

LOGISTICS REGRESSION ON BANK DATA

USING R STUDIO

[illegible]


```
> summary(x)
```

cardwdln	cardwdlt	cashcrn	cashcrt	cashwdn	cashwdt
Min. : 0.000	Min. : 0	Min. : 1.00	Min. : 200	Min. : 13.0	Min. : 30502
1st Qu.: 0.000	1st Qu.: 0	1st Qu.: 10.00	1st Qu.: 40800	1st Qu.: 70.0	1st Qu.: 354510
Median : 0.000	Median : 0	Median : 39.00	Median : 627659	Median : 99.0	Median : 700814
Mean : 1.415	Mean : 3640	Mean : 42.52	Mean : 796445	Mean : 116.9	Mean : 888342
3rd Qu.: 0.000	3rd Qu.: 0	3rd Qu.: 63.00	3rd Qu.: 1235188	3rd Qu.: 161.0	3rd Qu.: 1206393
Max. : 34.000	Max. : 83000	Max. : 148.00	Max. : 3708832	Max. : 324.0	Max. : 3392850

bankcolt	bankcoln	bankrn	bankrt	othcrn	othcrt
Min. : 0	Min. : 0.00	Min. : 1.00	Min. : 1901	Min. : 10.00	Min. : 969
1st Qu.: 0	1st Qu.: 0.00	1st Qu.: 21.00	1st Qu.: 85248	1st Qu.: 27.00	1st Qu.: 4370
Median : 0	Median : 0.00	Median : 44.50	Median : 196322	Median : 38.00	Median : 6489
Mean : 383349	Mean : 11.89	Mean : 62.18	Mean : 245154	Mean : 45.95	Mean : 7772
3rd Qu.: 527640	3rd Qu.: 22.00	3rd Qu.: 88.00	3rd Qu.: 341921	3rd Qu.: 61.00	3rd Qu.: 9764
Max. : 3552197	Max. : 72.00	Max. : 287.00	Max. : 1040262	Max. : 191.00	Max. : 30029

days	sex	card	age	second	frequency
Min. : 374.0	Length:682	Length:682	Min. : 19.07	Length:682	Length:682
1st Qu.: 802.5	Class :character	Class :character	1st Qu.: 30.82	Class :character	Class :character
Median : 1070.0	Mode :character	Mode :character	Median : 41.37	Mode :character	Mode :character
Mean : 1220.6			Mean : 41.40		
3rd Qu.: 1681.5			3rd Qu.: 52.13		
Max. : 2178.0			Max. : 64.92		

region	cardwdlnd	cardwdltd	cashcrnd	cashcrtnd	cashwdnd
Length:682	Min. : 0.00000	Min. : 0.000	Min. : 0.000488	Min. : 0.18	Min. : 0.03476
Class :character	1st Qu.: 0.00000	1st Qu.: 0.000	1st Qu.: 0.009484	1st Qu.: 33.69	1st Qu.: 0.08065
Mode :character	Median : 0.00000	Median : 0.000	Median : 0.037707	Median : 586.13	Median : 0.09298
	Mean : 0.00112	Mean : 2.891	Mean : 0.034502	Mean : 643.22	Mean : 0.09338
	3rd Qu.: 0.00000	3rd Qu.: 0.000	3rd Qu.: 0.051588	3rd Qu.: 1043.35	3rd Qu.: 0.10625
	Max. : 0.02224	Max. : 71.306	Max. : 0.086777	Max. : 2476.69	Max. : 0.15190

cashwdtd	bankcoltd	bankcoln	bankrnd	bankrtd	othcrnd
Min. : 49.01	Min. : 0.0	Min. : 0.00000	Min. : 0.00145	Min. : 3.091	Min. : 0.01669
1st Qu.: 365.92	1st Qu.: 0.0	1st Qu.: 0.00000	1st Qu.: 0.01988	1st Qu.: 88.044	1st Qu.: 0.03241
Median : 654.12	Median : 0.0	Median : 0.00000	Median : 0.04340	Median : 182.086	Median : 0.03276
Mean : 724.19	Mean : 325.4	Mean : 0.01006	Mean : 0.05018	Mean : 198.679	Mean : 0.03734
3rd Qu.: 1050.79	3rd Qu.: 627.6	3rd Qu.: 0.03235	3rd Qu.: 0.07333	3rd Qu.: 284.113	3rd Qu.: 0.03315
Max. : 2363.51	Max. : 1790.5	Max. : 0.03361	Max. : 0.14718	Max. : 600.155	Max. : 0.09947

othcrtcd	acardwdl	acashcr	acashwd	abankcol	abankr
Min. : 1.364	Min. : 0	Min. : 200	Min. : 850.3	Min. : 0	Min. : 312
1st Qu.: 4.766	1st Qu.: 0	1st Qu.: 4283	1st Qu.: 4371.0	1st Qu.: 0	1st Qu.: 2723
Median : 6.088	Median : 0	Median :15970	Median : 7518.6	Median : 0	Median : 4211
Mean : 6.300	Mean : 574	Mean :14154	Mean : 7421.0	Mean : 9963	Mean : 4590
3rd Qu.: 7.596	3rd Qu.: 0	3rd Qu.:22851	3rd Qu.:10264.9	3rd Qu.:19122	3rd Qu.: 6170
Max. :19.768	Max. :6600	Max. :31248	Max. :16958.0	Max. :54825	Max. :12683

aothcr
Min. : 43.9
1st Qu.:133.9
Median :172.7
Mean :173.6
3rd Qu.:212.8
Max. :335.1

> |


```
> library(pastecs)
```

```
> stat.desc(x)
```

	cardwdln	cardwdlt	cashcrn	cashcrt	cashwdn	cashwdt	bankcolt
nbr.val	682.0000000	6.820000e+02	682.000000	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02
nbr.null	534.0000000	5.340000e+02	0.000000	0.000000e+00	0.000000e+00	0.000000e+00	4.720000e+02
nbr.na	0.0000000	0.000000e+00	0.000000	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00
min	0.0000000	0.000000e+00	1.000000	2.000000e+02	1.300000e+01	3.050220e+04	0.000000e+00
max	34.0000000	8.300000e+04	148.000000	3.708832e+06	3.240000e+02	3.392850e+06	3.552197e+06
range	34.0000000	8.300000e+04	147.000000	3.708632e+06	3.110000e+02	3.362348e+06	3.552197e+06
sum	965.0000000	2.482600e+06	29001.000000	5.431758e+08	7.973800e+04	6.058496e+08	2.614443e+08
median	0.0000000	0.000000e+00	39.000000	6.276590e+05	9.900000e+01	7.008136e+05	0.000000e+00
mean	1.4149560	3.640176e+03	42.523460	7.964454e+05	1.169179e+02	8.883424e+05	3.833494e+05
SE.mean	0.1569420	4.024775e+02	1.294612	3.048655e+04	2.353701e+00	2.564952e+04	2.721105e+04
CI.mean.0.95	0.3081482	7.902459e+02	2.541910	5.985893e+04	4.621382e+00	5.036164e+04	5.342763e+04
var	16.7981901	1.104759e+08	1143.045704	6.338713e+11	3.778216e+03	4.486863e+11	5.049808e+11
std.dev	4.0985595	1.051075e+04	33.808959	7.961603e+05	6.146720e+01	6.698405e+05	7.106200e+05
coef.var	2.8965985	2.887430e+00	0.795066	9.996421e-01	5.257296e-01	7.540341e-01	1.853714e+00

	bankcoln	bankrn	bankrt	othcrn	othcrt	days	sex	card
nbr.val	682.0000000	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	NA	NA
nbr.null	472.0000000	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	NA	NA
nbr.na	0.0000000	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	NA	NA
min	0.0000000	1.000000e+00	1.901000e+03	1.000000e+01	9.690000e+02	3.740000e+02	NA	NA
max	72.0000000	2.870000e+02	1.040262e+06	1.910000e+02	3.002930e+04	2.178000e+03	NA	NA
range	72.0000000	2.860000e+02	1.038361e+06	1.810000e+02	2.906030e+04	1.804000e+03	NA	NA
sum	8106.0000000	4.240800e+04	1.671948e+08	3.133800e+04	5.300731e+06	8.324560e+05	NA	NA
median	0.0000000	4.450000e+01	1.963218e+05	3.800000e+01	6.489400e+03	1.070000e+03	NA	NA
mean	11.8856305	6.218182e+01	2.451537e+05	4.595015e+01	7.772333e+03	1.220610e+03	NA	NA
SE.mean	0.7772382	2.082669e+00	7.870811e+03	1.017397e+00	1.831863e+02	1.991879e+01	NA	NA
CI.mean.0.95	1.5260712	4.089223e+00	1.545397e+04	1.997612e+00	3.596779e+02	3.910961e+01	NA	NA
var	411.9957110	2.958181e+03	4.224968e+10	7.059358e+02	2.288604e+07	2.705890e+05	NA	NA
std.dev	20.2976775	5.438917e+01	2.055473e+05	2.656945e+01	4.783935e+03	5.201817e+02	NA	NA
coef.var	1.7077493	8.746796e-01	8.384426e-01	5.782235e-01	6.155083e-01	4.261654e-01	NA	NA

