```
> data<- read.csv("CleanCreditScoring.csv")
> dim(data)
[1] 4446   27
> summary(data)
    Status            Seniority          Home                Time
 Length:4446        Min.   : 0.000   Length:4446        Min.   : 6.00
 Class :character   1st Qu.: 2.000   Class :character   1st Qu.:36.00
 Mode  :character   Median : 5.000   Mode  :character   Median :48.00
                    Mean   : 7.991                      Mean   :46.45
                    3rd Qu.:12.000                      3rd Qu.:60.00
                    Max.   :48.000                      Max.   :72.00
      Age           Marital            Records             Job
 Min.   :18.00   Length:4446        Length:4446        Length:4446
 1st Qu.:28.00   Class :character   Class :character   Class :character
 Median :36.00   Mode  :character   Mode  :character   Mode  :character
 Mean   :37.08
 3rd Qu.:45.00
 Max.   :68.00
    Expenses         Income          Assets            Debt              Amount
 Min.   : 35.0   Min.   :  1.0   Min.   :     0   Min.   :    0.0   Min.   : 100
 1st Qu.: 35.0   1st Qu.: 90.0   1st Qu.:     0   1st Qu.:    0.0   1st Qu.: 700
 Median : 51.0   Median :124.0   Median :  3000   Median :    0.0   Median :1000
 Mean   : 55.6   Mean   :140.6   Mean   :  5355   Mean   :  342.3   Mean   :1039
 3rd Qu.: 72.0   3rd Qu.:170.0   3rd Qu.:  6000   3rd Qu.:    0.0   3rd Qu.:1300
 Max.   :180.0   Max.   :959.0   Max.   :300000   Max.   :30000.0   Max.   :5000
     Price           Finrat           Savings        seniorityR
 Min.   :  105   Min.   :  6.702   Min.   :-8.160   Length:4446
 1st Qu.: 1116   1st Qu.: 60.030   1st Qu.: 1.615   Class :character
 Median : 1400   Median : 77.097   Median : 3.120   Mode  :character
 Mean   : 1462   Mean   : 72.616   Mean   : 3.860
 3rd Qu.: 1692   3rd Qu.: 88.460   3rd Qu.: 5.196
 Max.   :11140   Max.   :100.000   Max.   :33.250
    timeR               ageR            expensesR           incomeR
 Length:4446        Length:4446        Length:4446        Length:4446
 Class :character   Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character   Mode  :character


   assetsR             debtR             amountR             priceR
 Length:4446        Length:4446        Length:4446        Length:4446
 Class :character   Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character   Mode  :character


   finratR             savingsR
 Length:4446        Length:4446
 Class :character   Class :character
 Mode  :character   Mode  :character


> str(data)
'data.frame':    4446 obs. of  27 variables:
 $ Status    : chr  "good" "good" "bad" "good" ...
 $ Seniority : int  9 17 10 0 0 1 29 9 0 0 ...
 $ Home      : chr  "rent" "rent" "owner" "rent" ...
 $ Time      : int  60 60 36 60 36 60 60 12 60 48 ...
```

```
 $ Age       : int  30 58 46 24 26 36 44 27 32 41 ...
 $ Marital   : chr  "married" "widow" "married" "single" ...
 $ Records   : chr  "no_rec" "no_rec" "yes_rec" "no_rec" ...
 $ Job       : chr  "freelance" "fixed" "freelance" "fixed" ...
 $ Expenses  : int  73 48 90 63 46 75 75 35 90 90 ...
 $ Income    : int  129 131 200 182 107 214 125 80 107 80 ...
 $ Assets    : int  0 0 3000 2500 0 3500 10000 0 15000 0 ...
 $ Debt      : int  0 0 0 0 0 0 0 0 0 0 ...
 $ Amount    : int  800 1000 2000 900 310 650 1600 200 1200 1200 ...
 $ Price     : int  846 1658 2985 1325 910 1645 1800 1093 1957 1468 ...
 $ Finrat    : num  94.6 60.3 67 67.9 34.1 ...
 $ Savings   : num  4.2 4.98 1.98 7.93 7.08 ...
 $ seniorityR: chr  "sen (8,14]" "sen (14,99]" "sen (8,14]" "sen (-1,1]" ...
 $ timeR     : chr  "time (48,99]" "time (48,99]" "time (24,36]" "time (48,99]" ...
 $ ageR      : chr  "age (25,30]" "age (50,99]" "age (40,50]" "age (0,25]" ...
 $ expensesR : chr  "exp (60,80]" "exp (40,50]" "exp (80,1e+04]" "exp (60,80]" ...
 $ incomeR   : chr  "inc (110,140]" "inc (110,140]" "inc (190,1e+04]" "inc (140,190]" ...
 $ assetsR   : chr  "asset (-1,0]" "asset (-1,0]" "asset (0,3e+03]" "asset (0,3e+03]" ...
 $ debtR     : chr  "debt (-1,0]" "debt (-1,0]" "debt (-1,0]" "debt (-1,0]" ...
 $ amountR   : chr  "am (600,900]" "am (900,1.1e+03]" "am (1.4e+03,1e+05]" "am (600,900]" ..
.
 $ priceR    : chr  "priz (0,1e+03]" "priz (1.5e+03,1.8e+03]" "priz (1.8e+03,1e+05]" "priz (
1.3e+03,1.5e+03]" ...
 $ finratR   : chr  "finr (90,100]" "finr (50,70]" "finr (50,70]" "finr (50,70]" ...
 $ savingsR  : chr  "sav (4,6]" "sav (4,6]" "sav (0,2]" "sav (6,99]" ...
