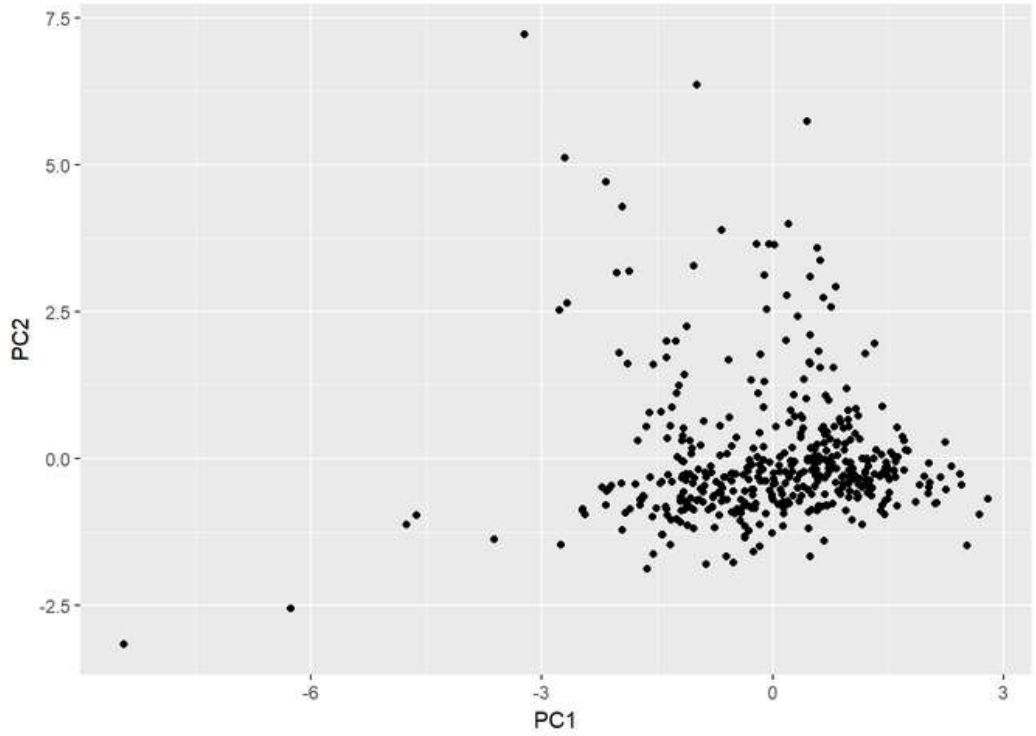
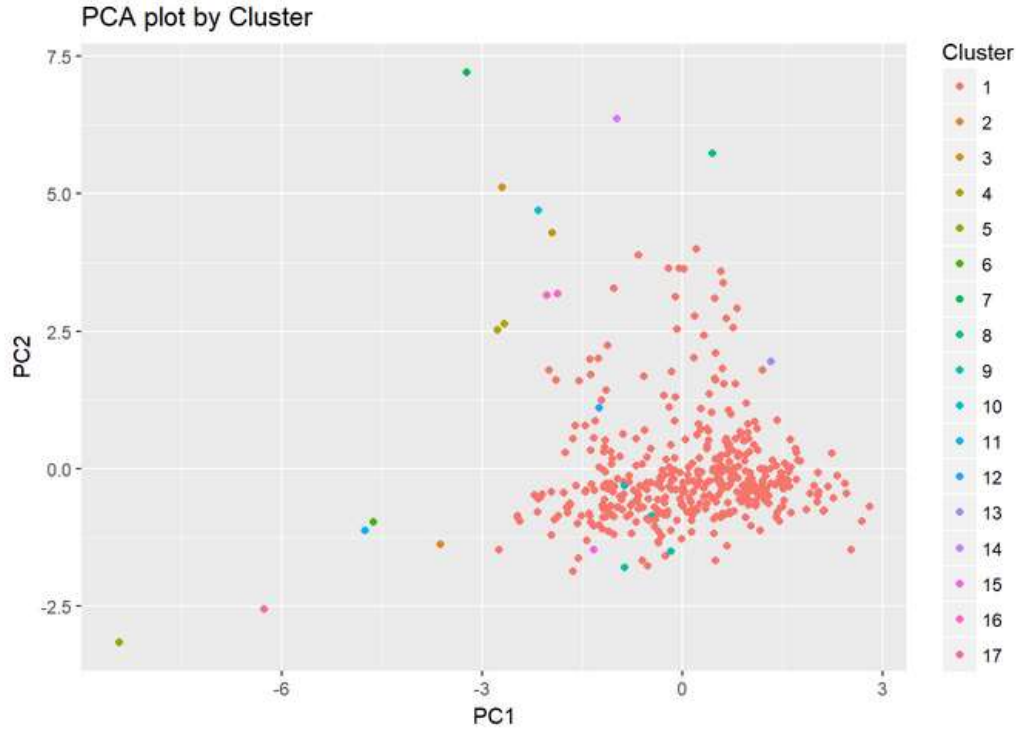
Mean-Shift Plot
 # Plot method 1a

```
ggplot(cc.data.pca$x, aes(x= PC1, y= PC2))+geom_point()
```



 # plot method 1b

```
ggplot(data = cc.data.pca$x, aes(x= PC1, y= PC2, col=
as.factor(CC.Clusters$labels)))+
  geom_point()+
  labs(title="PCA plot by Cluster")+
  scale_color_discrete(name="Cluster")
```