	age	second	frequency	region	cardwdlnd	cardwdltd	cashcrnd	cashcrt
nbr.val	6.820000e+02	NA	NA	NA	6.820000e+02	682.000000	6.820000e+02	6.820000e+02
nbr.null	0.000000e+00	NA	NA	NA	5.340000e+02	534.000000	0.000000e+00	0.000000e+00
nbr.na	0.000000e+00	NA	NA	NA	0.000000e+00	0.000000	0.000000e+00	0.000000e+00
min	1.906640e+01	NA	NA	NA	0.000000e+00	0.000000	4.880000e-04	1.800000e-01
max	6.492270e+01	NA	NA	NA	2.223900e-02	71.305800	8.677700e-02	2.476690e+03
range	4.585630e+01	NA	NA	NA	2.223900e-02	71.305800	8.628900e-02	2.476510e+03
sum	2.823580e+04	NA	NA	NA	7.640020e-01	1971.388500	2.353055e+01	4.386753e+05
median	4.137440e+01	NA	NA	NA	0.000000e+00	0.000000	3.770700e-02	5.861350e+02
mean	4.140146e+01	NA	NA	NA	1.120238e-03	2.890599	3.450227e-02	6.432188e+02
SE.mean	4.850669e-01	NA	NA	NA	1.142097e-04	0.297919	8.319853e-04	2.127258e+01
CI.mean.0.95	9.524063e-01	NA	NA	NA	2.242455e-04	0.584951	1.633565e-03	4.176771e+01
var	1.604677e+02	NA	NA	NA	8.895916e-06	60.531656	4.720801e-04	3.086203e+05
std.dev	1.266758e+01	NA	NA	NA	2.982602e-03	7.780209	2.172740e-02	5.55361e+02
coef.var	3.059695e-01	NA	NA	NA	2.662473e+00	2.691556	6.297385e-01	8.636813e-01
	cashwdnd	cashwdtd	bankcoltd	bankcolnd	bankrnd	bankrtd	othcrnd	
nbr.val	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	
nbr.null	0.000000e+00	0.000000e+00	4.720000e+02	4.720000e+02	0.000000e+00	0.000000e+00	0.000000e+00	
nbr.na	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	
min	3.476000e-02	4.901000e+01	0.000000e+00	0.000000e+00	1.450000e-03	3.091000e+00	1.669000e-02	
max	1.519000e-01	2.363510e+03	1.790460e+03	3.361300e-02	1.471800e-01	6.001550e+02	9.946900e-02	
range	1.171400e-01	2.314500e+03	1.790460e+03	3.361300e-02	1.457300e-01	5.970640e+02	8.277900e-02	
sum	6.368382e+01	4.938949e+05	2.219019e+05	6.859706e+00	3.422005e+01	1.354987e+05	2.546422e+01	
median	9.297500e-02	6.541200e+02	0.000000e+00	0.000000e+00	4.340000e-02	1.820860e+02	3.275700e-02	
mean	9.337804e-02	7.241861e+02	3.253693e+02	1.005822e-02	5.017603e-02	1.986785e+02	3.733757e-02	
SE.mean	7.413115e-04	1.617025e+01	2.065547e+01	5.778948e-04	1.348647e-03	5.003015e+00	4.769681e-04	
CI.mean.0.95	1.455531e-03	3.174953e+01	4.055606e+01	1.134670e-03	2.648006e-03	9.823188e+00	9.365047e-04	
var	3.747882e-04	1.783272e+05	2.909742e+05	2.277623e-04	1.240455e-03	1.707057e+04	1.551540e-04	
std.dev	1.935945e-02	4.222880e+02	5.394203e+02	1.509180e-02	3.522009e-02	1.306544e+02	1.245608e-02	
coef.var	2.073233e-01	5.831209e-01	1.657871e+00	1.500444e+00	7.019307e-01	6.576172e-01	3.336072e-01	

	othcrtcd	acardwdl	acashcr	acashwd	abankcol	abankr	aothcr
nbr.val	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02	6.820000e+02
nbr.null	0.000000e+00	5.340000e+02	0.000000e+00	0.000000e+00	4.720000e+02	0.000000e+00	0.000000e+00
nbr.na	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00
min	1.364400e+00	0.000000e+00	2.000000e+02	8.503300e+02	0.000000e+00	3.120000e+02	4.389500e+01
max	1.976840e+01	6.600000e+03	3.124758e+04	1.695803e+04	5.482450e+04	1.268287e+04	3.351290e+02
range	1.840400e+01	6.600000e+03	3.104758e+04	1.610770e+04	5.482450e+04	1.237087e+04	2.912340e+02
sum	4.296297e+03	3.915022e+05	9.652914e+06	5.061129e+06	6.794478e+06	3.130203e+06	1.183891e+05
median	6.088000e+00	0.000000e+00	1.597000e+04	7.518560e+03	0.000000e+00	4.211305e+03	1.727425e+02
mean	6.299555e+00	5.740501e+02	1.415383e+04	7.421010e+03	9.962578e+03	4.589740e+03	1.735910e+02
SE.mean	8.956413e-02	4.461129e+01	3.574241e+02	1.374844e+02	6.324772e+02	9.027906e+01	2.119873e+00
CI.mean.0.95	1.758550e-01	8.759219e+01	7.017856e+02	2.699442e+02	1.241840e+03	1.772587e+02	4.162271e+00
var	5.470822e+00	1.357294e+06	8.712686e+07	1.289113e+07	2.728187e+08	5.558510e+06	3.064812e+03
std.dev	2.338979e+00	1.165030e+03	9.334177e+03	3.590422e+03	1.651722e+04	2.357649e+03	5.536075e+01
coef.var	3.712927e-01	2.029491e+00	6.594805e-01	4.838186e-01	1.657927e+00	5.136782e-01	3.189148e-01

>


```

> library(fastDummies)
> x_final = dummy_cols(
+   x,
+   select_columns = NULL,
+   remove_first_dummy = FALSE,
+   remove_most_frequent_dummy = FALSE,
+   ignore_na = FALSE,
+   split = NULL,
+   remove_selected_columns = TRUE
+ )
> view(x_final)
> dim(x_final)
[1] 682 49
> colnames(x_final)
[1] "cardwdln"      "cardwdlt"      "cashcrn"      "cashcrt"
[5] "cashwdn"      "cashwdt"      "bankcolt"     "bankcoln"
[9] "bankrn"      "bankrt"      "othcrn"      "othcrt"
[13] "days"      "age"      "cardwdlnd"    "cardwdltd"
[17] "cashcrnd"    "cashcrtnd"    "cashwdnd"     "cashwdtd"
[21] "bankcoltd"   "bankcolnd"    "bankrnd"      "bankrtd"
[25] "othcrnd"     "othcrtnd"     "acardwdl"     "acashcr"
[29] "acashwd"     "abankcol"     "abankr"       "aothcr"
[33] "sex_F"      "sex_M"      "card_no"      "card_yes"
[37] "second_N"    "second_Y"    "frequency_After_Tr" "frequency_Monthly"
[41] "frequency_weekly" "region_central Bohemia" "region_east Bohemia" "region_north Bohemia"
[45] "region_north Moravia" "region_Prague" "region_south Bohemia" "region_south Moravia"
[49] "region_west Bohemia"
>

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```

> library(moments)
> skewness(x_final, na.rm = FALSE)

```

cardwdln	cardwdlt	cashcrn	cashcrt
4.154746241	4.049650122	0.634799297	1.064042905
cashwdn	cashwdt	bankcolt	bankcoln
0.730327897	1.130378446	2.025465044	1.554310955
bankrn	bankrt	othcrn	othcrt
1.432478228	1.335496786	1.624860544	1.413665976
days	age	cardwdlnd	cardwdltd
0.391612753	0.005967961	3.676056557	3.991652901
cashcrnd	cashcrtnd	cashwdnd	cashwdtd
-0.254375785	0.520997336	-0.080863727	0.462627449
bankcoltd	bankcolnd	bankrnd	bankrtd
1.366759956	0.832781654	0.732433668	0.537035388
othcrnd	othcrtnd	acardwdl	acashcr
2.351899357	0.974604132	1.886369073	-0.135176280
acashwd	abankcol	abankr	aothcr
0.142361803	1.366134649	0.700870691	0.064471833
sex_F	sex_M	card_no	card_yes
-0.041064372	0.041064372	-1.159222134	1.159222134
second_N	second_Y	frequency_After_Tr	frequency_Monthly
-1.404801373	1.404801373	4.285059016	-1.662754108
frequency_weekly	region_central Bohemia	region_east Bohemia	region_north Bohemia
2.156033814	2.174811441	2.293363435	2.877248083
region_north Moravia	region_Prague	region_south Bohemia	region_south Moravia
1.742452144	2.293363435	2.909145869	1.587480633
region_west Bohemia			
3.009337515			