> mean(data$Amount)
[1] 1038.763
> median(data$Amount)
[1] 1000
> mode(data$Amount)
[1] "numeric"
> min(data$Amount)
[1] 100
> max(data$Amount)
[1] 5000
> quantile(data$Amount)
  0%  25%  50%  75% 100%
 100  700 1000 1300 5000
> mean(data$Income)
[1] 140.6298
> median(data$Income)
[1] 124
> mode(data$Income)
[1] "numeric"
> min(data$Income)
[1] 1
> max(data$Income)
[1] 959
> quantile(data$Income)
  0%  25%  50%  75% 100%
   1   90  124  170  959
> cor(data$Income, data$Amount)
[1] 0.1908201
> cor(data$Amount, data$Income)
[1] 0.1908201
> linearModel <- lm(Amount ~ Income , data=data)
> print(linearModel)

Call:
```

```
lm(formula = Amount ~ Income, data = data)

Coefficients:
(Intercept)       Income
     879.87         1.13
```

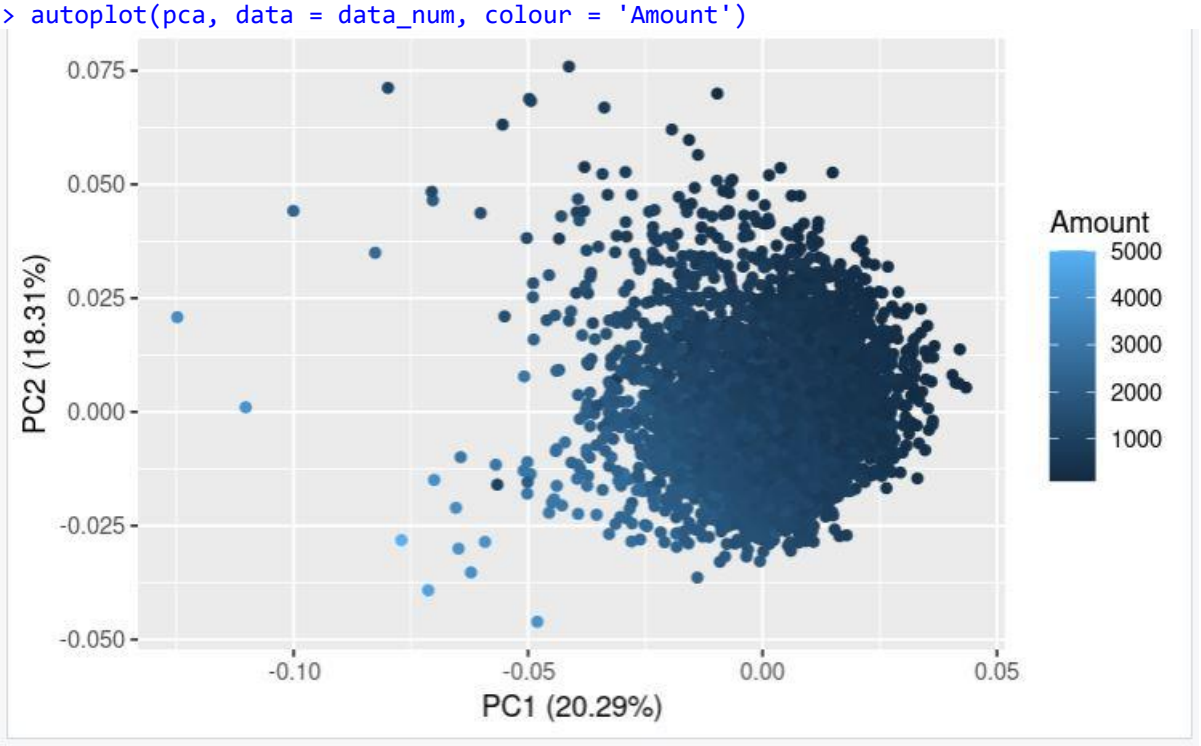
```
> data_num=select(data, c('Seniority','Time','Age','Expenses','Income','Assets','Debt','Amou
nt','Price','Finrat','Savings'))
> summary(data_num)
   Seniority           Time            Age           Expenses         Income
 Min.   : 0.000   Min.   : 6.00   Min.   :18.00   Min.   : 35.0   Min.   :  1.0
 1st Qu.: 2.000   1st Qu.:36.00   1st Qu.:28.00   1st Qu.: 35.0   1st Qu.: 90.0
 Median : 5.000   Median :48.00   Median :36.00   Median : 51.0   Median :124.0
 Mean   : 7.991   Mean   :46.45   Mean   :37.08   Mean   : 55.6   Mean   :140.6
 3rd Qu.:12.000   3rd Qu.:60.00   3rd Qu.:45.00   3rd Qu.: 72.0   3rd Qu.:170.0
 Max.   :48.000   Max.   :72.00   Max.   :68.00   Max.   :180.0   Max.   :959.0
     Assets            Debt             Amount         Price           Finrat
 Min.   :     0   Min.   :    0.0   Min.   : 100   Min.   :  105   Min.   :  6.702
 1st Qu.:     0   1st Qu.:    0.0   1st Qu.: 700   1st Qu.: 1116   1st Qu.: 60.030
 Median :  3000   Median :    0.0   Median :1000   Median : 1400   Median : 77.097
 Mean   :  5355   Mean   :  342.3   Mean   :1039   Mean   : 1462   Mean   : 72.616
 3rd Qu.:  6000   3rd Qu.:    0.0   3rd Qu.:1300   3rd Qu.: 1692   3rd Qu.: 88.460
 Max.   :300000   Max.   :30000.0   Max.   :5000   Max.   :11140   Max.   :100.000
    Savings
 Min.   :-8.160
 1st Qu.: 1.615
 Median : 3.120
 Mean   : 3.860
 3rd Qu.: 5.196
 Max.   :33.250
> data_standardize <- as.data.frame(scale(data_num[1:11]))
> data_standardize
     Seniority       Time          Age   Expenses       Income      Assets
1   0.12334900  0.9248073 -0.644810184  0.8912814 -0.145049697 -0.46426188
2   1.10177835  0.9248073  1.903803296 -0.3894013 -0.120105166 -0.46426188
3   0.24565267 -0.7136439  0.811540376  1.7621456  0.740481143 -0.20416871
4  -0.97738402  0.9248073 -1.190941644  0.3790083  0.515980367 -0.24751758
5  -0.97738402 -0.7136439 -1.008897824 -0.4918559 -0.419439535 -0.46426188
6  -0.85508035  0.9248073 -0.098678724  0.9937360  0.915092858 -0.16081985
7   2.56942237  0.9248073  0.629496556  0.9937360 -0.194938758  0.40271535
8   0.12334900 -2.3520952 -0.917875914 -1.0553562 -0.756190699 -0.46426188
9  -0.97738402  0.9248073 -0.462766364  1.7621456 -0.419439535  0.83620397
10 -0.97738402  0.1055817  0.356430826  1.7621456 -0.756190699 -0.46426188
11 -0.24356201  0.1055817 -0.280722544  0.2253264 -0.194938758 -0.11747099
12 -0.12125834 -0.7136439 -0.735832094  0.2253264 -0.244827820 -0.20416871
13  0.00104533  0.9248073 -0.644810184  0.9937360  0.728008878 -0.03077327
14  1.34638568 -0.7136439 -0.007656814  0.9937360  0.366313183 -0.16081985
15 -0.97738402 -1.9424823 -1.464007374 -1.0553562 -1.130358660 -0.46426188
16 -0.97738402 -1.5328695  2.814022396  0.9937360 -0.120105166 -0.10342596
17  0.85717101 -1.5328695  1.357671836 -1.0553562  2.361875640  0.96625056
18  3.05863704 -1.5328695  2.814022396  0.4814629  0.740481143 -0.03077327
19 -0.97738402  0.1055817 -0.098678724 -0.5430832 -0.132577432 -0.39923859
20 -0.85508035  0.9248073 -0.553788274 -1.0553562 -0.045271574 -0.46426188
