Assignment #4: Sensitivity Analysis

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Latin Hypercube Sensitivity Analysis

```
# read in function & data
source('compute_almond_yield.R')
clim =read.table("clim.txt")

# Test run function
test_func <- compute_almond_yield(clim = clim)

# precipitation parameter factors
factors = c("Pcoeff1", "Pcoeff2")

# Decide How many parameter sets to run
nsets=100

# Assumptions: precipitation has uniform distribution
q = c("qunif", "qunif")
q.arg = list(list(min=-0.084,max=-0.056), list(min=0.00344, max=0.00516))

# generate samples from LHS
sens_almond = LHS(NULL,factors,nsets,q,q.arg)
sens_pars = get.data(sens_almond)
head(sens_pars)
```

```
##    Pcoeff1   Pcoeff2
## 1 -0.07322 0.0035862
## 2 -0.07686 0.0044806
## 3 -0.06146 0.0051170
## 4 -0.06370 0.0043774
## 5 -0.08218 0.0039474
## 6 -0.07742 0.0037926
```

```
# Run the model for all of the parameters generated by LHS
res = sens_pars %>%
  pmap(compute_almond_yield,clim=clim)
head(res)
```

```
## [[1]]
## [[1]]$sdyield
```

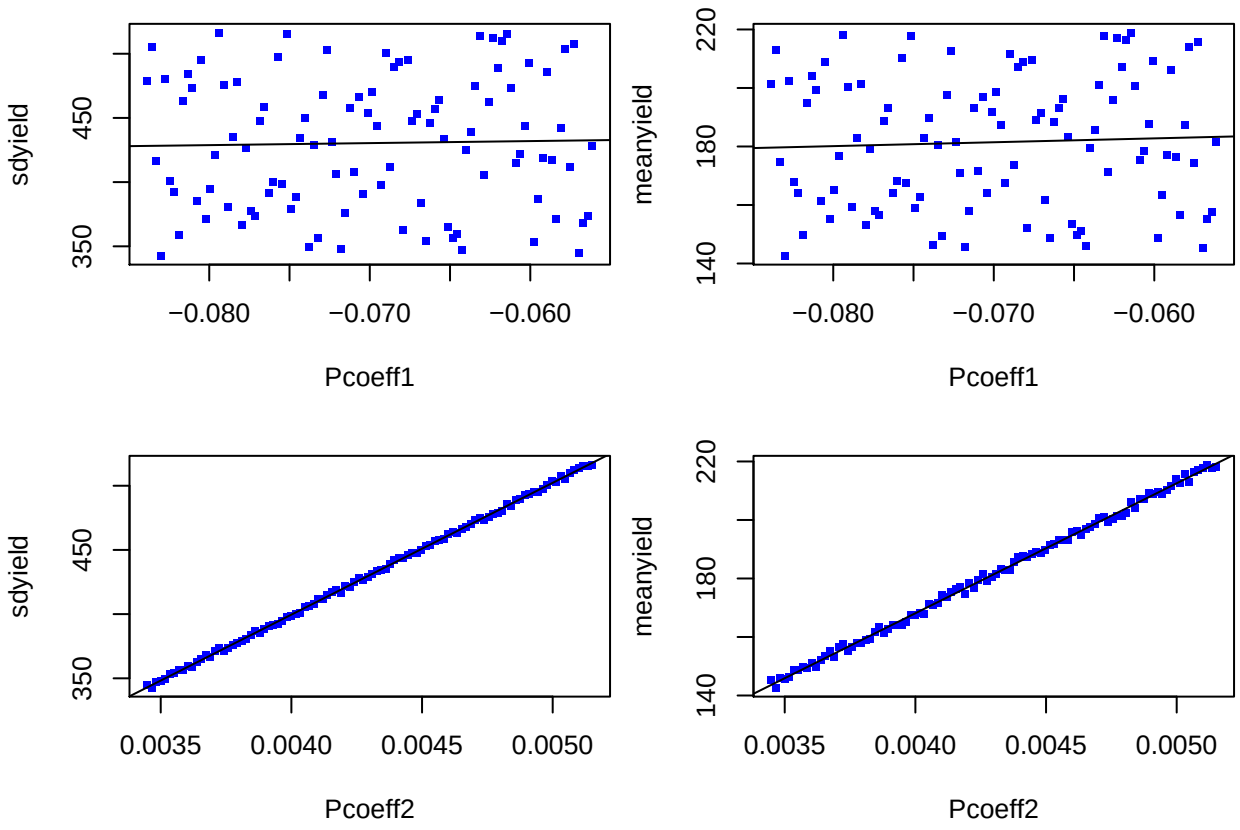
```
## [1] 356.5943
##
## [[1]]$meanyield
## [1] 149.3084
##
##
## [[2]]
## [[2]]$sdyield
## [1] 447.8473
##
## [[2]]$meanyield
## [1] 188.5611
##
##
## [[3]]
## [[3]]$sdyield
## [1] 515.6137
##
## [[3]]$meanyield
## [1] 218.8704
##
##
## [[4]]
## [[4]]$sdyield
## [1] 439.3252
##
## [[4]]$meanyield
## [1] 185.7171
##
##
## [[5]]
## [[5]]$sdyield
## [1] 392.2672
##
## [[5]]$meanyield
## [1] 164.1698
##
##
## [[6]]
## [[6]]$sdyield
## [1] 377.1236
##
## [[6]]$meanyield
## [1] 157.9223
```

```
# turn results in to a dataframe for easy display/analysis
resd = res %>%
  map_dfr(`[`,c("sdyield","meanyield"))
```