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>

```

```
> kurtosis(x_final, na.rm = FALSE)
```

cardwdln	cardwdlt	cashcrn	cashcrt
22.967148	21.479050	2.651457	3.584050
cashwdn	cashwdt	bankcolt	bankcoln
2.713348	3.889648	6.599217	4.172114
bankrn	bankrt	othcrn	othcrt
5.050608	4.645882	6.341890	5.417253
days	age	cardwdlnd	cardwdltd
1.866496	1.856900	18.681014	23.635413
cashcrnd	cashcrtnd	cashwdnd	cashwdtd
1.898457	2.399363	2.965035	2.498627
bankcoltd	bankcolnd	bankrnd	bankrtd
3.392571	1.694382	2.697029	2.486098
othcrnd	othcrtnd	acardwdl	acashcr
8.099410	5.346633	5.741520	1.439593
acashwd	abankcol	abankr	aothcr
2.107415	3.388263	3.062860	2.587661
sex_F	sex_M	card_no	card_yes
1.001686	1.001686	2.343796	2.343796
second_N	second_Y	frequency_After_Tr	frequency_Monthly
2.973467	2.973467	19.361731	3.764751
frequency_weekly	region_central Bohemia	region_east Bohemia	region_north Bohemia
5.648482	5.729805	6.259516	9.278557
region_north Moravia	region_Prague	region_south Bohemia	region_south Moravia
4.036139	6.259516	9.463130	3.520095
region_west Bohemia			
10.056112			