21 -0.73277668  0.9248073 -1.099919734 -0.4918559 -0.419439535 -0.46426188
22 -0.36586567  0.9248073 -1.372985464 -0.5430832  2.287042047  0.40271535
23 -0.85508035  0.9248073  0.720518466  2.5305552 -0.357078208 -0.29086644
24  2.32481503  0.9248073  0.356430826  0.9425087 -0.007854778 -0.46426188
25  2.20251136  0.9248073  1.266649926 -0.5430832  0.029562018 -0.16081985
26  0.49026000 -0.7136439  1.539715656  0.2253264 -0.132577432 -0.11747099
```

27	1.34638568	0.9248073	0.538474646	0.9937360	0.491035836	-0.11747099
28	0.85717101	-0.7136439	0.538474646	0.9937360	1.376566676	-0.11747099
29	-0.61047301	-1.5328695	-1.281963554	0.9937360	-0.693829373	-0.03077327
30	-0.48816934	0.1055817	-0.735832094	-0.5430832	0.116867876	-0.03077327
31	-0.97738402	-0.7136439	-1.281963554	-0.5430832	-0.232355554	-0.24751758
32	0.73486734	-1.5328695	1.266649926	0.9937360	0.715536613	-0.37756416
33	0.24565267	-0.7136439	0.174387006	0.9937360	0.116867876	-0.20416871
34	0.49026000	-0.7136439	-0.189700634	-1.0553562	0.366313183	-0.46426188
35	2.93633337	-1.5328695	2.267890936	-0.5430832	-0.269772350	0.27266877
36	0.24565267	-1.5328695	1.721759476	-0.5430832	0.840259266	0.70615739
37	-0.12125834	0.1055817	-0.462766364	0.9937360	-0.319661412	-0.20416871
38	-0.85508035	0.5151945	-0.098678724	0.7375995	-0.519217658	-0.46426188
39	2.69172604	0.9248073	2.449934756	-0.5430832	-0.257300085	0.74950625
40	-0.36586567	0.1055817	-0.553788274	-0.5943105	-0.631468046	-0.46426188
41	1.95790403	0.9248073	0.447452736	0.9937360	-0.045271574	-0.11747099
42	-0.97738402	0.9248073	2.176869026	-1.0553562	1.114649104	3.87062431
43	-0.97738402	0.9248073	-0.462766364	-0.5430832	0.017089753	0.14262218
44	-0.73277668	0.9248073	0.538474646	0.9937360	-0.868441088	-0.20416871
45	-0.85508035	0.9248073	-1.008897824	-1.0553562	-0.257300085	-0.46426188
46	-0.85508035	0.9248073	1.084606106	-1.0553562	1.152065900	0.91423192
47	0.85717101	-0.7136439	0.902562286	0.9937360	1.850512760	-0.16081985
48	-0.73277668	-0.7136439	-0.917875914	-0.3894013	-0.157521962	-0.46426188
49	2.08020769	-0.7136439	1.357671836	0.2253264	0.116867876	0.83620397
50	0.00104533	0.9248073	-0.826854004	0.2253264	0.054506549	-0.11747099
51	-0.36586567	0.9248073	-0.553788274	0.9937360	-0.631468046	-0.11747099
52	-0.97738402	0.9248073	-0.462766364	2.5305552	2.000179944	-0.46426188
53	-0.36586567	-0.7136439	1.266649926	0.9937360	0.740481143	-0.28219666
54	-0.61047301	-2.3520952	-0.007656814	0.2253264	0.116867876	-0.42091302
55	-0.85508035	0.1055817	-0.735832094	1.5060091	-0.506745392	-0.46426188
56	-0.12125834	0.9248073	-1.008897824	-1.0553562	-0.506745392	-0.46426188
57	-0.48816934	-1.1232567	-0.917875914	-0.5430832	-0.506745392	-0.03077327
58	-0.24356201	-1.5328695	2.358912846	0.2253264	0.179229202	-0.11747099
59	0.73486734	-1.5328695	1.630737566	1.7621456	7.163697801	-0.03077327
60	-0.61047301	0.9248073	-0.826854004	0.7375995	1.301733084	-0.46426188
61	0.00104533	0.1055817	-0.553788274	1.7621456	0.116867876	-0.46426188
62	-0.48816934	-0.3040311	-0.917875914	-1.0553562	-0.880913353	-0.46426188
63	1.71329669	-1.5328695	0.265408916	0.9937360	0.615758490	-0.20416871
64	-0.73277668	-0.7136439	-0.189700634	0.9937360	0.141812406	-0.20416871
65	0.85717101	0.9248073	0.538474646	0.9937360	-0.182466493	-0.20416871
66	0.24565267	-1.9424823	-0.280722544	0.9937360	0.503508102	-0.11747099
67	-0.48816934	0.9248073	-0.007656814	0.2253264	0.553397163	-0.20416871
68	0.12334900	0.9248073	1.448693746	-0.5430832	0.366313183	-0.24751758
69	1.71329669	0.9248073	0.811540376	1.9158275	0.441146775	0.18597104
70	1.22408201	-0.7136439	-0.098678724	0.2253264	1.214427227	-0.46426188
71	-0.85508035	0.9248073	0.811540376	0.2253264	-0.319661412	0.01257560
72	0.73486734	0.1055817	0.538474646	-0.5430832	0.740481143	0.31601763
73	0.00104533	-0.7136439	-0.553788274	0.9937360	3.372129133	0.31601763
