> df$Plant<-as.factor(df$Plant)

> df$Product\_Line<-as.factor(df$Product\_Line)

> mlr<-lm(df$Sales\_Transportation~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Sales\_Transportation ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-34272 -82 12 83 342056

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) -6.692e+02 2.272e+02 -2.945 0.003231 \*\*

df$Quantity\_units 1.041e-02 5.026e-03 2.071 0.038353 \*

df$N\_Parts 1.208e+01 1.209e+00 9.994 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes -4.618e-02 1.631e-02 -2.832 0.004627 \*\*

df$Machinery\_Minutes -3.162e-03 1.084e-02 -0.292 0.770452

df$Number\_of\_Deliveries 4.284e+01 1.110e+00 38.607 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -1.399e-02 2.139e-02 -0.654 0.513072

df$Turnover\_Range\_EUROb 20-100 -3.997e+01 5.513e+01 -0.725 0.468449

df$Turnover\_Range\_EUROc 100-250 -1.608e+01 5.461e+01 -0.294 0.768443

df$Turnover\_Range\_EUROd 250-500 -3.139e+01 5.482e+01 -0.573 0.566868

df$Turnover\_Range\_EUROe >500 -1.683e+01 4.844e+01 -0.347 0.728262

df$Turnover\_Range\_EUROStrategic 1.692e+02 6.458e+01 2.620 0.008798 \*\*

df$Customer\_ClassOthers -8.444e+00 2.993e+01 -0.282 0.777830

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -5.051e+02 2.461e+02 -2.052 0.040143 \*

df$Product\_LineCables -1.026e+02 2.252e+02 -0.455 0.648778

df$Product\_LineCables China 1.094e+03 2.804e+02 3.900 9.65e-05 \*\*\*

df$Product\_LineHigh-Tech Cables 5.895e+02 6.922e+02 0.852 0.394413

df$Product\_LineMIVI 8.516e+01 2.972e+02 0.287 0.774435

df$Product\_LinePlugs and Caps 5.296e+02 2.129e+02 2.488 0.012856 \*

df$Product\_LineProfiles 3.390e+02 2.134e+02 1.588 0.112201

df$Product\_LineProfiles Trading 6.313e+02 2.911e+02 2.168 0.030136 \*

df$Product\_LinePull Cables 1.643e+04 3.485e+02 47.132 < 2e-16 \*\*\*

df$Product\_LinePull Cables China 4.818e+02 6.208e+02 0.776 0.437741

df$Product\_LineResidual Springs 6.559e+02 2.293e+02 2.861 0.004228 \*\*

df$Product\_LineSprings 3.294e+02 2.090e+02 1.576 0.114947

df$Product\_LineSprings China 6.070e+02 2.637e+02 2.302 0.021335 \*

df$Product\_LineSprings Trading 8.306e+02 2.485e+02 3.342 0.000833 \*\*\*

df$Product\_LineTP 821 -6.494e+02 2.689e+02 -2.415 0.015725 \*

df$Product\_LineTP 821-822 7.907e+03 1.107e+03 7.145 9.19e-13 \*\*\*

df$PlantChina -7.852e+02 3.701e+02 -2.122 0.033864 \*

df$PlantFRA 4.614e+01 4.481e+02 0.103 0.917979

df$PlantIND 1.504e+02 8.134e+02 0.185 0.853348

df$PlantNorthern Italy 1.479e+01 8.448e+01 0.175 0.860997

df$PlantSouthern Italy 7.099e+01 8.820e+01 0.805 0.420902

df$PlantSpain 9.776e+01 8.195e+01 1.193 0.232934

df$PlantUK 2.320e+01 9.440e+01 0.246 0.805880

df$PlantUSA -3.326e+01 8.790e+01 -0.378 0.705095

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2288 on 32341 degrees of freedom

Multiple R-squared: 0.1642, Adjusted R-squared: 0.1632

F-statistic: 176.5 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Packing~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Packing ~ df$Quantity\_units + df$N\_Parts + df$Assembly\_Labour\_Minutes +

df$Machinery\_Minutes + df$Number\_of\_Deliveries + df$Average\_Delivery\_Batch\_Size\_units +

df$Turnover\_Range\_EURO + df$Customer\_Class + df$Product\_Line +

df$Plant)

Residuals:

Min 1Q Median 3Q Max

-10167 -53 -2 29 137541

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 2.892e+02 9.550e+01 3.029 0.002459 \*\*

df$Quantity\_units 7.461e-03 2.112e-03 3.532 0.000413 \*\*\*

df$N\_Parts 5.529e+00 5.082e-01 10.880 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes -5.631e-03 6.854e-03 -0.822 0.411334

df$Machinery\_Minutes 2.493e-03 4.554e-03 0.547 0.584087

df$Number\_of\_Deliveries 3.342e+00 4.664e-01 7.167 7.84e-13 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -1.668e-02 8.989e-03 -1.855 0.063540 .