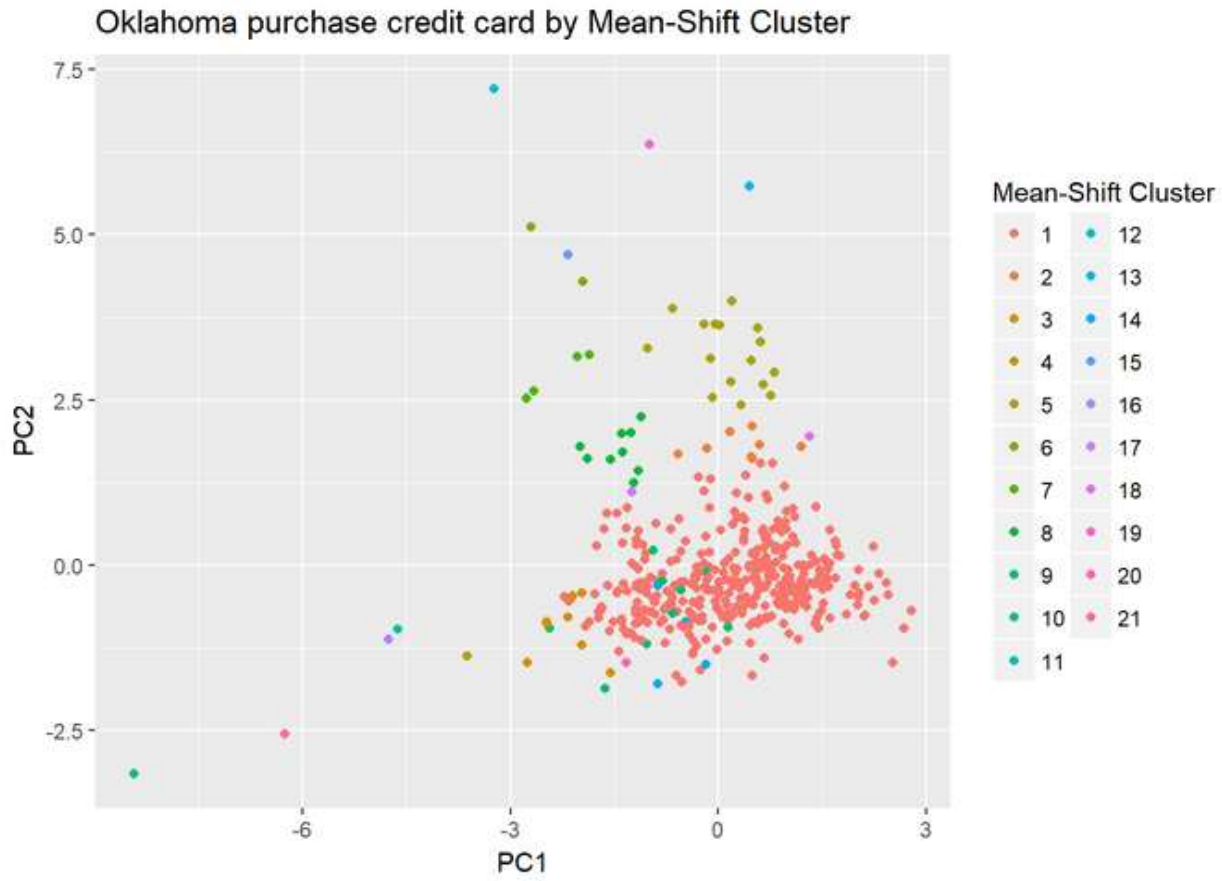
Mean Shift 2: The blurring version of the MeanShift

```
# MeanShift clustering (Option 2): The blurring version of the MeanShift
```

```
bv.cc.data.cluster <- bmsClustering(cc.data,h=1.0)
print(bv.cc.data.cluster)
```

Mean-Shift 2 plot methods (The blurring version of the MeanShift)

```
ggplot(data = cc.data.pca$x, aes(x= PC1, y= PC2, col=
  as.factor(bv.cc.data.cluster$labels)))+