74	-0.36586567	-1.5328695	0.538474646	0.9937360	-0.594051250	-0.20416871
75	1.34638568	0.9248073	0.083365096	1.5572364	-0.406967269	-0.46426188
76	0.73486734	-2.3520952	-0.007656814	1.7621456	4.482160750	-0.11747099
77	-0.97738402	-0.7136439	0.811540376	-0.5430832	-1.192719987	-0.46426188
78	0.12334900	-0.7136439	1.630737566	0.7375995	1.364094411	2.13666983
79	2.56942237	0.1055817	1.721759476	-0.5430832	-0.506745392	-0.20416871
80	0.24565267	-0.7136439	1.630737566	0.2253264	-0.880913353	-0.11747099
81	0.24565267	-0.7136439	1.357671836	0.2253264	0.116867876	-0.46426188
82	-0.85508035	-0.7136439	-0.735832094	0.2253264	-0.880913353	-0.07412213
83	0.36795634	0.9248073	0.174387006	-1.0553562	1.526233861	-0.24751758
84	0.24565267	0.9248073	0.083365096	0.9937360	0.740481143	0.31601763
85	-0.36586567	-1.5328695	-1.190941644	-1.0553562	-0.781135230	0.05592446

```
86  0.24565267  0.9248073 -0.826854004 -0.4406286 -0.257300085 -0.46426188
87  2.32481503  0.9248073  1.448693746  0.2253264 -0.194938758  0.40271535
88 -0.97738402  0.9248073 -1.099919734 -0.7992197 -1.130358660 -0.46426188
89  2.08020769  0.9248073  2.267890936  0.2253264  0.066978814 -0.46426188
90 -0.61047301  0.9248073 -0.735832094 -1.0553562 -0.880913353 -0.46426188
          Debt       Amount        Price       Finrat     Savings
1  -0.27497275 -0.502926620 -0.980789690  1.076292239  0.09122118
2  -0.27497275 -0.081650448  0.311061904 -0.603355539  0.30054458
3  -0.27497275  2.024730414  2.422252870 -0.275359014 -0.50454540
4  -0.27497275 -0.292288534 -0.218724526 -0.230100242  1.09311094
5  -0.27497275 -1.535053242 -0.878968875 -1.890600827  0.86514639
6  -0.27497275 -0.818883749  0.290379551 -1.623431387  2.40740313
7  -0.27497275  1.182178069  0.536976837  0.798038516 -0.53272355
8  -0.27497275 -1.766755137 -0.587824981 -2.663882467 -0.31132381
9  -0.27497275  0.339625725  0.786756025 -0.554082158 -0.80779596
10 -0.27497275  0.339625725  0.008781358  0.447630897 -1.14325012
11 -0.27497275  0.234306682  0.182194934  0.015049241 -0.30782342
12 -0.27497275 -0.818883749 -0.871014124 -0.077396355 -0.12924961
13  1.73355215  0.971539983  0.298334302  0.897113705  0.02681398
14 -0.06608616 -0.924202792 -0.831240368 -0.430915430  0.45190149
15 -0.27497275 -1.345478965 -1.531258473  0.362107682 -0.85475955
16 -0.27497275 -0.292288534 -0.439866609  0.160315079 -0.63514889
17 -0.27497275  0.971539983  1.174947883 -0.219001389  0.23077011
18  1.33184717 -0.924202792 -0.178950770 -1.381615651  0.19856651
19 -0.27497275  0.128987638  0.077192219  0.008977742 -0.04052081
20 -0.27497275  0.444944768 -0.333272943  1.331210105  0.27800206
21 -0.27497275  0.971539983  1.155856480 -0.200679223 -0.38109827
22 -0.27497275  0.128987638 -0.482822265  1.093297967  3.04809711
23  0.12673223 -0.924202792 -0.207587874 -1.352160865 -0.98223213
24 -0.27497275 -0.186969491  0.054918915 -0.449038167  0.08274655
25 -0.27497275  0.655582854 -0.167814118  1.317653934  0.13296659
26 -0.27497275 -0.713564706  1.014261909 -1.926529193 -0.06979681
27 -0.27497275 -0.081650448 -0.624416837  1.022115112  0.65478417
28 -0.27497275  1.603454242  1.741326168 -0.108943117 -0.09126588
29 -0.27497275 -0.924202792  0.218786790 -1.722186615 -0.92855946
30  2.37628012  0.128987638 -0.239406879  0.550501571 -0.19275601
31 -0.27497275 -1.345478965 -1.690353497  1.342952057  0.82385306
32 -0.27497275 -1.240159922 -1.292615937 -0.166039289  0.72455863
33 -0.27497275 -0.081650448 -0.108948959 -0.043176651 -0.31132381
34 -0.27497275  0.128987638  0.126511676 -0.062797663  0.14977318
35 -0.27497275 -0.713564706 -0.417593306 -0.700473724 -0.35502869
36 -0.27497275 -1.134840879  0.155148780 -1.989403832  1.06376988
37 -0.27497275 -0.502926620 -0.417593306 -0.291788568 -0.39183281
38 -0.27497275 -0.186969491 -0.815330865  1.342952057 -0.59352903