df$Turnover\_Range\_EUROb 20-100 -7.395e+00 2.317e+01 -0.319 0.749603

df$Turnover\_Range\_EUROc 100-250 4.480e+00 2.295e+01 0.195 0.845243

df$Turnover\_Range\_EUROd 250-500 1.210e+00 2.304e+01 0.053 0.958124

df$Turnover\_Range\_EUROe >500 2.615e+01 2.036e+01 1.284 0.199059

df$Turnover\_Range\_EUROStrategic 1.255e+02 2.714e+01 4.623 3.81e-06 \*\*\*

df$Customer\_ClassOthers -3.340e+01 1.258e+01 -2.655 0.007930 \*\*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -4.130e+02 1.034e+02 -3.992 6.57e-05 \*\*\*

df$Product\_LineCables -4.963e+02 9.465e+01 -5.244 1.58e-07 \*\*\*

df$Product\_LineCables China -6.131e+02 1.179e+02 -5.201 1.99e-07 \*\*\*

df$Product\_LineHigh-Tech Cables -2.734e+02 2.909e+02 -0.940 0.347319

df$Product\_LineMIVI -4.305e+02 1.249e+02 -3.447 0.000568 \*\*\*

df$Product\_LinePlugs and Caps -3.173e+02 8.948e+01 -3.546 0.000391 \*\*\*

df$Product\_LineProfiles -3.501e+02 8.971e+01 -3.902 9.55e-05 \*\*\*

df$Product\_LineProfiles Trading -2.794e+01 1.224e+02 -0.228 0.819359

df$Product\_LinePull Cables 4.693e+03 1.465e+02 32.040 < 2e-16 \*\*\*

df$Product\_LinePull Cables China -6.374e+02 2.609e+02 -2.443 0.014576 \*

df$Product\_LineResidual Springs -2.895e+02 9.636e+01 -3.005 0.002662 \*\*

df$Product\_LineSprings -3.001e+02 8.783e+01 -3.417 0.000635 \*\*\*

df$Product\_LineSprings China -3.955e+02 1.108e+02 -3.569 0.000359 \*\*\*

df$Product\_LineSprings Trading -1.530e+02 1.045e+02 -1.465 0.142901

df$Product\_LineTP 821 -5.171e+02 1.130e+02 -4.576 4.76e-06 \*\*\*

df$Product\_LineTP 821-822 4.137e+03 4.651e+02 8.895 < 2e-16 \*\*\*

df$PlantChina -1.828e+02 1.555e+02 -1.175 0.240008

df$PlantFRA -4.662e+00 1.883e+02 -0.025 0.980249

df$PlantIND 6.785e+01 3.419e+02 0.198 0.842673

df$PlantNorthern Italy 1.617e+00 3.551e+01 0.046 0.963674

df$PlantSouthern Italy 8.117e+00 3.707e+01 0.219 0.826675

df$PlantSpain 2.742e+01 3.445e+01 0.796 0.425987

df$PlantUK -6.579e+00 3.968e+01 -0.166 0.868307

df$PlantUSA -3.579e+01 3.694e+01 -0.969 0.332685

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 961.8 on 32341 degrees of freedom

Multiple R-squared: 0.08528, Adjusted R-squared: 0.08427

F-statistic: 83.76 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Outbound\_Logistics\_Local\_Branches~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Outbound\_Logistics\_Local\_Branches ~ df$Quantity\_units +

df$N\_Parts + df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes +

df$Number\_of\_Deliveries + df$Average\_Delivery\_Batch\_Size\_units +

df$Turnover\_Range\_EURO + df$Customer\_Class + df$Product\_Line +

df$Plant)

Residuals:

Min 1Q Median 3Q Max

-56735 -128 69 161 152206

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.153e+03 1.672e+02 6.893 5.58e-12 \*\*\*

df$Quantity\_units -5.366e-03 3.699e-03 -1.451 0.146885

df$N\_Parts 3.818e+00 8.898e-01 4.291 1.79e-05 \*\*\*

df$Assembly\_Labour\_Minutes -3.305e-03 1.200e-02 -0.275 0.782999

df$Machinery\_Minutes -6.199e-03 7.974e-03 -0.777 0.436915

df$Number\_of\_Deliveries 1.169e+02 8.166e-01 143.155 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 6.494e-02 1.574e-02 4.126 3.70e-05 \*\*\*

df$Turnover\_Range\_EUROb 20-100 2.863e+01 4.057e+01 0.706 0.480417

df$Turnover\_Range\_EUROc 100-250 5.682e+01 4.019e+01 1.414 0.157473

df$Turnover\_Range\_EUROd 250-500 6.321e+01 4.034e+01 1.567 0.117171

df$Turnover\_Range\_EUROe >500 1.044e+00 3.565e+01 0.029 0.976643

df$Turnover\_Range\_EUROStrategic -2.318e+01 4.753e+01 -0.488 0.625834

df$Customer\_ClassOthers 6.298e+01 2.202e+01 2.859 0.004246 \*\*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -1.109e+03 1.811e+02 -6.120 9.44e-10 \*\*\*

df$Product\_LineCables -1.043e+03 1.657e+02 -6.291 3.19e-10 \*\*\*

df$Product\_LineCables China -8.724e+02 2.064e+02 -4.227 2.37e-05 \*\*\*

df$Product\_LineHigh-Tech Cables -9.046e+02 5.094e+02 -1.776 0.075767 .