  geom_point()+
  labs(title="Oklahoma purchase credit card by Mean-Shift Cluster")+
  scale_color_discrete(name="Mean-Shift Cluster")
```



DBSCAN

```
library(FNN)
library(ggplot2)
set.seed(123)
```

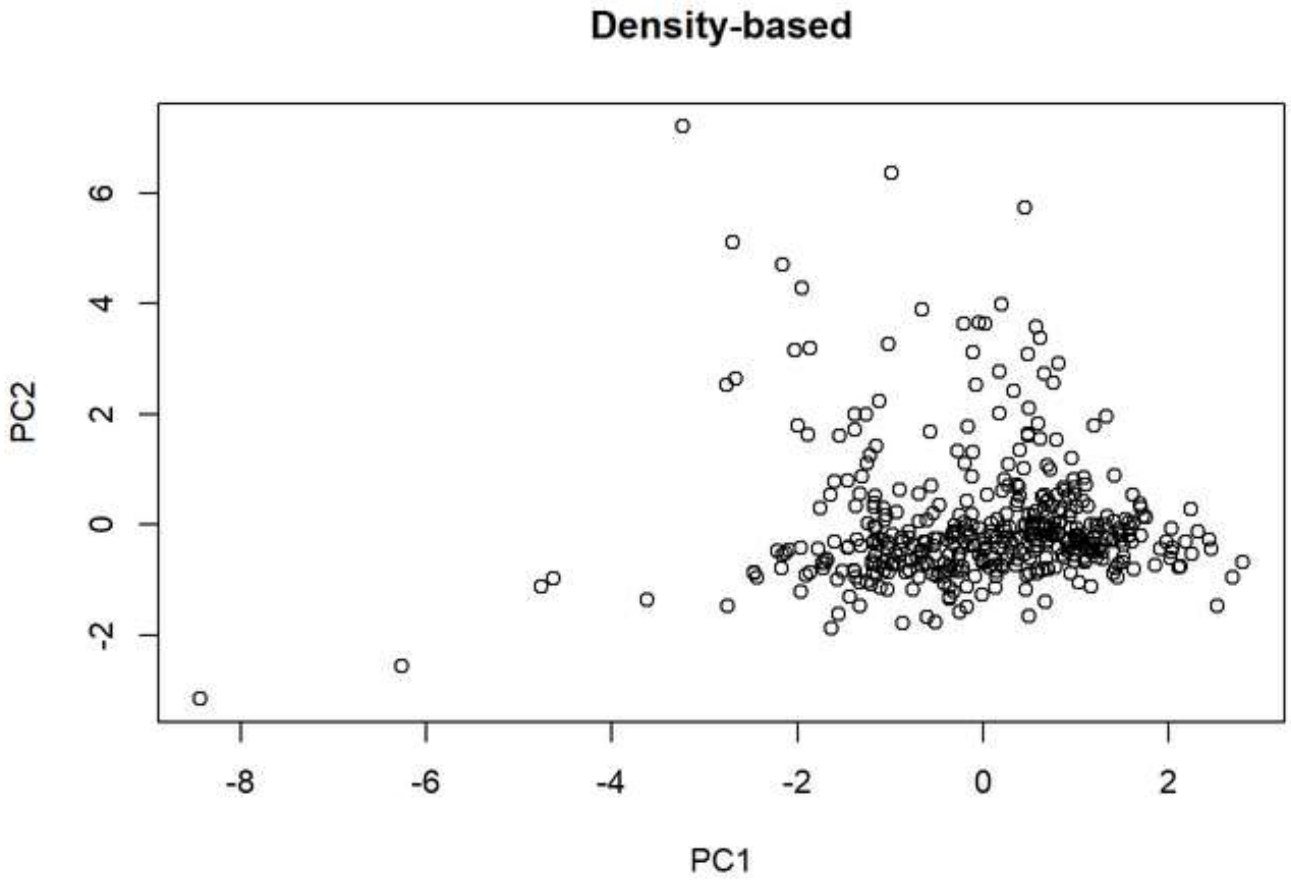
 # mean and sd

```
cc.data.sd<-scale(cc.data.pca$x[,1:4])
cc.data <-t(cc.data.sd)
dim(cc.data)
```

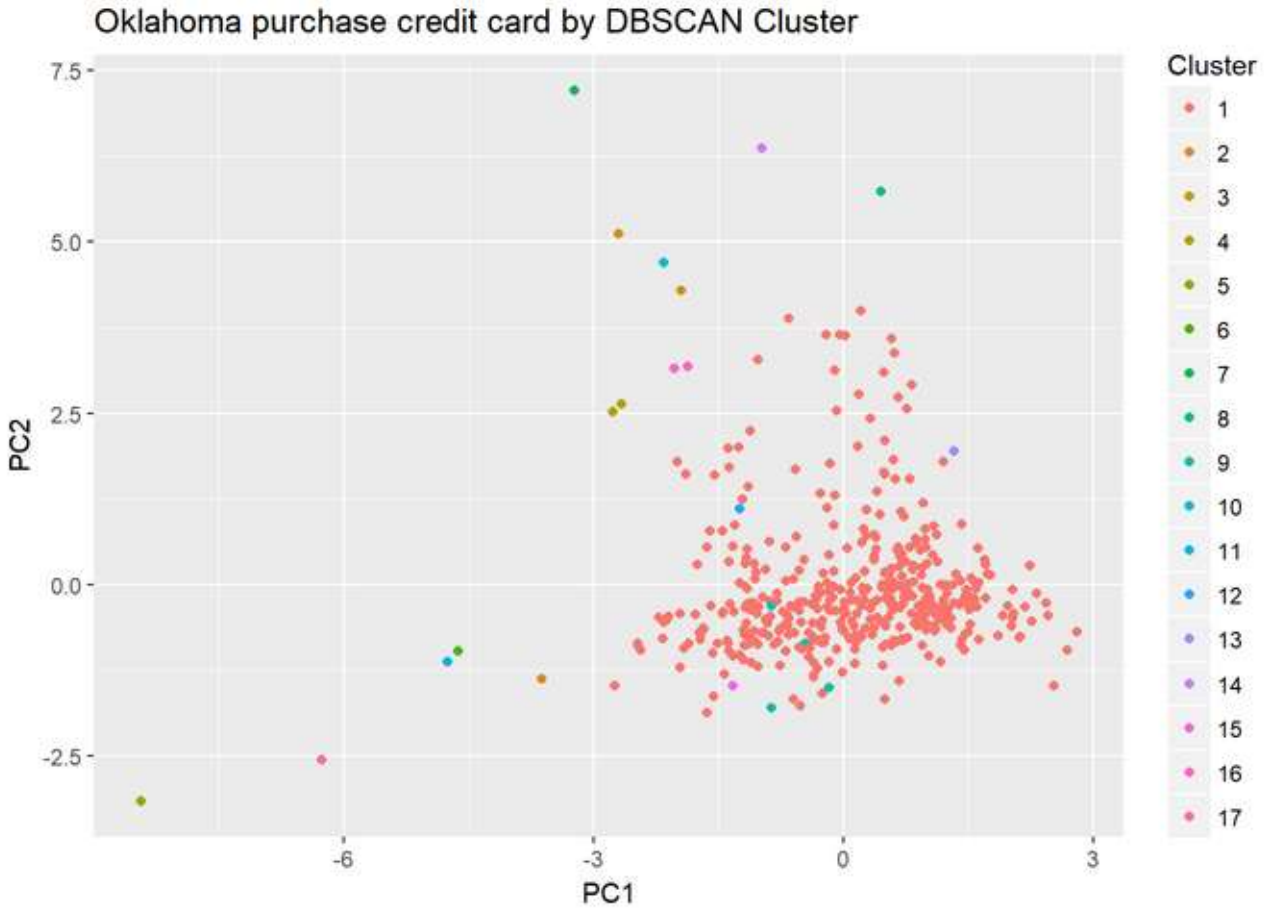
DBSCAN Plot

