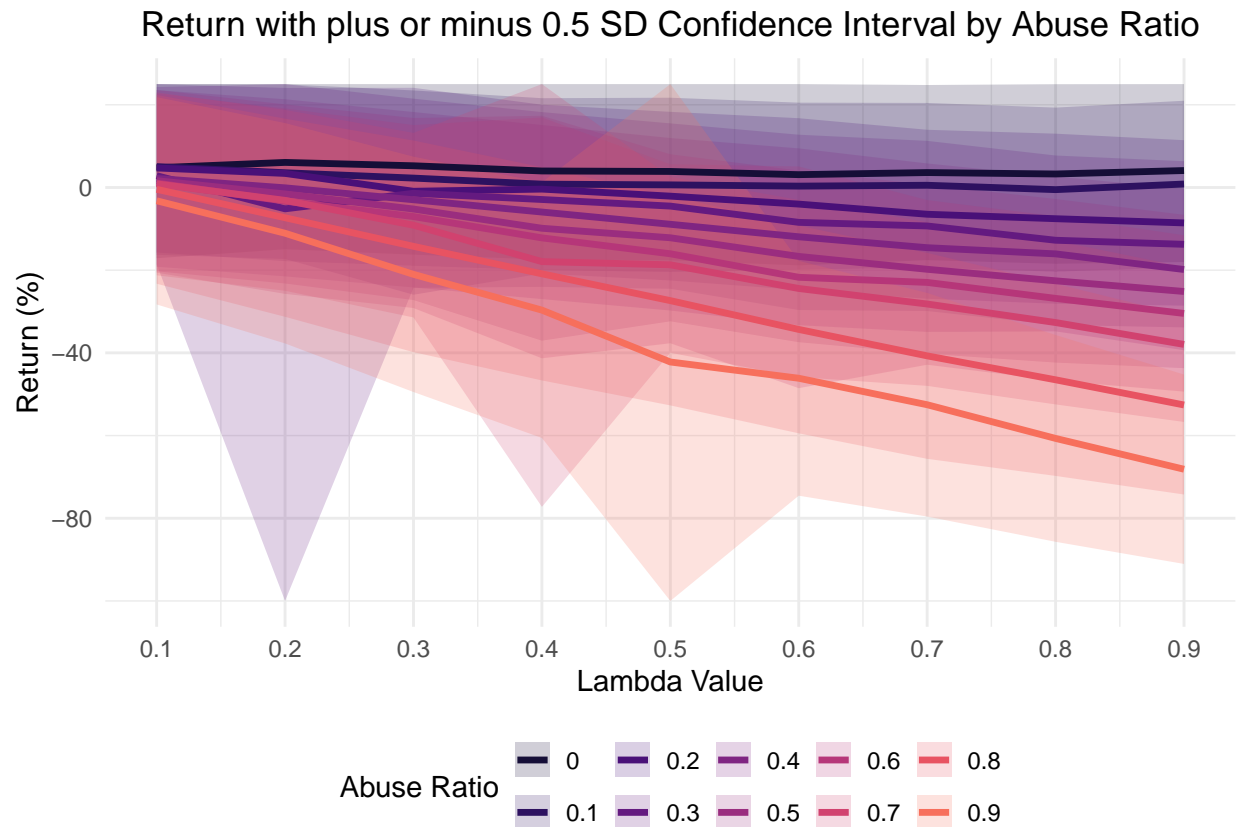
  # Add boundary constraints
  y_min <- -100
  y_max <- 25
  plot_data[, `:=`(
    adjusted_ymin = pmax(return - 0.5 * sd, y_min),
    adjusted_ymax = pmin(return + 0.5 * sd, y_max)
  )]

  # Plotting with C.I.
  ggplot(plot_data, aes(x = as.numeric(gsub("lambda_", "", lambda)), y = return, group = factor(abuse_ratio))) +
    geom_ribbon(aes(ymin = adjusted_ymin, ymax = adjusted_ymax, fill = factor(abuse_ratio)),
      alpha = 0.2
    ) +
    geom_line(aes(color = factor(abuse_ratio)), linewidth = 1.2) +
    labs(
      title = "Return with plus or minus 0.5 SD Confidence Interval by Abuse Ratio",
      x = "Lambda Value",
      y = "Return (%)",
      color = "Abuse Ratio",
      fill = "Abuse Ratio"
    ) +
    theme_minimal() +
    scale_x_continuous(breaks = seq(0.1, 0.9, by = 0.1)) +
    scale_color_viridis_d(option = "plasma") +
    scale_fill_viridis_d(option = "plasma") +
    guides(
      color = guide_legend(nrow = 2, title.position = "top"),
      fill = guide_legend(nrow = 2, title.position = "top")
    ) +
    theme(
      legend.position = "bottom",
      plot.title = element_text(hjust = 0.5),
      legend.key.size = unit(0.5, "cm")
    ) +
    scale_x_continuous(breaks = seq(0, 0.9, by = 0.1)) +
    scale_y_continuous(limits = c(y_min, y_max)) +
    coord_cartesian(ylim = c(y_min, y_max)) + # Double protection for y-axis range
    scale_color_viridis_d(option = "magma", begin = 0.1, end = 0.7) +
    scale_fill_viridis_d(option = "magma", begin = 0.1, end = 0.7) +
    guides(
      color = guide_legend(nrow = 2),
      fill = guide_legend(nrow = 2)
    ) +
    guides(
      color = guide_legend(nrow = 2, ncol = 5),
      fill = guide_legend(nrow = 2, ncol = 5)
    )

```

)

```
## Scale for x is already present.  
## Adding another scale for x, which will replace the existing scale.  
## Scale for colour is already present.  
## Adding another scale for colour, which will replace the existing scale.  
## Scale for fill is already present.  
## Adding another scale for fill, which will replace the existing scale.
```



```
# plot without C.I.  
ggplot(plot_data, aes(x = as.numeric(gsub("lambda_", "", lambda)), y = return, group = factor(abuse_ratio))) +  
  geom_line(aes(color = factor(abuse_ratio)), linewidth = 1.2) +  
  labs(  
    title = "Return without Confidence Interval by Abuse Ratio",  
    x = "Lambda Value",  
    y = "Return (%)",  
    color = "Abuse Ratio"  
  ) +  
  theme_minimal() +  
  scale_x_continuous(breaks = seq(0.1, 0.9, by = 0.1)) +  
  scale_color_viridis_d(option = "plasma") +  
  guides(  
    color = guide_legend(nrow = 2, title.position = "top")  
  ) +  
  theme()
```

```

legend.position = "bottom",
plot.title = element_text(hjust = 0.5),
legend.key.size = unit(0.5, "cm")
) +
guides(color = guide_legend(nrow = 2, ncol = 5))

```