df$Product\_LineMIVI -1.897e+03 2.187e+02 -8.675 < 2e-16 \*\*\*

df$Product\_LinePlugs and Caps -9.612e+02 1.567e+02 -6.135 8.59e-10 \*\*\*

df$Product\_LineProfiles -1.095e+03 1.571e+02 -6.972 3.20e-12 \*\*\*

df$Product\_LineProfiles Trading -9.529e+02 2.143e+02 -4.448 8.71e-06 \*\*\*

df$Product\_LinePull Cables 1.917e+03 2.565e+02 7.475 7.91e-14 \*\*\*

df$Product\_LinePull Cables China 1.397e+04 4.569e+02 30.568 < 2e-16 \*\*\*

df$Product\_LineResidual Springs -8.452e+02 1.687e+02 -5.009 5.50e-07 \*\*\*

df$Product\_LineSprings -1.027e+03 1.538e+02 -6.676 2.50e-11 \*\*\*

df$Product\_LineSprings China -8.596e+02 1.940e+02 -4.430 9.45e-06 \*\*\*

df$Product\_LineSprings Trading -6.592e+02 1.829e+02 -3.604 0.000314 \*\*\*

df$Product\_LineTP 821 -1.550e+03 1.979e+02 -7.832 4.94e-15 \*\*\*

df$Product\_LineTP 821-822 -3.290e+03 8.144e+02 -4.040 5.37e-05 \*\*\*

df$PlantChina 2.511e+03 2.723e+02 9.220 < 2e-16 \*\*\*

df$PlantFRA -3.959e+02 3.297e+02 -1.200 0.229955

df$PlantIND -2.522e+02 5.986e+02 -0.421 0.673523

df$PlantNorthern Italy -5.364e+02 6.218e+01 -8.627 < 2e-16 \*\*\*

df$PlantSouthern Italy -5.042e+02 6.491e+01 -7.768 8.21e-15 \*\*\*

df$PlantSpain -5.597e+02 6.031e+01 -9.279 < 2e-16 \*\*\*

df$PlantUK -4.164e+02 6.947e+01 -5.994 2.07e-09 \*\*\*

df$PlantUSA -2.128e+02 6.469e+01 -3.290 0.001002 \*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1684 on 32341 degrees of freedom

Multiple R-squared: 0.4451, Adjusted R-squared: 0.4445

F-statistic: 720.7 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Distribution\_Activities~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Distribution\_Activities ~ df$Quantity\_units +

df$N\_Parts + df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes +

df$Number\_of\_Deliveries + df$Average\_Delivery\_Batch\_Size\_units +

df$Turnover\_Range\_EURO + df$Customer\_Class + df$Product\_Line +

df$Plant)

Residuals:

Min 1Q Median 3Q Max

-4629.9 -36.1 -8.0 13.2 7439.3

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 2.949e+02 1.790e+01 16.471 < 2e-16 \*\*\*

df$Quantity\_units 9.926e-04 3.960e-04 2.507 0.012192 \*

df$N\_Parts 2.181e+00 9.526e-02 22.896 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes 2.805e-03 1.285e-03 2.183 0.029022 \*

df$Machinery\_Minutes 1.747e-03 8.537e-04 2.046 0.040723 \*

df$Number\_of\_Deliveries 5.445e+00 8.742e-02 62.282 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 1.028e-03 1.685e-03 0.610 0.541954

df$Turnover\_Range\_EUROb 20-100 2.331e+00 4.343e+00 0.537 0.591548

df$Turnover\_Range\_EUROc 100-250 8.048e+00 4.303e+00 1.871 0.061418 .

df$Turnover\_Range\_EUROd 250-500 8.013e+00 4.319e+00 1.855 0.063562 .

df$Turnover\_Range\_EUROe >500 2.125e+01 3.816e+00 5.567 2.61e-08 \*\*\*

df$Turnover\_Range\_EUROStrategic 6.388e+01 5.088e+00 12.555 < 2e-16 \*\*\*

df$Customer\_ClassOthers -2.032e+01 2.358e+00 -8.618 < 2e-16 \*\*\*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -3.637e+02 1.939e+01 -18.757 < 2e-16 \*\*\*

df$Product\_LineCables -3.330e+02 1.774e+01 -18.771 < 2e-16 \*\*\*

df$Product\_LineCables China -3.370e+02 2.209e+01 -15.254 < 2e-16 \*\*\*

df$Product\_LineHigh-Tech Cables -3.069e+02 5.454e+01 -5.628 1.84e-08 \*\*\*

df$Product\_LineMIVI -4.039e+02 2.341e+01 -17.252 < 2e-16 \*\*\*

df$Product\_LinePlugs and Caps -3.202e+02 1.677e+01 -19.089 < 2e-16 \*\*\*

df$Product\_LineProfiles -3.205e+02 1.682e+01 -19.062 < 2e-16 \*\*\*

df$Product\_LineProfiles Trading -3.046e+02 2.294e+01 -13.279 < 2e-16 \*\*\*

df$Product\_LinePull Cables 4.308e-01 2.746e+01 0.016 0.987481

df$Product\_LinePull Cables China -5.157e+02 4.891e+01 -10.543 < 2e-16 \*\*\*

df$Product\_LineResidual Springs -2.601e+02 1.806e+01 -14.399 < 2e-16 \*\*\*

df$Product\_LineSprings -2.804e+02 1.646e+01 -17.033 < 2e-16 \*\*\*

df$Product\_LineSprings China -3.237e+02 2.077e+01 -15.584 < 2e-16 \*\*\*

df$Product\_LineSprings Trading -2.915e+02 1.958e+01 -14.885 < 2e-16 \*\*\*

df$Product\_LineTP 821 -3.971e+02 2.118e+01 -18.748 < 2e-16 \*\*\*

df$Product\_LineTP 821-822 -5.992e+02 8.719e+01 -6.872 6.44e-12 \*\*\*

df$PlantChina -3.077e+01 2.916e+01 -1.055 0.291219

df$PlantFRA 1.379e+01 3.530e+01 0.391 0.696075

df$PlantIND 4.561e+01 6.408e+01 0.712 0.476611

df$PlantNorthern Italy 3.923e+01 6.656e+00 5.894 3.82e-09 \*\*\*

df$PlantSouthern Italy 1.942e+01 6.949e+00 2.795 0.005194 \*\*

df$PlantSpain 2.348e+01 6.457e+00 3.636 0.000277 \*\*\*

df$PlantUK -3.195e-01 7.438e+00 -0.043 0.965731

df$PlantUSA -2.077e+00 6.925e+00 -0.300 0.764282

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 180.3 on 32341 degrees of freedom