39 -0.27497275  0.181647160 -0.258498282  0.682768343  0.03754852
40 -0.27497275  0.550263811  0.377881814  0.189017498 -0.58010000
41 -0.27497275 -0.292288534 -0.470094664  0.220906435  0.07333029
42 -0.27497275 -0.186969491 -0.497140818  0.490043905  2.26920145
43  2.13525713  0.444944768  0.164694482  0.353338959 -0.17284833
44 -0.27497275  0.971539983  0.142421178  1.178635345 -1.07884292
45 -0.27497275  0.234306682 -0.258498282  0.777080302  0.15422822
46  3.34037208  2.235368500  1.020625710  1.333628442  0.13722632
47 -0.27497275  0.971539983  1.100173222 -0.146073526  0.34240926
48 -0.27497275 -1.240159922 -1.459665712  0.488087694  0.68162050
49 -0.27497275 -0.608245663  0.501975932 -1.492559803  0.12342478
50  0.52843721  1.182178069  0.406518918  1.006107947 -0.28113293
51 -0.27497275 -0.292288534  0.059691766 -0.618736693 -0.76754146
52 -0.27497275  0.339625725 -0.299862988  1.058091446  1.59405581
53  0.68911920 -0.292288534 -0.711919100  0.787301303  0.17709745
```

```
54 -0.27497275 -1.134840879  0.379472764 -2.119699602 -0.45624000
55 -0.27497275 -0.081650448 -0.186905521  0.084991799 -0.84268320
56 -0.27497275 -0.081650448 -0.357137197  0.400137189  0.01071218
57 -0.27497275 -1.134840879 -0.659417742 -1.221469305 -0.15030581
58 -0.27497275 -0.924202792 -0.659417742 -0.753509202 -0.01612415
59 -0.27497275 -0.502926620 -0.220315476 -0.597993760  3.99590759
60 -0.27497275  1.666645668  1.174947883  0.516297666  0.50388479
61 -0.27497275  0.128987638 -0.051674751  0.211208548 -0.33328081
62 -0.27497275 -0.924202792 -0.853513671 -0.383588257 -0.37841464
63 -0.27497275 -0.081650448  0.059691766 -0.291788568 -0.29522201
64 -0.27497275 -0.081650448  0.126511676 -0.380840586 -0.29200165
65 -0.27497275  0.655582854 -0.163041268  1.306891602 -0.42761458
66 -0.27497275 -0.924202792 -0.735783353 -0.618736693 -0.18250941
67 -0.27497275  0.339625725  0.161512581  0.201560265  0.64136600
68 -0.27497275 -0.397607577 -0.409638554 -0.101860196  1.33200692
69 -0.27497275  2.024730414  1.173356933  0.897113705 -0.36768011
70 -0.27497275 -0.292288534  1.195630236 -1.567683690  0.87484210
71  0.36775522 -0.081650448 -0.517823171  0.752029984 -0.27912021
72 -0.27497275 -0.924202792 -0.696009597 -0.690505793  2.29180046
73  2.93866710 -0.502926620  0.207650138 -1.098383754  2.53869472
74 -0.27497275 -0.713564706  0.433565072 -1.582621223 -0.87028628
75 -0.27497275 -0.081650448 -0.525777922  0.771081662 -0.68166520
76 -0.27497275 -1.134840879 -0.198042173 -1.728600956  1.60479035
77 -0.27497275 -0.292288534 -0.576688330  0.451275353 -1.03590479
78 -0.27497275  1.498135199  1.294269151  0.209551044 -0.04219373
79 -0.27497275 -0.292288534 -0.163041268 -0.315828871 -0.24870570
80 -0.27497275 -0.081650448 -0.042129049 -0.146073526 -0.93929399
81 -0.27497275 -1.029521836 -1.353072046  0.846119122  0.54499917
82 -0.27497275 -0.397607577 -0.576688330  0.228356177 -0.92224503
83 -0.27497275 -0.081650448 -0.258498282  0.211208548  2.63530552
84 -0.27497275 -0.081650448  0.996761456 -1.213628901  0.97682016
85  2.13525713 -1.134840879  1.271995848 -2.477224311 -0.86844607
86 -0.27497275 -0.924202792 -0.649872041 -0.769492659  0.92314750
87 -0.27497275  0.815667799 -0.058038552  1.342952057 -0.30195179
88 -0.27497275  0.002604787 -0.659417742  1.305515249 -0.88107979
89 -0.27497275 -0.081650448 -0.271225884  0.234567547  0.34884998
90 -0.27497275 -0.186969491 -0.454185161  0.397108076 -0.44268059
 [ reached 'max' / getOption("max.print") -- omitted 4356 rows ]
> data.mat <- as.matrix(data_standardize)
> cov.mat <- cor(data_standardize)
> cov.mat
             Seniority         Time          Age     Expenses       Income
Seniority  1.000000000 -0.021873631  0.50608874  0.125680475  0.121224109
Time      -0.021873631  1.000000000 -0.05184996 -0.001717144 -0.029915238
Age        0.506088738 -0.051849964  1.00000000  0.248136938  0.147556491