```
>
```



```
> cov(X_final, y = NULL, use = "all.obs",
+      method = c("pearson", "kendall", "spearman"))
```

	cardwdln	cardwdlt	cashcrn	cashcrt	cashwdn	cashwdt
cardwdln	1.679819e+01	4.175893e+04	7.108459e+00	2.837741e+05	3.461856e+01	4.291605e+05
cardwdlt	4.175893e+04	1.104759e+08	1.241932e+04	6.287861e+08	9.173355e+04	1.254574e+09
cashcrn	7.108459e+00	1.241932e+04	1.143046e+03	2.395113e+07	1.016185e+03	8.630951e+06
cashcrt	2.837741e+05	6.287861e+08	2.395113e+07	6.338713e+11	2.325112e+07	3.121917e+11
cashwdn	3.461856e+01	9.173355e+04	1.016185e+03	2.325112e+07	3.778216e+03	3.152388e+07
cashwdt	4.291605e+05	1.254574e+09	8.630951e+06	3.121917e+11	3.152388e+07	4.486863e+11
bankcolt	2.487750e+05	8.843629e+08	-1.392162e+07	-2.949235e+11	1.331333e+07	1.650125e+11
bankcoln	2.840480e+00	1.292193e+04	-4.122631e+02	-9.052729e+06	3.477835e+02	2.895702e+06
bankrn	2.128421e+01	4.792763e+04	4.594216e+02	4.867020e+06	1.079589e+03	5.720579e+05
bankrt	4.390280e+04	1.014267e+08	1.375630e+06	2.401536e+10	4.870257e+06	2.418969e+10
othcrn	1.216022e+01	2.825223e+04	3.856076e+02	7.245943e+06	1.177196e+03	7.681437e+06
othcrt	5.211641e+03	1.370668e+07	6.905714e+04	1.809367e+09	2.336958e+05	2.328833e+09
days	3.249536e+02	8.215301e+05	9.740256e+03	1.835138e+08	2.944405e+04	2.028072e+08
age	-3.222854e+00	-8.167516e+03	-1.153024e+01	-3.588424e+05	-3.716559e+01	-5.146878e+05
cardwdlnd	1.147578e-02	2.863384e+01	-5.156414e-04	9.528954e+01	4.431790e-03	1.694243e+02
cardwdltd	2.862161e+01	7.678288e+04	-6.019662e+00	1.642874e+05	1.304912e+01	5.565153e+05
cashcrnd	-1.700071e-03	-8.699517e+00	5.741555e-01	1.256929e+04	2.211255e-02	1.240761e+03
cashcrtd	7.734666e+01	1.250050e+05	1.269674e+04	3.700225e+08	3.744596e+03	1.318293e+08
cashwdnd	3.280288e-03	1.109649e+01	8.537733e-02	4.579066e+03	7.205856e-01	8.937296e+03
cashwdtd	1.398476e+02	4.880916e+05	1.095468e+03	1.264453e+08	7.216126e+03	2.139045e+08
	bankcolt	bankcoln	bankrn	bankrt	othcrn	othcrt
cardwdln	2.487750e+05	2.840480e+00	2.128421e+01	4.390280e+04	1.216022e+01	5.211641e+03
cardwdlt	8.843629e+08	1.292193e+04	4.792763e+04	1.014267e+08	2.825223e+04	1.370668e+07
cashcrn	-1.392162e+07	-4.122631e+02	4.594216e+02	1.375630e+06	3.856076e+02	6.905714e+04
cashcrt	-2.949235e+11	-9.052729e+06	4.867020e+06	2.401536e+10	7.245943e+06	1.809367e+09
cashwdn	1.331333e+07	3.477835e+02	1.079589e+03	4.870257e+06	1.177196e+03	2.336958e+05
cashwdt	1.650125e+11	2.895702e+06	5.720579e+05	2.418969e+10	7.681437e+06	2.328833e+09
bankcolt	5.049808e+11	1.321166e+07	3.471449e+06	4.253350e+10	2.396349e+06	8.964488e+08
bankcoln	1.321166e+07	4.119957e+02	1.323380e+02	1.240419e+06	9.034671e+01	1.903253e+04
bankrn	3.471449e+06	1.323380e+02	2.958181e+03	7.816448e+06	5.084100e+02	6.168501e+04
bankrt	4.253350e+10	1.240419e+06	7.816448e+06	4.224968e+10	1.998009e+06	3.365907e+08
othcrn	2.396349e+06	9.034671e+01	5.084100e+02	1.998009e+06	7.059358e+02	1.032305e+05
othcrt	8.964488e+08	1.903253e+04	6.168501e+04	3.365907e+08	1.032305e+05	2.288604e+07
days	7.501535e+07	2.393240e+03	1.387209e+04	5.521954e+07	1.063491e+04	1.820002e+06
age	-1.591926e+05	4.432083e-01	5.604678e+00	1.078255e+04	-9.041659e+00	-3.849296e+03
cardwdlnd	1.142992e+02	-3.421802e-05	7.262428e-03	-2.767009e+00	5.906903e-04	2.332172e+00
cardwdltd	4.943633e+05	4.231427e+00	1.507803e+01	-1.167834e+04	-2.911200e-01	6.291254e+03

cardwdlnd	1.142992e+02	-3.421802e-05	7.262428e-03	-2.767009e+00	5.906903e-04	2.332172e+00
cardwdltd	4.943633e+05	4.231427e+00	1.507803e+01	-1.167834e+04	-2.911200e-01	6.291254e+03
cashcrnd	-1.154214e+04	-3.441042e-01	8.255751e-03	-2.300392e+02	1.030889e-02	5.047645e+00
cashcrt	-2.397556e+08	-7.368263e+03	-1.975118e+03	-3.828199e+06	2.552289e+02	4.652696e+05
cashwdnd	4.380549e+03	8.616139e-02	-1.035292e-01	-7.744766e+01	1.377649e-01	4.534031e+01
cashwdtd	8.179762e+07	8.925653e+02	-6.017299e+03	-8.978603e+06	1.803049e+00	7.050688e+05
	days	age	cardwdlnd	cardwdltd	cashcrnd	cashcrt
cardwdlnd	3.249536e+02	-3.222854e+00	1.147578e-02	2.862161e+01	-1.700071e-03	7.734666e+01
cardwdltd	8.215301e+05	-8.167516e+03	2.863384e+01	7.678288e+04	-8.699517e+00	1.250050e+05
cashcrn	9.740256e+03	-1.153024e+01	-5.156414e-04	-6.019662e+00	5.741555e-01	1.269674e+04
cashcrt	1.835138e+08	-3.588424e+05	9.528954e+01	1.642874e+05	1.256929e+04	3.700225e+08
cashwdn	2.944405e+04	-3.716559e+01	4.431790e-03	1.304912e+01	2.211255e-02	3.744596e+03
cashwdt	2.028072e+08	-5.146878e+05	1.694243e+02	5.565153e+05	1.240761e+03	1.318293e+08
bankcolt	7.501535e+07	-1.591926e+05	1.142992e+02	4.943633e+05	-1.154214e+04	-2.397556e+08
bankcoln	2.393240e+03	4.432083e-01	-3.421802e-05	4.231427e+00	-3.441042e-01	-7.368263e+03
bankrn	1.387209e+04	5.604678e+00	7.262428e-03	1.507803e+01	8.255751e-03	-1.975118e+03
bankrt	5.521954e+07	1.078255e+04	-2.767009e+00	-1.167834e+04	-2.300392e+02	-3.828199e+06
othcrn	1.063491e+04	-9.041659e+00	5.906903e-04	-2.911200e-01	1.030889e-02	2.552289e+02
othcrt	1.820002e+06	-3.849296e+03	2.332172e+00	6.291254e+03	5.047645e+00	4.652696e+05
days	2.705890e+05	-2.710554e+02	4.765026e-02	1.120454e+02	4.102651e-01	1.134271e+04
age	-2.710554e+02	1.604677e+02	-1.576494e-03	-3.714542e+00	-3.241043e-04	-9.508226e+01
cardwdlnd	4.765026e-02	-1.576494e-03	8.895916e-06	2.227062e-02	-9.602379e-07	7.025441e-02
cardwdltd	1.120454e+02	-3.714542e+00	2.227062e-02	6.053166e+01	-6.541902e-03	1.106483e+02