Multiple R-squared: 0.2313, Adjusted R-squared: 0.2305

F-statistic: 270.3 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Manufacturing\_Costs~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Manufacturing\_Costs ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-141369 -530 86 345 594420

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 2.698e+02 5.209e+02 0.518 0.604466

df$Quantity\_units 1.806e-02 1.152e-02 1.568 0.116990

df$N\_Parts 4.155e+01 2.771e+00 14.992 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes 2.910e-02 3.738e-02 0.778 0.436352

df$Machinery\_Minutes 2.847e-02 2.484e-02 1.146 0.251637

df$Number\_of\_Deliveries 1.896e+02 2.543e+00 74.556 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 1.581e-02 4.902e-02 0.322 0.747107

df$Turnover\_Range\_EUROb 20-100 -1.391e+02 1.264e+02 -1.101 0.270996

df$Turnover\_Range\_EUROc 100-250 -8.705e+01 1.252e+02 -0.695 0.486828

df$Turnover\_Range\_EUROd 250-500 -1.452e+02 1.257e+02 -1.155 0.248036

df$Turnover\_Range\_EUROe >500 4.568e+01 1.110e+02 0.411 0.680774

df$Turnover\_Range\_EUROStrategic 8.932e+02 1.480e+02 6.033 1.62e-09 \*\*\*

df$Customer\_ClassOthers -1.656e+02 6.860e+01 -2.414 0.015771 \*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -2.910e+03 5.642e+02 -5.159 2.50e-07 \*\*\*

df$Product\_LineCables -3.014e+03 5.162e+02 -5.839 5.29e-09 \*\*\*

df$Product\_LineCables China -3.367e+02 6.428e+02 -0.524 0.600407

df$Product\_LineHigh-Tech Cables -5.005e+02 1.587e+03 -0.315 0.752443

df$Product\_LineMIVI -2.782e+03 6.812e+02 -4.084 4.44e-05 \*\*\*

df$Product\_LinePlugs and Caps -9.158e+02 4.880e+02 -1.877 0.060560 .

df$Product\_LineProfiles -1.572e+03 4.892e+02 -3.213 0.001316 \*\*

df$Product\_LineProfiles Trading -1.311e+03 6.674e+02 -1.965 0.049399 \*

df$Product\_LinePull Cables 2.272e+04 7.989e+02 28.436 < 2e-16 \*\*\*

df$Product\_LinePull Cables China 6.565e+03 1.423e+03 4.613 3.98e-06 \*\*\*

df$Product\_LineResidual Springs -8.823e+02 5.255e+02 -1.679 0.093192 .

df$Product\_LineSprings -6.428e+02 4.790e+02 -1.342 0.179668

df$Product\_LineSprings China 2.008e+03 6.044e+02 3.322 0.000895 \*\*\*

df$Product\_LineSprings Trading -1.484e+03 5.697e+02 -2.604 0.009217 \*\*

df$Product\_LineTP 821 -1.731e+03 6.163e+02 -2.808 0.004984 \*\*

df$Product\_LineTP 821-822 8.562e+04 2.537e+03 33.751 < 2e-16 \*\*\*

df$PlantChina -2.014e+01 8.483e+02 -0.024 0.981061

df$PlantFRA 1.352e+02 1.027e+03 0.132 0.895268

df$PlantIND 8.116e+02 1.865e+03 0.435 0.663370

df$PlantNorthern Italy 1.737e+02 1.937e+02 0.897 0.369721

df$PlantSouthern Italy 1.483e+02 2.022e+02 0.733 0.463319

df$PlantSpain 2.773e+02 1.879e+02 1.476 0.139957

df$PlantUK 7.065e+00 2.164e+02 0.033 0.973956

df$PlantUSA -5.846e+01 2.015e+02 -0.290 0.771696

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 5245 on 32341 degrees of freedom

Multiple R-squared: 0.2935, Adjusted R-squared: 0.2927

F-statistic: 373.2 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Internal\_Logistics\_Costs~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Internal\_Logistics\_Costs ~ df$Quantity\_units +

df$N\_Parts + df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes +

df$Number\_of\_Deliveries + df$Average\_Delivery\_Batch\_Size\_units +

df$Turnover\_Range\_EURO + df$Customer\_Class + df$Product\_Line +

df$Plant)

Residuals:

Min 1Q Median 3Q Max

-56072 -243 25 151 238467

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 9.781e+02 2.304e+02 4.245 2.19e-05 \*\*\*

df$Quantity\_units 7.100e-03 5.097e-03 1.393 0.163649

df$N\_Parts 2.328e+01 1.226e+00 18.990 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes -8.976e-03 1.654e-02 -0.543 0.587293

df$Machinery\_Minutes 4.550e-03 1.099e-02 0.414 0.678854

df$Number\_of\_Deliveries 7.485e+01 1.125e+00 66.518 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 6.306e-03 2.169e-02 0.291 0.771256

df$Turnover\_Range\_EUROb 20-100 -6.124e+01 5.591e+01 -1.095 0.273358

df$Turnover\_Range\_EUROc 100-250 -4.210e+01 5.538e+01 -0.760 0.447181

df$Turnover\_Range\_EUROd 250-500 -5.920e+01 5.559e+01 -1.065 0.286905

df$Turnover\_Range\_EUROe >500 5.222e+01 4.912e+01 1.063 0.287726

df$Turnover\_Range\_EUROStrategic 4.065e+02 6.550e+01 6.206 5.50e-10 \*\*\*

df$Customer\_ClassOthers -8.968e+01 3.035e+01 -2.955 0.003129 \*\*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -1.020e+03 2.496e+02 -4.087 4.38e-05 \*\*\*

df$Product\_LineCables -2.046e+03 2.284e+02 -8.957 < 2e-16 \*\*\*

df$Product\_LineCables China -2.594e+03 2.844e+02 -9.120 < 2e-16 \*\*\*

df$Product\_LineHigh-Tech Cables -1.012e+03 7.020e+02 -1.441 0.149559

df$Product\_LineMIVI -1.909e+03 3.014e+02 -6.335 2.40e-10 \*\*\*

df$Product\_LinePlugs and Caps -1.200e+03 2.159e+02 -5.556 2.77e-08 \*\*\*

df$Product\_LineProfiles -1.497e+03 2.164e+02 -6.919 4.65e-12 \*\*\*

df$Product\_LineProfiles Trading -1.352e+03 2.952e+02 -4.579 4.68e-06 \*\*\*

df$Product\_LinePull Cables 9.409e+03 3.534e+02 26.621 < 2e-16 \*\*\*

df$Product\_LinePull Cables China -3.309e+03 6.296e+02 -5.255 1.49e-07 \*\*\*

df$Product\_LineResidual Springs -1.252e+03 2.325e+02 -5.383 7.37e-08 \*\*\*

df$Product\_LineSprings -1.113e+03 2.119e+02 -5.251 1.53e-07 \*\*\*

df$Product\_LineSprings China -1.848e+03 2.674e+02 -6.912 4.85e-12 \*\*\*

df$Product\_LineSprings Trading -1.413e+03 2.520e+02 -5.605 2.10e-08 \*\*\*

df$Product\_LineTP 821 -2.313e+02 2.727e+02 -0.848 0.396321

df$Product\_LineTP 821-822 -4.358e+03 1.122e+03 -3.883 0.000103 \*\*\*

df$PlantChina -2.255e+02 3.753e+02 -0.601 0.547846

df$PlantFRA 8.462e+00 4.544e+02 0.019 0.985143

df$PlantIND 3.111e+02 8.249e+02 0.377 0.706045

df$PlantNorthern Italy 4.362e+01 8.568e+01 0.509 0.610701

df$PlantSouthern Italy 2.264e+01 8.944e+01 0.253 0.800177

df$PlantSpain 6.839e+01 8.311e+01 0.823 0.410567

df$PlantUK 1.857e+00 9.574e+01 0.019 0.984521

df$PlantUSA -1.153e+02 8.914e+01 -1.293 0.195896

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2321 on 32341 degrees of freedom

Multiple R-squared: 0.2319, Adjusted R-squared: 0.2311

F-statistic: 271.3 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Transportations~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Transportations ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-25838 -59 13 58 171922

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) -3.216e+02 1.177e+02 -2.733 0.00628 \*\*

df$Quantity\_units 7.216e-04 2.603e-03 0.277 0.78160

df$N\_Parts 1.000e+01 6.262e-01 15.970 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes -3.384e-02 8.445e-03 -4.007 6.15e-05 \*\*\*

df$Machinery\_Minutes -1.051e-03 5.612e-03 -0.187 0.85142

df$Number\_of\_Deliveries 4.499e+01 5.747e-01 78.288 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 9.914e-03 1.108e-02 0.895 0.37079

df$Turnover\_Range\_EUROb 20-100 -3.540e+01 2.855e+01 -1.240 0.21506

df$Turnover\_Range\_EUROc 100-250 -2.983e+01 2.829e+01 -1.055 0.29165

df$Turnover\_Range\_EUROd 250-500 -3.503e+01 2.839e+01 -1.234 0.21727

df$Turnover\_Range\_EUROe >500 -3.090e+01 2.509e+01 -1.232 0.21809

df$Turnover\_Range\_EUROStrategic 3.365e+01 3.345e+01 1.006 0.31449

df$Customer\_ClassOthers -1.516e+01 1.550e+01 -0.978 0.32796

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -2.812e+02 1.275e+02 -2.206 0.02741 \*