 # plot method 1a

```
model <- dbscan(cc.data.pca$x, eps=0.15, MinPts=5)
plot(cc.data.pca$x, col=as.factor(model$cluster), main="Density-based")
```



```
# plot method 1b
ggplot(data = cc.data.pca$x, aes(x= PC1, y= PC2, col=
as.factor(CC.Clusters$labels)))+
  geom_point()+
  labs(title="Oklahoma purchase credit card by DBSCAN Cluster")+
  scale_color_discrete(name="Cluster")
```

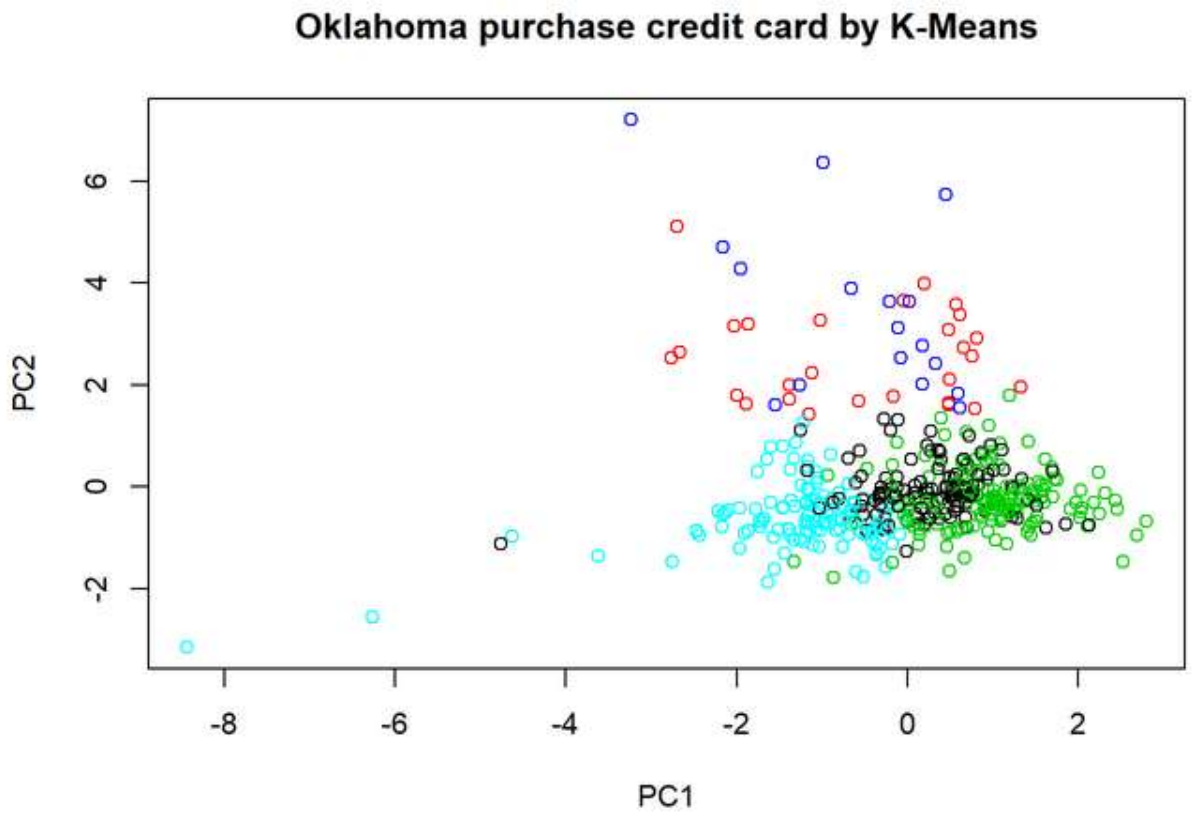