cashcrnd	4.102651e-01	-3.241043e-04	-9.602379e-07	-6.541902e-03	4.720801e-04	1.041811e+01
cashcrt	1.134271e+04	-9.508226e+01	7.025441e-02	1.106483e+02	1.041811e+01	3.086203e+05
cashwdnd	2.944047e+00	-1.471827e-02	7.862249e-07	4.317805e-03	-6.804758e-08	2.631878e+00
cashwdtd	4.400106e+03	-2.368767e+02	1.233241e-01	4.365114e+02	7.883247e-01	1.043521e+05
	cashwdnd	cashwdtd	bankcoltd	bankcoln	bankrnd	bankrtd
cardwdlnd	3.280288e-03	1.398476e+02	8.331459e+01	-9.527067e-04	5.921725e-03	-9.267697e+00
cardwdltd	1.109649e+01	4.880916e+05	4.179588e+05	1.971100e+00	1.216697e+01	-2.628331e+04
cashcrn	8.537733e-02	1.095468e+03	-1.215243e+04	-3.617593e-01	2.003129e-02	-2.201681e+02
cashcrt	4.579066e+03	1.264453e+08	-2.523353e+08	-7.734561e+03	-1.940884e+03	-4.378091e+06
cashwdn	7.205856e-01	7.216126e+03	2.132153e+03	1.993293e-02	-1.636458e-01	-4.150346e+02
cashwdt	8.937296e+03	2.139045e+08	7.035782e+07	5.643481e+02	-5.558668e+03	-7.934777e+06
bankcolt	4.380549e+03	8.179762e+07	3.390749e+08	8.685176e+03	-1.622377e+02	1.818810e+07
bankcoln	8.616139e-02	8.925653e+02	8.673756e+03	2.693635e-01	8.701248e-03	4.816959e+02
bankrn	-1.035292e-01	-6.017299e+03	-1.160943e+03	-2.041228e-02	1.594486e+00	3.454077e+03
bankrt	-7.744766e+01	-8.978603e+06	1.458065e+07	3.771522e+02	3.507524e+03	2.170931e+07
othcrn	1.377649e-01	1.803049e+00	-7.377838e+02	-1.195960e-02	1.925749e-03	-5.641215e+01

othcrt	4.534031e+01	7.050688e+05	1.978873e+05	-3.130562e-01	-1.423684e+01	-6.679804e+03
days	2.944047e+00	4.400106e+03	-1.381984e+04	-3.921165e-01	9.380337e-01	2.648590e+03
age	-1.471827e-02	-2.368767e+02	-5.264307e+01	1.989416e-03	1.906515e-02	8.060436e+01
cardwdlnd	7.862249e-07	1.233241e-01	7.920636e-02	-6.630820e-07	4.868197e-06	-6.286427e-03
cardwdltd	4.317805e-03	4.365114e+02	3.981561e+02	2.267224e-03	1.134786e-02	-1.446438e+01
cashcrnd	-6.804758e-08	7.883247e-01	-9.773121e+00	-2.897264e-04	6.451214e-06	-1.423919e-01
cashcrt	2.631878e+00	1.043521e+05	-2.039090e+05	-6.244933e+00	-1.498059e+00	-1.417579e+03
cashwdnd	3.747882e-04	5.810629e+00	2.731196e+00	4.382163e-05	-1.641329e-04	-4.338063e-01
cashwdtd	5.810629e+00	1.783272e+05	7.161536e+04	7.802956e-01	-4.546263e+00	-5.694987e+03
	othcrnd	othcrt	acardwdl	acashcr	acashwd	abankcol
cardwdln	-7.670699e-04	2.125164e+00	2.832072e+03	2.765733e+03	1.248661e+03	2.526469e+03
cardwdlt	-3.387330e+00	5.825791e+03	7.944807e+06	5.368517e+06	4.463812e+06	1.269221e+07
cashcrn	7.967644e-03	5.332245e+00	-2.643237e+02	1.948612e+05	2.274001e+03	-3.721780e+05
cashcrt	7.364407e+01	4.473038e+05	6.868503e+07	5.869329e+09	9.679952e+08	-7.726585e+09
cashwdn	6.295915e-02	3.455917e+01	4.267246e+03	5.738149e+04	2.072403e+04	6.431118e+04
cashwdt	1.098880e+02	7.375710e+05	1.515641e+08	1.720201e+09	1.530003e+09	2.148103e+09
bankcolt	-9.941745e+01	3.120032e+05	9.405498e+07	-4.254110e+09	5.062777e+08	1.037428e+10
bankcoln	6.463538e-03	2.993517e+00	8.631722e+02	-1.311115e+05	2.887419e+03	2.653269e+05
bankrn	-1.422573e-02	-1.597350e+01	-2.589155e+03	-3.483943e+04	-5.594291e+04	-3.616882e+04
bankrt	-8.058178e+01	-6.843279e+03	-4.541516e+06	-1.412813e+08	-8.452560e+07	4.446714e+08
othcrn	2.099356e-01	2.350140e+01	-1.740475e+02	9.367904e+03	-1.029511e+04	-2.284623e+04
othcrt	2.276578e+01	7.638879e+03	1.210239e+06	7.586480e+06	3.948947e+06	5.990875e+06
days	3.760965e-01	8.315652e+01	9.600182e+03	3.145958e+05	-1.738466e+05	-4.300207e+05
age	-2.336016e-04	-1.384246e+00	-5.183667e+02	-1.887879e+03	-8.431330e+02	-1.726919e+03
cardwdlnd	-1.755014e-06	1.560732e-03	2.250832e+00	1.983484e+00	1.274598e+00	2.386304e+00
cardwdltd	-5.332429e-03	4.394132e+00	6.403946e+03	3.492297e+03	4.442145e+03	1.203229e+04
cashcrnd	-1.135004e-05	1.414268e-03	-5.794597e-01	1.551072e+02	5.073999e+00	-2.992898e+02
cashcrt	-3.703371e-01	3.056887e+02	5.198672e+04	4.778137e+06	8.746852e+05	-6.243612e+06
cashwdnd	2.807365e-05	2.249678e-02	3.248978e+00	2.558260e+01	3.127323e+01	8.339347e+01
cashwdtd	-1.625851e-01	5.582856e+02	1.338573e+05	1.175121e+06	1.410749e+06	2.192725e+06
	abankr	aothcr	sex_F	sex_M	card_no	card_yes
cardwdln	-8.205286e+02	6.233457e+01	-1.474371e-01	1.474371e-01	-1.063814e+00	1.063814e+00
cardwdlt	-1.733974e+06	1.771715e+05	-3.804423e+02	3.804423e+02	-2.736814e+03	2.736814e+03
cashcrn	-5.249067e+03	3.159856e+01	-5.494335e-01	5.494335e-01	3.509373e-01	-3.509373e-01
cashcrt	6.710194e+07	1.059181e+07	-1.451506e+04	1.451506e+04	-2.543896e+04	2.543896e+04
cashwdn	3.459085e+03	6.279063e+02	-3.236787e-01	3.236787e-01	-3.846681e-01	3.846681e-01
cashwdt	2.794262e+08	1.932036e+07	-7.496567e+03	7.496567e+03	-5.002126e+04	5.002126e+04
bankcolt	3.560717e+08	9.591009e+06	3.135237e+03	-3.135237e+03	-2.833433e+04	2.833433e+04
bankcoln	6.612055e+03	9.086440e+01	-1.412620e-01	1.412620e-01	-9.903497e-02	9.903497e-02
bankrn	4.020381e-04	4.412820e-02	6.714724e-01	6.714724e-01	1.402216e+00	1.402216e+00

bankrt	1.396501e+08	-1.340118e+05	-3.542028e+03	3.542028e+03	1.923774e+03	-1.923774e+03
othcrn	-3.542841e+03	-2.044999e+02	3.661512e-01	-3.661512e-01	7.070851e-01	-7.070851e-01
othcrt	6.691701e+05	1.036094e+05	-1.993602e+01	1.993602e+01	-3.472074e+02	3.472074e+02
days	-4.974744e+04	6.877454e+00	-3.452672e+00	3.452672e+00	7.027452e+00	-7.027452e+00
age	7.699079e+02	-2.749460e+01	-5.776849e-01	5.776849e-01	1.031518e-01	-1.031518e-01
cardwdlnd	-6.036629e-01	5.136532e-02	-9.747087e-05	9.747087e-05	-8.422344e-04	8.422344e-04