df$Product\_LineCables -3.367e+02 1.166e+02 -2.887 0.00389 \*\*

df$Product\_LineCables China -3.584e+02 1.452e+02 -2.467 0.01362 \*

df$Product\_LineHigh-Tech Cables 2.973e+02 3.585e+02 0.829 0.40695

df$Product\_LineMIVI -9.747e+01 1.539e+02 -0.633 0.52653

df$Product\_LinePlugs and Caps 2.374e+02 1.103e+02 2.153 0.03131 \*

df$Product\_LineProfiles 5.730e+01 1.105e+02 0.518 0.60421

df$Product\_LineProfiles Trading 1.783e+02 1.508e+02 1.183 0.23697

df$Product\_LinePull Cables 7.371e+03 1.805e+02 40.837 < 2e-16 \*\*\*

df$Product\_LinePull Cables China -2.182e+02 3.215e+02 -0.679 0.49741

df$Product\_LineResidual Springs 1.463e+02 1.187e+02 1.232 0.21807

df$Product\_LineSprings 1.398e+02 1.082e+02 1.292 0.19645

df$Product\_LineSprings China -7.992e+01 1.366e+02 -0.585 0.55836

df$Product\_LineSprings Trading 8.241e+01 1.287e+02 0.640 0.52202

df$Product\_LineTP 821 -1.467e+02 1.392e+02 -1.053 0.29214

df$Product\_LineTP 821-822 -1.413e+03 5.732e+02 -2.465 0.01371 \*

df$PlantChina -1.199e+02 1.917e+02 -0.626 0.53158

df$PlantFRA -2.665e+00 2.321e+02 -0.011 0.99084

df$PlantIND 9.940e+01 4.213e+02 0.236 0.81347

df$PlantNorthern Italy 3.038e+00 4.376e+01 0.069 0.94465

df$PlantSouthern Italy 2.307e+01 4.568e+01 0.505 0.61359

df$PlantSpain 5.098e+01 4.245e+01 1.201 0.22971

df$PlantUK 7.210e+00 4.889e+01 0.147 0.88277

df$PlantUSA -5.182e+01 4.552e+01 -1.138 0.25499

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1185 on 32341 degrees of freedom

Multiple R-squared: 0.2619, Adjusted R-squared: 0.2611

F-statistic: 318.7 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Inbound\_Logistics~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Inbound\_Logistics ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-12316 -59 -9 30 91637

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) -2.325e+02 8.791e+01 -2.644 0.008190 \*\*

df$Quantity\_units 4.658e-03 1.944e-03 2.395 0.016613 \*

df$N\_Parts 5.190e+00 4.678e-01 11.094 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes 1.042e-02 6.309e-03 1.652 0.098501 .

df$Machinery\_Minutes 2.292e-03 4.192e-03 0.547 0.584557

df$Number\_of\_Deliveries 1.372e+01 4.293e-01 31.950 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -5.031e-03 8.274e-03 -0.608 0.543137

df$Turnover\_Range\_EUROb 20-100 -5.518e+00 2.133e+01 -0.259 0.795863

df$Turnover\_Range\_EUROc 100-250 3.276e+01 2.113e+01 1.550 0.121059

df$Turnover\_Range\_EUROd 250-500 2.071e+01 2.121e+01 0.977 0.328762

df$Turnover\_Range\_EUROe >500 5.296e+01 1.874e+01 2.826 0.004719 \*\*

df$Turnover\_Range\_EUROStrategic 1.149e+02 2.499e+01 4.599 4.27e-06 \*\*\*

df$Customer\_ClassOthers -1.671e+01 1.158e+01 -1.443 0.149022

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -2.844e+02 9.522e+01 -2.986 0.002826 \*\*

df$Product\_LineCables -2.155e+02 8.712e+01 -2.474 0.013374 \*

df$Product\_LineCables China 1.520e+03 1.085e+02 14.013 < 2e-16 \*\*\*

df$Product\_LineHigh-Tech Cables 1.935e+02 2.678e+02 0.723 0.469928

df$Product\_LineMIVI -5.792e+01 1.150e+02 -0.504 0.614412

df$Product\_LinePlugs and Caps 1.415e+02 8.236e+01 1.718 0.085869 .

df$Product\_LineProfiles 3.147e+01 8.257e+01 0.381 0.703126

df$Product\_LineProfiles Trading 1.828e+02 1.126e+02 1.623 0.104668

df$Product\_LinePull Cables 3.992e+03 1.348e+02 29.606 < 2e-16 \*\*\*

df$Product\_LinePull Cables China 7.937e+03 2.402e+02 33.044 < 2e-16 \*\*\*

df$Product\_LineResidual Springs 4.387e+02 8.870e+01 4.946 7.61e-07 \*\*\*

df$Product\_LineSprings 6.688e+01 8.085e+01 0.827 0.408089

df$Product\_LineSprings China 5.622e+02 1.020e+02 5.512 3.58e-08 \*\*\*

df$Product\_LineSprings Trading 2.712e+02 9.615e+01 2.820 0.004805 \*\*

df$Product\_LineTP 821 -2.254e+02 1.040e+02 -2.167 0.030255 \*

df$Product\_LineTP 821-822 -5.257e+02 4.281e+02 -1.228 0.219465

df$PlantChina 4.758e+02 1.432e+02 3.323 0.000891 \*\*\*

df$PlantFRA 2.967e+01 1.734e+02 0.171 0.864095

df$PlantIND 1.077e+02 3.147e+02 0.342 0.732225

df$PlantNorthern Italy 3.874e+01 3.269e+01 1.185 0.235912

df$PlantSouthern Italy 6.982e-01 3.412e+01 0.020 0.983676

df$PlantSpain 3.473e+01 3.171e+01 1.095 0.273358

df$PlantUK -9.405e+00 3.652e+01 -0.258 0.796783

df$PlantUSA 1.522e+01 3.401e+01 0.448 0.654396

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 885.3 on 32341 degrees of freedom