Scatter plot

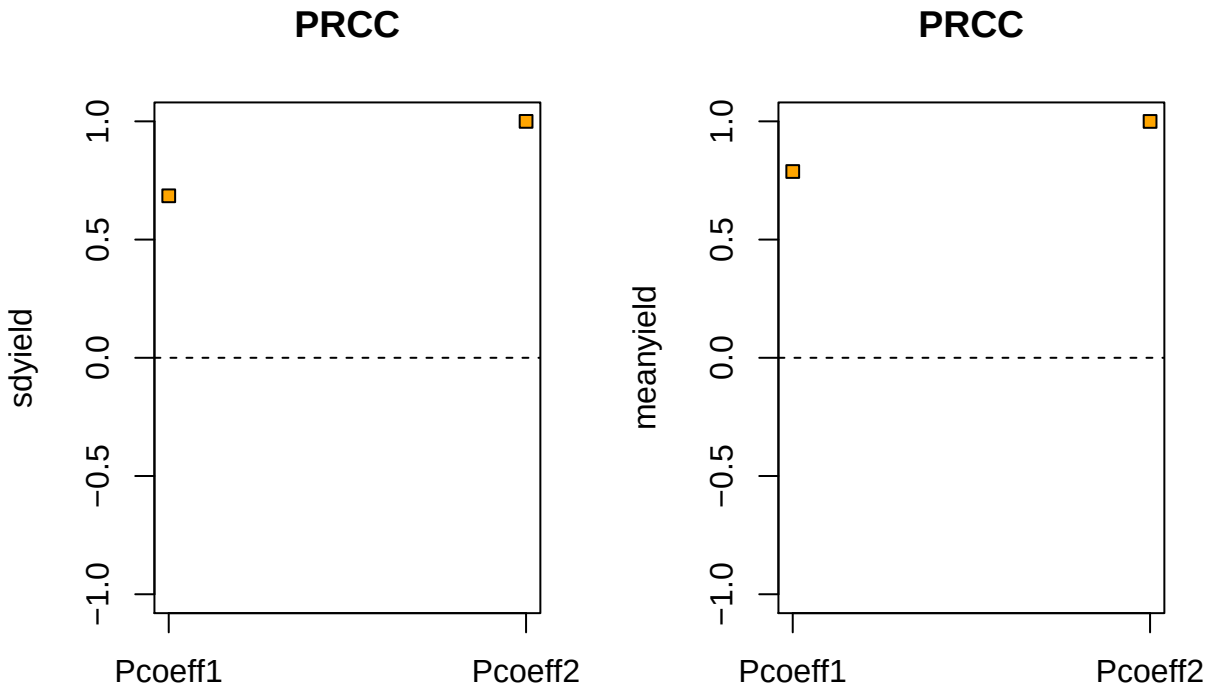
```
sens_almond = pse::tell(sens_almond,
                        t(as.matrix(resd)),
                        res.names=c("sdyield","meanyield"))

# Analyze parameter sensitivity
pse::plotscatter(sens_almond, col="blue", cex=5)
```



PRCC plot

```
# prcc plot
pse::plotprcc(sens_almond)
```




```
sens_almond$prcc
```

```
## [[1]]
##
## Call:
## pcc.default(X = L, y = r, rank = T, nboot = nboot)
##
## Partial Rank Correlation Coefficients (PRCC):
##          original
## Pcoeff1 0.6850534
## Pcoeff2 0.9998917
##
## [[2]]
##
## Call:
## pcc.default(X = L, y = r, rank = T, nboot = nboot)
##
## Partial Rank Correlation Coefficients (PRCC):
##          original
## Pcoeff1 0.7878571
## Pcoeff2 0.9996173
```

Based on the scatter and PRCC plots, **Pcoeff2** contributes more to paramter uncertainty.