cardwdltd	-1.197274e+03	1.469820e+02	-2.683083e-01	2.683083e-01	-2.173255e+00	2.173255e+00
cashcrnd	-2.548385e+00	4.676242e-02	-4.689947e-04	4.689947e-04	9.640693e-05	-9.640693e-05
cashcrt	1.032707e+05	9.295937e+03	-1.417002e+01	1.417002e+01	-2.579743e+01	2.579743e+01
cashwdnd	6.181197e+00	5.122874e-01	-6.522209e-05	6.522209e-05	-9.842350e-04	9.842350e-04
cashwdtd	2.774230e+05	1.607198e+04	-5.634086e+00	5.634086e+00	-5.048258e+01	5.048258e+01
	second_N	second_Y	frequency_After_Tr	frequency_Monthly	frequency_weekly	
cardwdlnd	-5.848954e-02	5.848954e-02	1.280677e-02	8.669543e-02	-9.950220e-02	
cardwdltd	-1.604618e+02	1.604618e+02	8.768630e+01	1.328071e+02	-2.204934e+02	
cashcrn	1.701935e-01	-1.701935e-01	1.751091e-01	-3.063353e-01	1.312263e-01	
cashcrt	1.731113e+04	-1.731113e+04	8.561276e+03	-3.000084e+04	2.143956e+04	
cashwdn	-2.157212e-01	2.157212e-01	3.401286e-01	-1.788693e+00	1.448564e+00	
cashwdt	9.177402e+03	-9.177402e+03	1.199647e+04	-5.326493e+04	4.126846e+04	
bankcolt	-1.925994e+04	1.925994e+04	5.110239e+03	-2.826765e+04	2.315741e+04	
bankcoln	-5.015912e-01	5.015912e-01	1.448749e-01	-7.064133e-01	5.615384e-01	
bankrn	-1.155119e+00	1.155119e+00	-2.699239e-01	7.964224e-01	-5.264985e-01	
bankrt	-1.056384e+04	1.056384e+04	1.655559e+03	-4.769560e+03	3.114001e+03	
othcrn	-2.132581e-01	2.132581e-01	8.016932e-02	-1.470367e-01	6.686734e-02	
othcrt	-6.477723e+01	6.477723e+01	3.657539e+01	-1.726416e+02	1.360662e+02	
days	-7.779081e+00	7.779081e+00	2.718768e+00	-1.072683e+01	8.008066e+00	
age	-2.092420e-01	2.092420e-01	4.856049e-02	-1.100458e-01	6.148532e-02	
cardwdlnd	-3.873356e-05	3.873356e-05	1.564229e-05	6.092396e-05	-7.656625e-05	
cardwdltd	-1.151651e-01	1.151651e-01	8.892193e-02	8.213462e-02	-1.710565e-01	
cashcrnd	7.261304e-05	-7.261304e-05	1.441226e-04	-3.300199e-05	-1.111206e-04	
cashcrt	1.229710e+01	-1.229710e+01	7.157646e+00	-1.908567e+01	1.192803e+01	
cashwdnd	4.144128e-04	-4.144128e-04	8.095870e-05	-6.219995e-04	5.410408e-04	
cashwdtd	1.269590e+01	-1.269590e+01	7.350831e+00	-3.349366e+01	2.614283e+01	
	region_central	Bohemia	region_east	Bohemia	region_north	Bohemia
cardwdlnd	2.428721e-03		-2.181543e-02		3.625210e-02	3.002958e-02
cardwdltd	-2.072810e+01		-3.902317e+01		1.015408e+02	4.008724e+01
cashcrn	-8.371680e-01		-7.337838e-02		2.585447e-01	-5.495519e-01
cashcrt	-1.610918e+04		-3.502661e+01		2.435371e+03	-4.099865e+03
cashwdn	-1.800440e-01		-2.674048e-01		-8.751706e-01	-1.004982e+00
cashwdt	-5.884573e+02		-1.840151e+03		-9.905200e+03	3.224893e+03
bankcolt	1.476016e+04		-2.974600e+03		-1.136599e+04	4.605119e+03

cashwdn	-1.800440e-01	-2.674048e-01	-8.751706e-01	-1.004982e+00
cashwdt	-5.884573e+02	-1.840151e+03	-9.905200e+03	3.224893e+03
bankcolt	1.476016e+04	-2.974600e+03	-1.136599e+04	4.605119e+03
bankcoln	3.778168e-01	6.843912e-02	-2.805043e-01	-1.242566e-01
bankrn	-1.429716e-01	1.126685e-01	6.195435e-01	-6.979042e-01
bankrt	-7.606790e+02	-1.288356e+03	3.159569e+02	-2.620105e+03
othcrn	-2.900341e-01	-1.348198e-01	-4.815844e-01	-8.981961e-02
othcrt	-2.929322e+01	2.473886e+00	-5.107301e+01	-1.620070e+01
days	-2.270040e+00	7.074339e-01	-2.636135e+00	-1.236324e+01
age	-7.495350e-02	-1.546995e-01	1.017067e-01	1.667382e-02
cardwdlnd	-1.203286e-05	-3.049332e-05	4.489062e-05	3.482116e-05
cardwdltd	-4.641851e-02	-6.376081e-02	1.256446e-01	6.035906e-02
cashcrnd	-4.894301e-04	-9.830093e-06	2.170658e-04	-1.419413e-04
cashcrt	-6.450948e+00	1.277059e+00	1.116095e+00	6.156763e-01
cashwdnd	1.187912e-04	-2.082158e-04	-4.344789e-04	1.990600e-04
cashwdtd	4.305160e+00	-8.923934e-01	-7.893393e+00	1.071069e+01

	region_Prague	region_south Bohemia	region_south Moravia	region_west Bohemia
cardwdlnd	-3.356286e-02	-8.659854e-03	-3.895643e-02	3.428415e-02
cardwdltd	-8.028602e+01	1.657774e+01	-6.120807e+01	4.303960e+01
cashcrn	5.815409e-01	-5.439172e-01	2.356441e-01	9.282860e-01
cashcrt	1.070576e+04	-1.098904e+04	1.094400e+01	1.808105e+04
cashwdn	9.440490e-01	7.771907e-02	2.754660e-01	1.030368e+00
cashwdt	2.543941e+03	3.538304e+03	-2.143124e+03	5.169795e+03
bankcolt	-2.503532e+03	1.221620e+04	-4.337087e+03	-1.040027e+04
bankcoln	-5.197204e-02	4.388578e-01	-7.231473e-02	-3.560660e-01
bankrn	9.643572e-01	-6.474436e-01	-5.043385e-01	2.960886e-01
bankrt	5.788687e+03	-1.874020e+03	-2.176493e+03	2.615009e+03
othcrn	6.361053e-01	1.760823e-02	7.845974e-02	2.640846e-01
othcrt	8.287036e+01	-3.145197e+01	1.774761e+01	2.492704e+01
days	1.021404e+01	-3.773272e+00	4.321788e-01	9.689033e+00
age	-2.278093e-01	3.823782e-01	-4.691449e-03	-3.860495e-02
cardwdlnd	-8.098316e-06	-5.865275e-06	-5.717569e-05	3.395369e-05
cardwdltd	-2.596977e-02	2.717748e-02	-1.255534e-01	4.852138e-02
cashcrnd	2.551347e-04	-2.978736e-04	1.486120e-04	3.182627e-04
cashcrt	7.308190e+00	-6.698591e+00	-2.701660e+00	5.534179e+00
cashwdnd	2.435396e-05	3.489543e-04	-7.346041e-05	2.499559e-05
cashwdtd	-2.297796e-01	5.016543e+00	-6.414997e+00	-4.601830e+00

[reached getoption("max.print") -- omitted 29 rows]

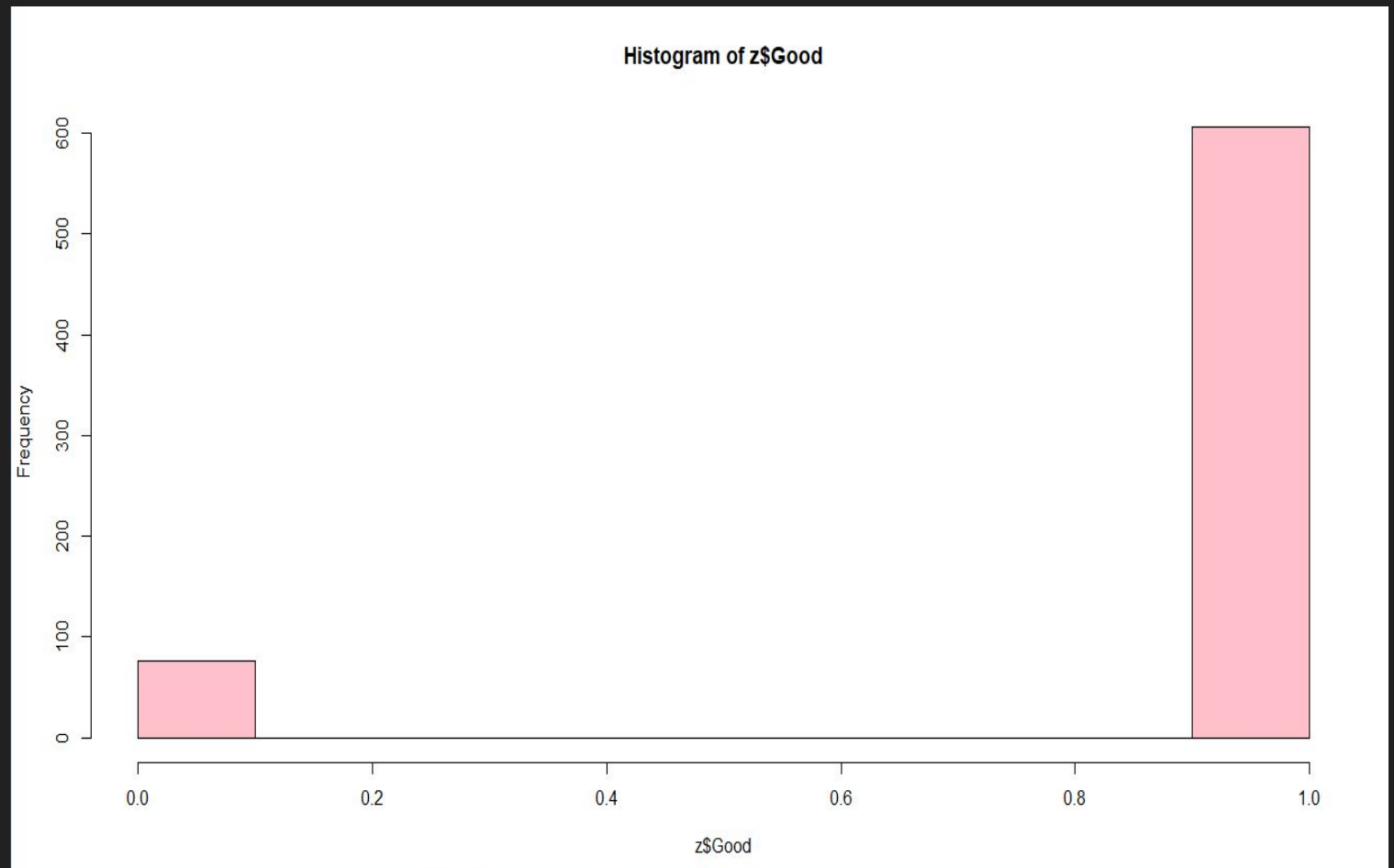
>

Code after calculating covariance

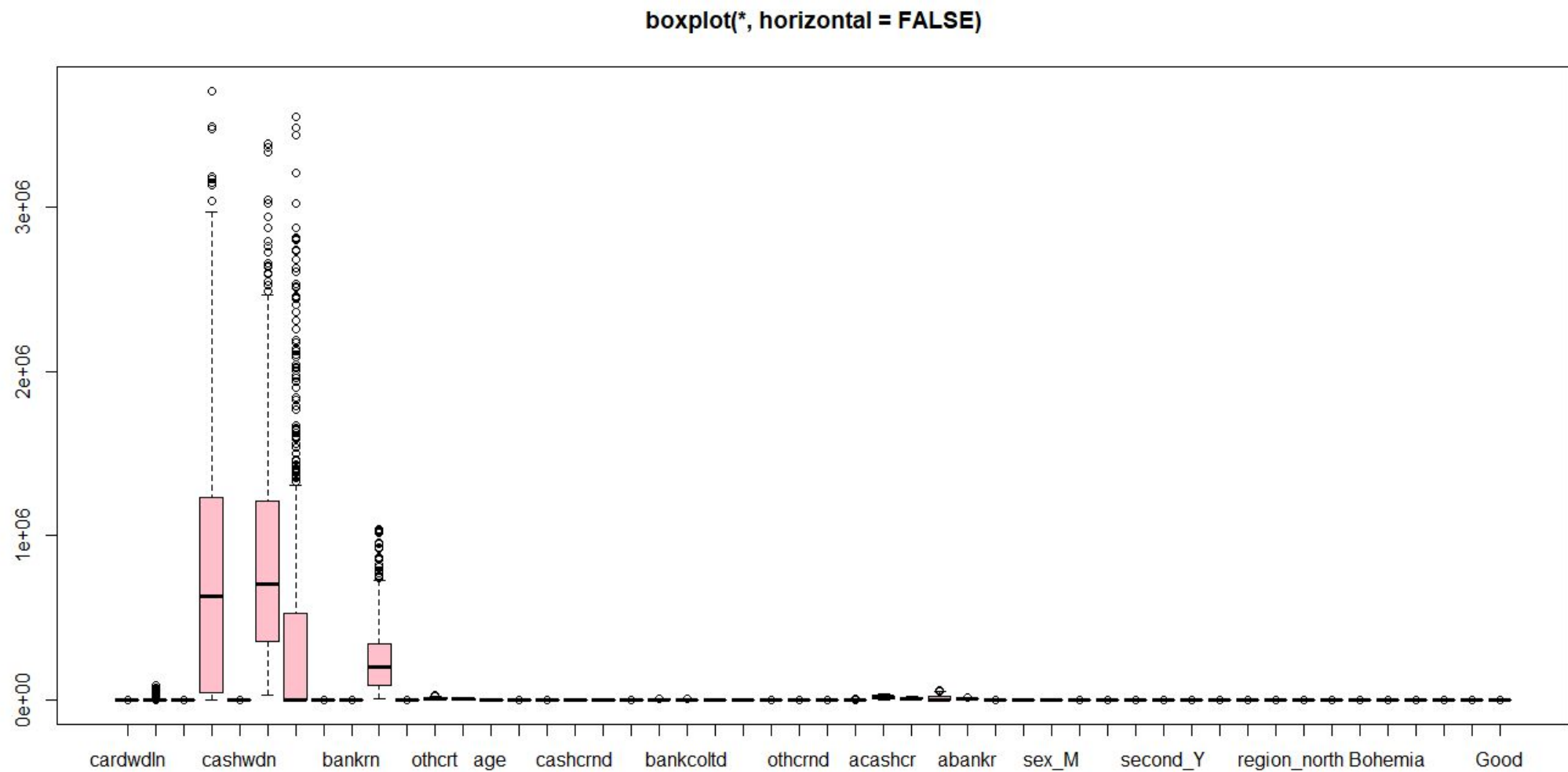
```
cor(x_final, y = NULL, use = "all.obs",  
    method = c("pearson"))  
z = cbind(x_final, Good = y_final)  
View(z)  
colnames(z)
```


Code to Visualize the data

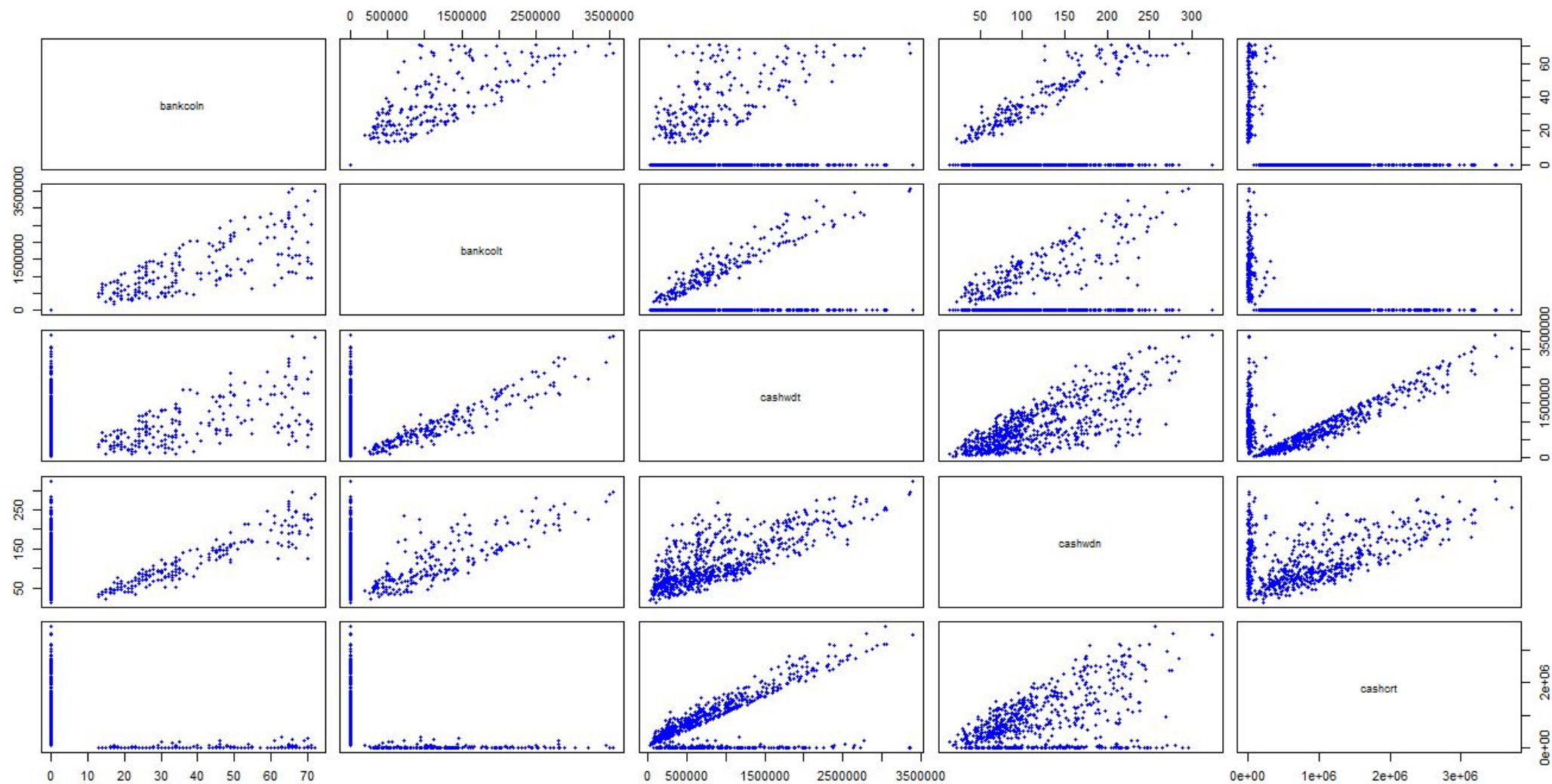
```
hist(z$Good,cl='pink')
```