Multiple R-squared: 0.1586, Adjusted R-squared: 0.1577

F-statistic: 169.4 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Manage\_Foreign\_Relationships~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Manage\_Foreign\_Relationships ~ df$Quantity\_units +

df$N\_Parts + df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes +

df$Number\_of\_Deliveries + df$Average\_Delivery\_Batch\_Size\_units +

df$Turnover\_Range\_EURO + df$Customer\_Class + df$Product\_Line +

df$Plant)

Residuals:

Min 1Q Median 3Q Max

-18953 -33 -2 32 105827

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) -2.981e+02 1.044e+02 -2.854 0.00432 \*\*

df$Quantity\_units 6.532e-04 2.310e-03 0.283 0.77736

df$N\_Parts 2.545e+00 5.557e-01 4.579 4.70e-06 \*\*\*

df$Assembly\_Labour\_Minutes 1.065e-03 7.495e-03 0.142 0.88702

df$Machinery\_Minutes 6.009e-03 4.981e-03 1.207 0.22761

df$Number\_of\_Deliveries 2.459e+00 5.100e-01 4.821 1.43e-06 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 2.135e-03 9.830e-03 0.217 0.82803

df$Turnover\_Range\_EUROb 20-100 -3.393e+00 2.534e+01 -0.134 0.89350

df$Turnover\_Range\_EUROc 100-250 3.254e+01 2.510e+01 1.296 0.19490

df$Turnover\_Range\_EUROd 250-500 3.013e+01 2.520e+01 1.196 0.23184

df$Turnover\_Range\_EUROe >500 6.351e+01 2.226e+01 2.852 0.00434 \*\*

df$Turnover\_Range\_EUROStrategic 8.775e+01 2.969e+01 2.956 0.00312 \*\*

df$Customer\_ClassOthers -1.361e+01 1.376e+01 -0.989 0.32253

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -5.490e+01 1.131e+02 -0.485 0.62749

df$Product\_LineCables -4.030e-01 1.035e+02 -0.004 0.99689

df$Product\_LineCables China 2.939e+03 1.289e+02 22.799 < 2e-16 \*\*\*

df$Product\_LineHigh-Tech Cables 2.315e+02 3.182e+02 0.728 0.46687

df$Product\_LineMIVI 1.342e+02 1.366e+02 0.982 0.32597

df$Product\_LinePlugs and Caps 2.062e+02 9.785e+01 2.108 0.03508 \*

df$Product\_LineProfiles 1.562e+02 9.810e+01 1.593 0.11126

df$Product\_LineProfiles Trading 1.960e+02 1.338e+02 1.465 0.14296

df$Product\_LinePull Cables -1.297e+02 1.602e+02 -0.810 0.41813

df$Product\_LinePull Cables China 1.809e+04 2.854e+02 63.397 < 2e-16 \*\*\*

df$Product\_LineResidual Springs 4.662e+02 1.054e+02 4.424 9.72e-06 \*\*\*

df$Product\_LineSprings 1.318e+02 9.605e+01 1.373 0.16992

df$Product\_LineSprings China 8.512e+02 1.212e+02 7.023 2.21e-12 \*\*\*

df$Product\_LineSprings Trading 2.048e+02 1.142e+02 1.792 0.07308 .

df$Product\_LineTP 821 -9.099e+01 1.236e+02 -0.736 0.46158

df$Product\_LineTP 821-822 -1.444e+01 5.087e+02 -0.028 0.97736

df$PlantChina 1.027e+03 1.701e+02 6.037 1.59e-09 \*\*\*

df$PlantFRA 6.710e+01 2.060e+02 0.326 0.74458

df$PlantIND 1.055e+02 3.739e+02 0.282 0.77791

df$PlantNorthern Italy 3.854e+01 3.883e+01 0.992 0.32103

df$PlantSouthern Italy 2.684e+01 4.054e+01 0.662 0.50799

df$PlantSpain 3.592e+01 3.767e+01 0.954 0.34027

df$PlantUK 2.095e+01 4.339e+01 0.483 0.62925

df$PlantUSA 5.409e+01 4.040e+01 1.339 0.18060

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1052 on 32341 degrees of freedom

Multiple R-squared: 0.2003, Adjusted R-squared: 0.1994

F-statistic: 225 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Manage\_Orders\_to\_Suppliers~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Manage\_Orders\_to\_Suppliers ~ df$Quantity\_units +

df$N\_Parts + df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes +

df$Number\_of\_Deliveries + df$Average\_Delivery\_Batch\_Size\_units +

df$Turnover\_Range\_EURO + df$Customer\_Class + df$Product\_Line +

df$Plant)

Residuals:

Min 1Q Median 3Q Max

-5620.4 -38.6 -3.3 20.0 25174.7

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 7.729e+02 3.511e+01 22.014 < 2e-16 \*\*\*

df$Quantity\_units 3.385e-03 7.765e-04 4.360 1.31e-05 \*\*\*

df$N\_Parts 4.178e+00 1.868e-01 22.368 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes 3.055e-03 2.520e-03 1.213 0.225295

df$Machinery\_Minutes -3.091e-03 1.674e-03 -1.846 0.064886 .

df$Number\_of\_Deliveries 4.680e+00 1.714e-01 27.296 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -6.019e-03 3.304e-03 -1.822 0.068530 .