K-Means clustering

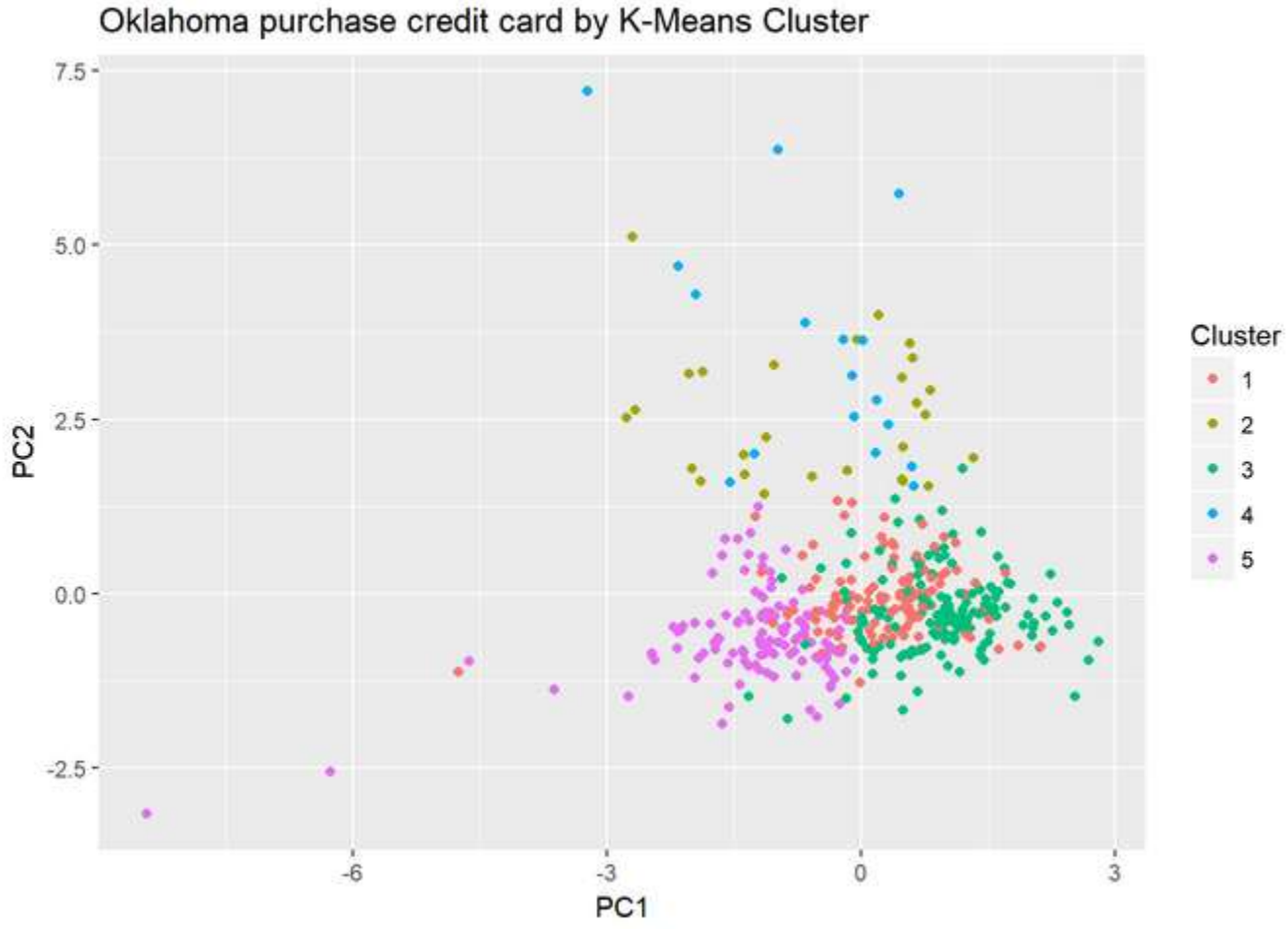
```
library(ggplot2)

k.means.model5 <- kmeans(cc.data.pca$x, 5)
print(k.means.model5)

k.means.model8 <- kmeans(cc.data.pca$x, 8)
print(k.means.model8)

k.means.model12 <- kmeans(cc.data.pca$x, 12)
print(k.means.model12)
```

K-Means plot method

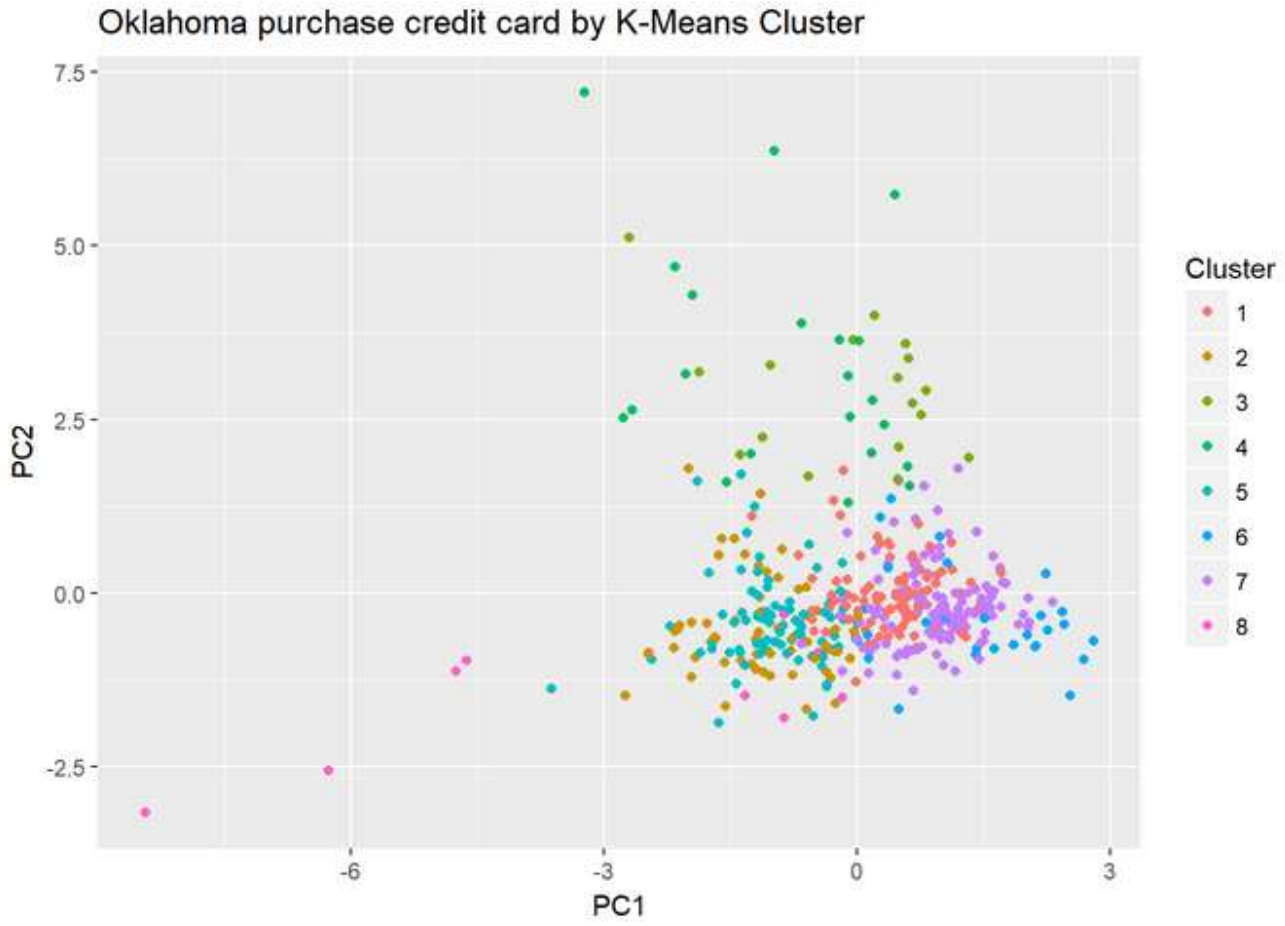
```
# plot method 1a: 5 clusters
plot(cc.data.pca$x, col=k.means.model5$cluster, main="Oklahoma purchase
credit card by K-Means")
```



```
# plot method 1b:5 clusters
ggplot(cc.data.pca$x, aes(x=PC1, y=PC2,
color=as.factor(k.means.model5$cluster))) +
    geom_point()+
  scale_color_discrete(name="Cluster")+
  labs(title="Oklahoma purchase credit card by K-Means Cluster")
```



```
#plot method 1c: 8 clusters
ggplot(cc.data.pca$x, aes(x=PC1, y=PC2,
color=as.factor(k.means.model8$cluster))) +
    geom_point()+
  scale_color_discrete(name="Cluster")+
  labs(title="Oklahoma purchase credit card by K-Means Cluster")
```



```
#plot method  1d: 12 clusters
ggplot(cc.data.pca$x, aes(x=PC1, y=PC2,
color=as.factor(k.means.model12$cluster))) +
    geom_point()+
  scale_color_discrete(name="Cluster")+
  labs(title="Oklahoma purchase credit card by K-Means Cluster")
```