```
boxplot(z, main = "boxplot(*, horizontal = FALSE)", horizontal = FALSE, col='pink')
```




```
pairs(z[,8:4], pch = 20, col = 'blue')
```



Code for Model Fitting

```
logreg <- glm(Good~., data =z, family = binomial)  
summary(logreg)
```


Code for Accessing Significant variables

```
sign_var=z[c(1,4,6,7,9,18,19,20,21,24,28,29,32,34)]
```

```
sign_var
```

Code for Stepwise Regression

```
step.model <- step(logreg,direction = "both",trace = 1)  
summary(step.model)  
AIC(step.model)  
BIC(step.model)
```


Results of stepwise regression

```
> summary(step.model)
```

Call:
glm(formula = Good ~ cashcrt + cashwdn + cashwdt + bankcolt +
bankrt + othcrt + days + cashcrnd + cashcrt + cashwdnd +
cashwdtd + bankcoltd + bankcolnd + bankrtd + acardwdl + acashcr +
acashwd + abankcol + aothcr + card_no + second_N + `region_north Bohemia` +
`region_west Bohemia`, family = binomial, data = z)

Deviance Residuals:

Min	1Q	Median	3Q	Max
-3.15785	0.00003	0.03742	0.20651	1.94556

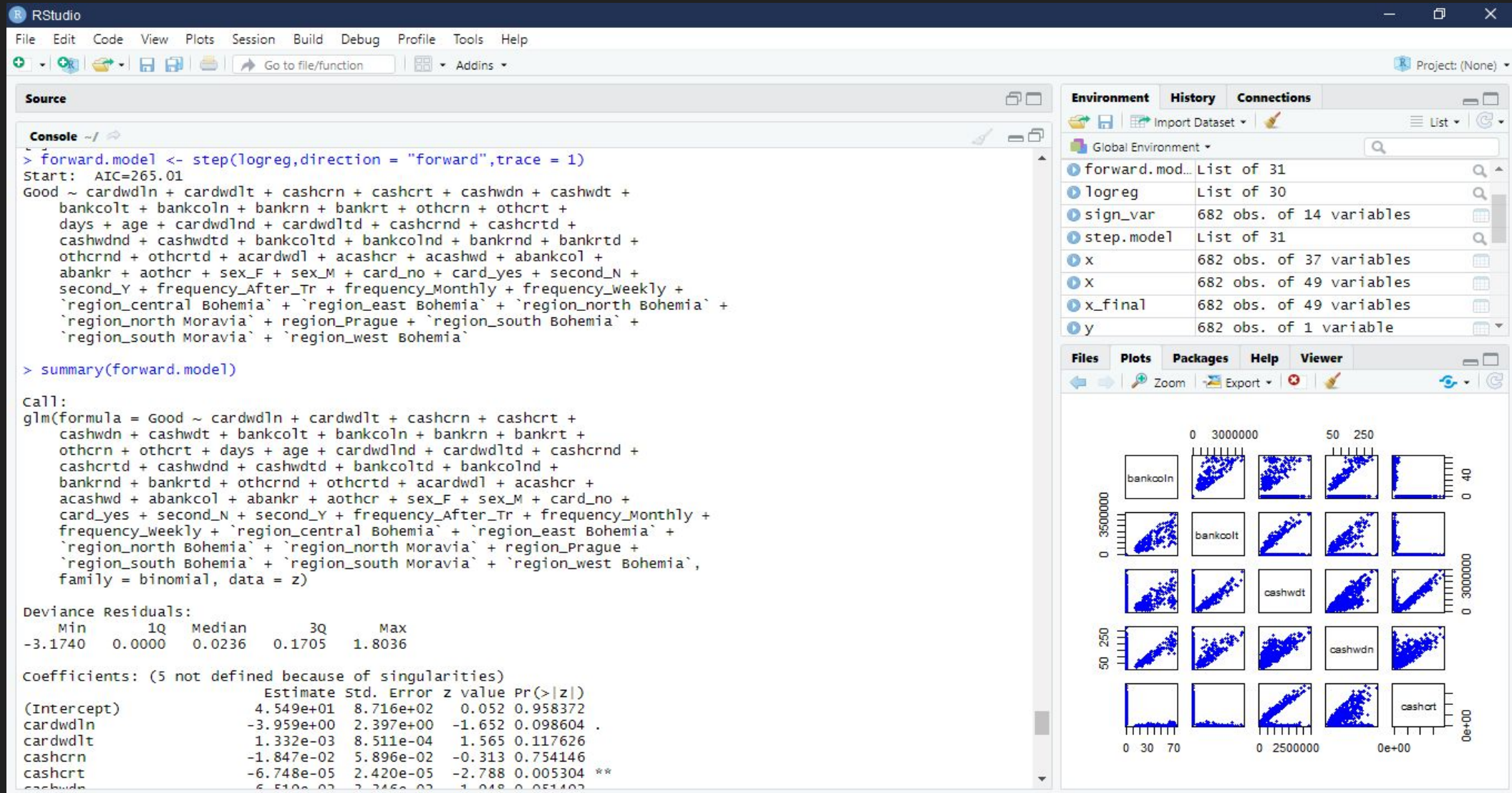
Coefficients:

	Estimate	Std. Error	z value	Pr(> z)	
(Intercept)	3.624e+01	1.148e+03	0.032	0.97482	
cashcrt	-5.502e-05	2.154e-05	-2.554	0.01065	*
cashwdn	5.318e-02	3.019e-02	1.762	0.07815	.
cashwdt	5.417e-05	2.213e-05	2.448	0.01437	*
bankcolt	-5.538e-05	2.149e-05	-2.577	0.00997	**
bankrt	5.873e-05	2.180e-05	2.694	0.00707	**
othcrt	1.086e-04	6.573e-05	1.652	0.09858	.
days	-5.146e-03	2.666e-03	-1.930	0.05358	.
cashcrnd	-1.702e+02	5.487e+01	-3.102	0.00192	**
cashcrt	7.441e-02	2.712e-02	2.744	0.00608	**
cashwdnd	-1.051e+02	5.502e+01	-1.911	0.05600	.
cashwdtd	-6.380e-02	2.727e-02	-2.339	0.01931	*
bankcoltd	1.493e-01	6.246e-02	2.389	0.01687	*
bankcolnd	-1.120e+02	5.622e+01	-1.991	0.04645	*
bankrtd	-6.708e-02	2.631e-02	-2.549	0.01080	*
acardwdl	-9.884e-04	4.121e-04	-2.398	0.01648	*
acashcr	-5.197e-04	1.328e-04	-3.913	9.10e-05	***
acashwd	-7.967e-04	3.283e-04	-2.427	0.01523	*
abankcol	-2.782e-03	1.693e-03	-1.643	0.10042	
aothcr	7.122e-02	9.680e-03	7.358	1.87e-13	***
card_no	-3.643e+00	1.375e+00	-2.650	0.00806	**
second_N	-1.800e+01	1.148e+03	-0.016	0.98749	
`region_north Bohemia`	2.279e+00	1.253e+00	1.819	0.06896	.
`region_west Bohemia`	-9.024e-01	5.695e-01	-1.584	0.11308	

Code for Forward Regression