Expenses   0.125680475 -0.001717144  0.24813694  1.000000000  0.255005191
Income     0.121224109 -0.029915238  0.14755649  0.255005191  1.000000000
Assets     0.124240730 -0.083017696  0.18098586  0.018934567  0.219111978
Debt      -0.019346612  0.058267474 -0.04618789  0.014770828  0.144696747
Amount    -0.007639347  0.430858318  0.02903078  0.049539122  0.190820113
Price      0.041121984  0.129676827  0.04868519  0.040728033  0.217789281
Finrat    -0.073391667  0.468641344 -0.03451424  0.024582188 -0.003407192
Savings    0.093245565  0.101653260  0.06203607 -0.038093908  0.717962971
               Assets         Debt       Amount       Price       Finrat
Seniority  0.12424073 -0.019346612 -0.007639347  0.04112198 -0.073391667
Time      -0.08301770  0.058267474  0.430858318  0.12967683  0.468641344
Age        0.18098586 -0.046187886  0.029030782  0.04868519 -0.034514243
Expenses   0.01893457  0.014770828  0.049539122  0.04072803  0.024582188
Income     0.21911198  0.144696747  0.190820113  0.21778928 -0.003407192
```

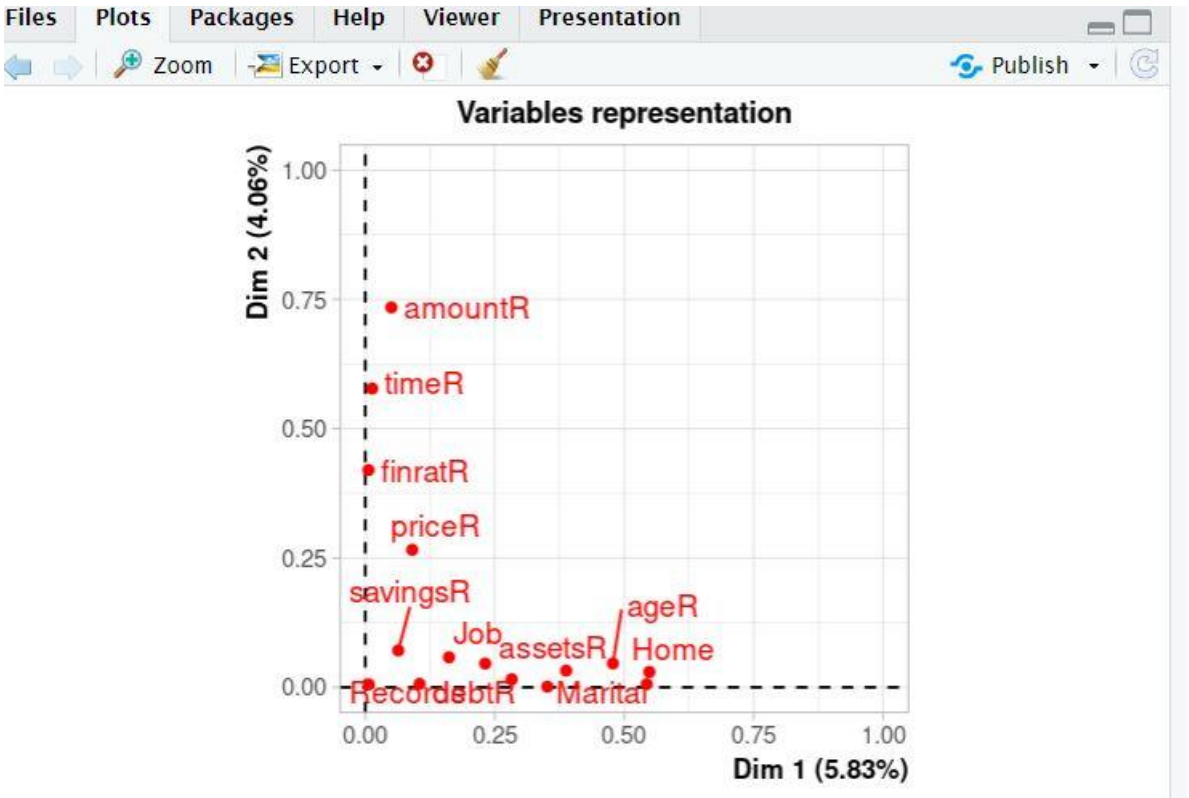
```
Assets      1.00000000  0.191619494  0.144283763  0.19489363 -0.025059986
Debt        0.19161949  1.000000000  0.050902247  0.04391706  0.008608526
Amount      0.14428376  0.050902247  1.000000000  0.72502542  0.473842104
Price       0.19489363  0.043917062  0.725025421  1.00000000 -0.181347572
Finrat     -0.02505999  0.008608526  0.473842104 -0.18134757  1.000000000
Savings     0.06700103  0.004990061 -0.149323053 -0.07036095 -0.123180383
                Savings
Seniority  0.093245565
Time       0.101653260
Age        0.062036075
Expenses  -0.038093908
Income     0.717962971
Assets     0.067001028
Debt       0.004990061
Amount    -0.149323053
Price     -0.070360949
Finrat    -0.123180383
Savings    1.000000000
> pca <- prcomp(data_standardize,center = T,scale. = T)
> summary(pca)
Importance of components:
                          PC1    PC2    PC3    PC4     PC5     PC6     PC7     PC8
Standard deviation     1.4940 1.4191 1.2053 1.1558 1.03388 0.97976 0.88080 0.73682
Proportion of Variance 0.2029 0.1831 0.1321 0.1214 0.09717 0.08727 0.07053 0.04936
Cumulative Proportion  0.2029 0.3860 0.5181 0.6395 0.73667 0.82393 0.89446 0.94382
                           PC9    PC10    PC11
Standard deviation     0.68353 0.32702 0.20945
Proportion of Variance 0.04247 0.00972 0.00399
Cumulative Proportion  0.98629 0.99601 1.00000
> library(ggfortify)
Loading required package: ggplot2
> library(ggplot2)
> autoplot(pca, data = data_num, colour = 'Amount')
```



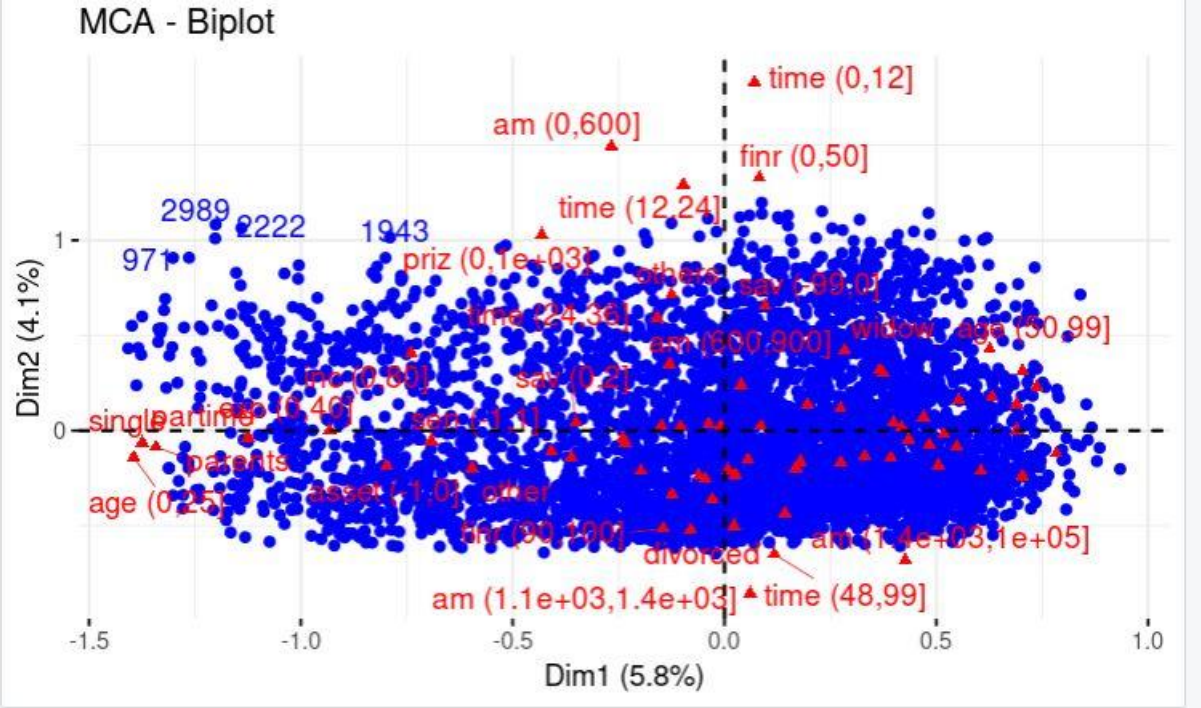
```
> library(FactoMineR)
Error in library(FactoMineR) : there is no package called ‘FactoMineR’
> data_categ=select(data, c('Home','Marital','Records','Job','seniorityR','timeR','ageR','ex
pensesR','incomeR','assetsR','debtR','amountR','priceR','finratR','savingsR'))
> summary(data_categ)
     Home              Marital            Records              Job
 Length:4446        Length:4446        Length:4446        Length:4446
 Class :character   Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character   Mode  :character
  seniorityR           timeR               ageR            expensesR
 Length:4446        Length:4446        Length:4446        Length:4446
 Class :character   Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character   Mode  :character
   incomeR            assetsR             debtR              amountR
 Length:4446        Length:4446        Length:4446        Length:4446
 Class :character   Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character   Mode  :character
    priceR             finratR            savingsR
 Length:4446        Length:4446        Length:4446
 Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character
> data(data_categ)
Warning message:
In data(data_categ) : data set ‘data_categ’ not found
> res.mca <- MCA(data_categ,
+                quali.sup = 1:16,  # Supplementary qualitative variable
+                graph=FALSE)
Error in MCA(data_categ, quali.sup = 1:16, graph = FALSE) :
  could not find function "MCA"
> install.packages(c("FactoMineR", "factoextra"))
Installing packages into ‘/cloud/lib/x86_64-pc-linux-gnu-library/4.2’
(as ‘lib’ is unspecified)
also installing the dependencies ‘corrplot’, ‘viridis’, ‘ggsci’, ‘cowplot’, ‘ggsignif’, ‘pol
ynom’, ‘rstatix’, ‘plyr’, ‘dendextend’, ‘ggpubr’, ‘reshape2’

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/corrplot_0.92.tar.gz'
Content type 'application/x-gzip' length 3842498 bytes (3.7 MB)
==================================================
downloaded 3.7 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/viridis_0.6.2.tar.gz'
Content type 'application/x-gzip' length 2997398 bytes (2.9 MB)
==================================================
downloaded 2.9 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/ggsci_2.9.tar.gz'
Content type 'application/x-gzip' length 2979553 bytes (2.8 MB)
==================================================
downloaded 2.8 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/cowplot_1.1.1.tar.gz'
Content type 'application/x-gzip' length 1376382 bytes (1.3 MB)
==================================================
downloaded 1.3 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/ggsignif_0.6.3.tar.gz'
Content type 'application/x-gzip' length 600746 bytes (586 KB)
==================================================
downloaded 586 KB
```

```
trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/polynom_1.4-1.tar.gz'
Content type 'application/x-gzip' length 404572 bytes (395 KB)
==================================================
downloaded 395 KB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/rstatix_0.7.0.tar.gz'
Content type 'application/x-gzip' length 597842 bytes (583 KB)
==================================================
downloaded 583 KB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/plyr_1.8.7.tar.gz'
Content type 'application/x-gzip' length 1159494 bytes (1.1 MB)
==================================================
downloaded 1.1 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/dendextend_1.16.0.tar.gz'
Content type 'application/x-gzip' length 3895307 bytes (3.7 MB)
==================================================
downloaded 3.7 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/ggpubr_0.4.0.tar.gz'
Content type 'application/x-gzip' length 1897240 bytes (1.8 MB)
==================================================
downloaded 1.8 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/reshape2_1.4.4.tar.gz'
Content type 'application/x-gzip' length 550845 bytes (537 KB)
==================================================
downloaded 537 KB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/FactoMineR_2.6.tar.gz'
Content type 'application/x-gzip' length 3799947 bytes (3.6 MB)
==================================================
downloaded 3.6 MB

trying URL 'http://rspm/default/__linux__/focal/latest/src/contrib/factoextra_1.0.7.tar.gz'
Content type 'application/x-gzip' length 414461 bytes (404 KB)
==================================================
downloaded 404 KB

* installing *binary* package ‘corrplot’ ...
* DONE (corrplot)
* installing *binary* package ‘viridis’ ...
* DONE (viridis)
* installing *binary* package ‘ggsci’ ...
* DONE (ggsci)
* installing *binary* package ‘cowplot’ ...
* DONE (cowplot)
* installing *binary* package ‘ggsignif’ ...
* DONE (ggsignif)
* installing *binary* package ‘polynom’ ...
* DONE (polynom)
* installing *binary* package ‘plyr’ ...
* DONE (plyr)
* installing *binary* package ‘FactoMineR’ ...
* DONE (FactoMineR)
* installing *binary* package ‘rstatix’ ...