```
forward.model <- step(logreg,direction = "forward",trace = 1)  
summary(forward.model)  
AIC(forward.model)  
BIC(forward.model)
```


Results of forward regression



	Estimate	Std. Error	z value	Pr(> z)	
(Intercept)	4.549e+01	8.716e+02	0.052	0.958372	
cardwdln	-3.959e+00	2.397e+00	-1.652	0.098604	.
cardwdlt	1.332e-03	8.511e-04	1.565	0.117626	
cashcrn	-1.847e-02	5.896e-02	-0.313	0.754146	
cashcrt	-6.748e-05	2.420e-05	-2.788	0.005304	**
cashwdn	6.519e-02	3.346e-02	1.948	0.051402	.
cashwdt	6.618e-05	2.429e-05	2.725	0.006433	**
bankcolt	-6.725e-05	2.424e-05	-2.774	0.005531	**
bankcoln	-4.773e-02	9.783e-02	-0.488	0.625631	
bankrn	2.347e-02	1.953e-02	1.202	0.229439	
bankrt	6.840e-05	2.483e-05	2.754	0.005882	**
othcrn	-2.316e-02	5.747e-02	-0.403	0.687011	
othcrt	4.184e-04	4.435e-04	0.943	0.345444	
days	-6.223e-03	3.810e-03	-1.633	0.102435	
age	-2.377e-02	1.849e-02	-1.286	0.198474	
cardwdlnd	6.151e+03	4.499e+03	1.367	0.171568	
cardwdltd	-1.945e+00	1.531e+00	-1.270	0.204019	
cashcrnd	-1.741e+02	1.006e+02	-1.730	0.083588	.
cashcrtnd	8.436e-02	2.871e-02	2.938	0.003301	**
cashwdnd	-1.344e+02	6.208e+01	-2.165	0.030373	*
cashwdtd	-7.024e-02	2.822e-02	-2.489	0.012803	*
bankcoltd	1.760e-01	7.321e-02	2.404	0.016226	*
bankcolnd	-8.156e+01	1.205e+02	-0.677	0.498399	
bankrnd	-3.681e+01	2.553e+01	-1.442	0.149271	
bankrtd	-7.036e-02	2.854e-02	-2.465	0.013691	*
othcrnd	5.533e+00	8.135e+01	0.068	0.945780	
othcrtnd	-3.000e-01	6.880e-01	-0.436	0.662851	
acarwdl	-1.273e-03	6.897e-04	-1.846	0.064932	.
acashcr	-5.432e-04	1.489e-04	-3.649	0.000264	***
acashwd	-1.058e-03	4.148e-04	-2.551	0.010744	*
abankcol	-3.370e-03	1.999e-03	-1.686	0.091857	.
abankr	-2.143e-04	1.644e-04	-1.304	0.192355	
aothcr	7.170e-02	1.671e-02	4.292	1.77e-05	***
sex_F	2.078e-01	4.691e-01	0.443	0.657796	
sex_M	NA	NA	NA	NA	
card_no	-4.484e+00	2.016e+00	-2.224	0.026142	*
card_yes	NA	NA	NA	NA	
second_N	-2.046e+01	8.715e+02	-0.023	0.981270	
second_Y	NA	NA	NA	NA	

second_Y	NA	NA	NA	NA
frequency_After_Tr	-4.905e-01	9.733e-01	-0.504	0.614294
frequency_Monthly	-6.629e-01	6.513e-01	-1.018	0.308748
frequency_Weekly	NA	NA	NA	NA
`region_central Bohemia`	8.557e-01	8.530e-01	1.003	0.315750
`region_east Bohemia`	1.255e-01	8.261e-01	0.152	0.879221
`region_north Bohemia`	3.099e+00	1.406e+00	2.205	0.027448 *
`region_north Moravia`	1.059e+00	7.983e-01	1.327	0.184611
region_Prague	8.971e-01	8.606e-01	1.042	0.297220
`region_south Bohemia`	5.121e-01	9.244e-01	0.554	0.579559
`region_south Moravia`	1.630e+00	8.099e-01	2.013	0.044149 *
`region_west Bohemia`	NA	NA	NA	NA

 Signif. codes: 0 '****' 0.001 '***' 0.01 '**' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 476.73 on 681 degrees of freedom
 Residual deviance: 175.01 on 637 degrees of freedom
 AIC: 265.01

Number of Fisher Scoring iterations: 19

```
> AIC(forward.model)
[1] 265.0111
> BIC(forward.model)
[1] 468.6375
>
```

Code for Backward Regression

```
backward.model <- step(logreg,direction = "backward",trace = 1)  
summary(backward.model)  
AIC(backward.model)  
BIC(backward.model)
```


Results for backward regression

```
> summary(backward.model)

Call:
glm(formula = Good ~ cashcrt + cashwdn + cashwdt + bankcolt +
    bankrt + othcrt + days + cashcrnd + cashcrt + cashwdnd +
    cashwdtd + bankcoltd + bankcolnd + bankrtd + acardwdl + acashcr +
    acashwd + abankcol + aothcr + card_no + second_N + `region_north Bohemia`,
    family = binomial, data = z)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-3.10297  0.00003  0.04153  0.21914  2.03085

Coefficients:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)   3.593e+01  1.160e+03   0.031  0.975284
cashcrt       -5.722e-05  2.141e-05  -2.673  0.007517 **
cashwdn       4.828e-02  2.968e-02   1.627  0.103790
cashwdt       5.645e-05  2.196e-05   2.571  0.010131 *
bankcolt     -5.731e-05  2.136e-05  -2.683  0.007292 **
bankrt        6.113e-05  2.166e-05   2.823  0.004764 **
othcrt        1.102e-04  6.590e-05   1.673  0.094388 .
days        -4.752e-03  2.621e-03  -1.813  0.069837 .
cashcrnd     -1.679e+02  5.425e+01  -3.095  0.001966 **
cashcrt       7.673e-02  2.709e-02   2.832  0.004624 **
cashwdnd     -1.052e+02  5.415e+01  -1.942  0.052123 .
cashwdtd     -6.567e-02  2.714e-02  -2.420  0.015520 *
bankcoltd     1.475e-01  6.151e-02   2.398  0.016482 *
bankcolnd    -1.086e+02  5.550e+01  -1.956  0.050420 .
bankrtd      -7.012e-02  2.625e-02  -2.671  0.007568 **
acardwdl     -9.552e-04  4.086e-04  -2.338  0.019412 *
acashcr      -5.082e-04  1.309e-04  -3.882  0.000104 ***
acashwd      -8.297e-04  3.265e-04  -2.542  0.011037 *
abankcol     -2.652e-03  1.653e-03  -1.605  0.108596
aothcr       6.932e-02  9.419e-03   7.359  1.85e-13 ***
card_no      -3.537e+00  1.367e+00  -2.586  0.009697 **
second_N     -1.798e+01  1.160e+03  -0.016  0.987629
`region_north Bohemia` 2.389e+00  1.246e+00   1.917  0.055213 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
`region_north Bohemia` 2.389e+00 1.246e+00 1.917 0.055213 .  
---  
signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
  
(Dispersion parameter for binomial family taken to be 1)  
  
Null deviance: 476.73 on 681 degrees of freedom  
Residual deviance: 192.49 on 659 degrees of freedom  
AIC: 238.49  
  
Number of Fisher Scoring iterations: 19  
  
> |
```

```
Number of Fisher Scoring iterations: 19  
  
> AIC(backward.model)  
[1] 238.4932  
> BIC(backward.model)  
[1] 342.5689  
> |
```


THANK YOU