* DONE (rstatix)
```

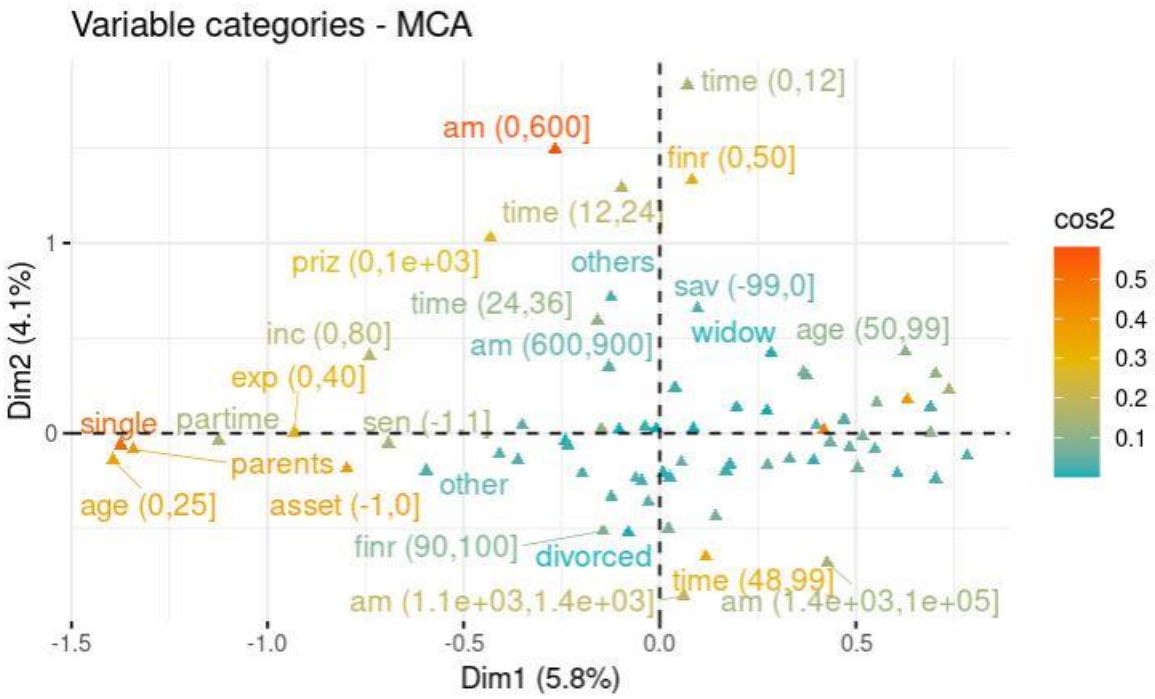
```
* installing *binary* package ‘dendextend’ ...
* DONE (dendextend)
* installing *binary* package ‘reshape2’ ...
* DONE (reshape2)
* installing *binary* package ‘ggpubr’ ...
* DONE (ggpubr)
* installing *binary* package ‘factoextra’ ...
* DONE (factoextra)

The downloaded source packages are in
        ‘/tmp/RtmpqLf93S/downloaded_packages’
> library("FactoMineR")
> library("factoextra")
Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
> res.mca <- MCA(data_categ,
+                quali.sup = 1:16,  # Supplementary qualitative variable
+                graph=FALSE)
Error in `[.data.frame`(X, , quali.sup, drop = FALSE) :
  undefined columns selected
> res.mca <- MCA(data_categ)
Warning message:
ggrepel: 5 unlabeled data points (too many overlaps). Consider increasing max.overlaps
> fviz_mca_biplot (res.mca, repel = TRUE,
Warning messages:
1: ggrepel: 3 unlabeled data points (too many overlaps). Consider increasing max.overlaps
2: ggrepel: 3 unlabeled data points (too many overlaps). Consider increasing max.overlaps
+                 ggtheme = theme_minimal())
```



```
Warning messages:
1: ggrepel: 4446 unlabeled data points (too many overlaps). Consider increasing max.overlaps
2: ggrepel: 56 unlabeled data points (too many overlaps). Consider increasing max.overlaps
> res.mca <- MCA(data_categ)
Warning messages:
1: ggrepel: 4442 unlabeled data points (too many overlaps). Consider increasing max.overlaps
2: ggrepel: 46 unlabeled data points (too many overlaps). Consider increasing max.overlaps
3: ggrepel: 4442 unlabeled data points (too many overlaps). Consider increasing max.overlaps
4: ggrepel: 46 unlabeled data points (too many overlaps). Consider increasing max.overlaps
5: ggrepel: 5 unlabeled data points (too many overlaps). Consider increasing max.overlaps
> fviz_mca_biplot (res.mca, repel = TRUE, ggtheme = theme_minimal())
```




```
Warning messages:
1: ggrepel: 3 unlabeled data points (too many overlaps). Consider increasing max.overlaps
2: ggrepel: 3 unlabeled data points (too many overlaps). Consider increasing max.overlaps
3: ggrepel: 4446 unlabeled data points (too many overlaps). Consider increasing max.overlaps
4: ggrepel: 56 unlabeled data points (too many overlaps). Consider increasing max.overlaps
> head(var$cos2, 4)
Error in var$cos2 : object of type 'closure' is not subsettable
In addition: Warning messages:
1: ggrepel: 4442 unlabeled data points (too many overlaps). Consider increasing max.overlaps
2: ggrepel: 46 unlabeled data points (too many overlaps). Consider increasing max.overlaps
3: ggrepel: 4442 unlabeled data points (too many overlaps). Consider increasing max.overlaps
4: ggrepel: 46 unlabeled data points (too many overlaps). Consider increasing max.overlaps
> fviz_mca_var(res.mca, col.var = "cos2",
+              gradient.cols = c("#00AFBB", "#E7B800", "#FC4E07"),
+              repel = TRUE,
+              ggtheme = theme_minimal())
Warning message:
ggrepel: 57 unlabeled data points (too many overlaps). Consider increasing max.overlaps


>
```


Variable categories - MCA
time (0,12]
am (0,600]
finr (0,50]
time (12,24]
priz (0,1e+03]
others
sav (-99,0]
time (24,36]
inc (0,80]
am (600,900]
widow
age (50,99]
exp (0,40]
single
partime
sen (-1,1]
parents
other
age (0,25]
asset (-1,0]
finr (90,100]
divorced
time (48,99]
am (1.1e+03,1.4e+03]
am (1.4e+03,1e+05]
cos2
0.5
0.4
0.3
0.2
0.1
Dim2 (4.1%)
Dim1 (5.8%)
1
0
-1.5
-1.0
-0.5
0.0
0.5