df$Turnover\_Range\_EUROb 20-100 -6.138e+00 8.518e+00 -0.721 0.471174

df$Turnover\_Range\_EUROc 100-250 1.409e+00 8.438e+00 0.167 0.867376

df$Turnover\_Range\_EUROd 250-500 1.212e+00 8.470e+00 0.143 0.886204

df$Turnover\_Range\_EUROe >500 2.038e+01 7.484e+00 2.723 0.006478 \*\*

df$Turnover\_Range\_EUROStrategic 7.337e+01 9.979e+00 7.353 1.99e-13 \*\*\*

df$Customer\_ClassOthers -1.670e+01 4.624e+00 -3.612 0.000305 \*\*\*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -7.504e+02 3.803e+01 -19.734 < 2e-16 \*\*\*

df$Product\_LineCables -9.657e+02 3.479e+01 -27.754 < 2e-16 \*\*\*

df$Product\_LineCables China -1.041e+03 4.333e+01 -24.019 < 2e-16 \*\*\*

df$Product\_LineHigh-Tech Cables -7.767e+02 1.070e+02 -7.262 3.90e-13 \*\*\*

df$Product\_LineMIVI -9.236e+02 4.591e+01 -20.117 < 2e-16 \*\*\*

df$Product\_LinePlugs and Caps -8.087e+02 3.289e+01 -24.587 < 2e-16 \*\*\*

df$Product\_LineProfiles -8.350e+02 3.298e+01 -25.321 < 2e-16 \*\*\*

df$Product\_LineProfiles Trading -5.528e+02 4.498e+01 -12.289 < 2e-16 \*\*\*

df$Product\_LinePull Cables -9.727e+01 5.385e+01 -1.806 0.070855 .

df$Product\_LinePull Cables China -1.140e+03 9.592e+01 -11.881 < 2e-16 \*\*\*

df$Product\_LineResidual Springs -8.017e+02 3.542e+01 -22.632 < 2e-16 \*\*\*

df$Product\_LineSprings -8.245e+02 3.229e+01 -25.537 < 2e-16 \*\*\*

df$Product\_LineSprings China -8.892e+02 4.074e+01 -21.827 < 2e-16 \*\*\*

df$Product\_LineSprings Trading -6.556e+02 3.840e+01 -17.074 < 2e-16 \*\*\*

df$Product\_LineTP 821 -9.455e+02 4.154e+01 -22.762 < 2e-16 \*\*\*

df$Product\_LineTP 821-822 -1.106e+03 1.710e+02 -6.466 1.02e-10 \*\*\*

df$PlantChina -3.277e+01 5.718e+01 -0.573 0.566549

df$PlantFRA 6.531e+00 6.923e+01 0.094 0.924842

df$PlantIND 5.255e+01 1.257e+02 0.418 0.675835

df$PlantNorthern Italy 1.629e+01 1.305e+01 1.248 0.212081

df$PlantSouthern Italy 1.795e+01 1.363e+01 1.317 0.187777

df$PlantSpain 1.674e+01 1.266e+01 1.322 0.186080

df$PlantUK 7.967e+00 1.459e+01 0.546 0.584925

df$PlantUSA 2.376e+01 1.358e+01 1.750 0.080201 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 353.6 on 32341 degrees of freedom

Multiple R-squared: 0.1301, Adjusted R-squared: 0.1291

F-statistic: 134.3 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Inspect\_goods~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Inspect\_goods ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-6200 -49 3 29 91916

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.291e+02 6.798e+01 1.899 0.057583 .

df$Quantity\_units 2.914e-03 1.504e-03 1.938 0.052652 .

df$N\_Parts 6.756e+00 3.617e-01 18.679 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes -2.869e-03 4.878e-03 -0.588 0.556430

df$Machinery\_Minutes -6.300e-03 3.242e-03 -1.943 0.051975 .

df$Number\_of\_Deliveries 6.173e+00 3.319e-01 18.596 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -3.680e-03 6.398e-03 -0.575 0.565126

df$Turnover\_Range\_EUROb 20-100 -1.940e+00 1.649e+01 -0.118 0.906346

df$Turnover\_Range\_EUROc 100-250 8.518e+00 1.634e+01 0.521 0.602139

df$Turnover\_Range\_EUROd 250-500 8.342e+00 1.640e+01 0.509 0.610962

df$Turnover\_Range\_EUROe >500 3.060e+01 1.449e+01 2.111 0.034737 \*

df$Turnover\_Range\_EUROStrategic 1.246e+02 1.932e+01 6.449 1.14e-10 \*\*\*

df$Customer\_ClassOthers -7.648e+00 8.953e+00 -0.854 0.392950

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -7.838e+01 7.363e+01 -1.065 0.287091

df$Product\_LineCables -3.273e+02 6.737e+01 -4.858 1.19e-06 \*\*\*

df$Product\_LineCables China -5.320e+02 8.389e+01 -6.342 2.30e-10 \*\*\*

df$Product\_LineHigh-Tech Cables -1.484e+02 2.071e+02 -0.717 0.473676

df$Product\_LineMIVI -3.043e+02 8.890e+01 -3.423 0.000620 \*\*\*

df$Product\_LinePlugs and Caps -1.872e+02 6.369e+01 -2.939 0.003290 \*\*

df$Product\_LineProfiles -2.732e+02 6.385e+01 -4.278 1.89e-05 \*\*\*

df$Product\_LineProfiles Trading -2.031e+02 8.709e+01 -2.332 0.019703 \*

df$Product\_LinePull Cables -1.450e+02 1.043e+02 -1.390 0.164392

df$Product\_LinePull Cables China -6.255e+02 1.857e+02 -3.368 0.000758 \*\*\*

df$Product\_LineResidual Springs -1.735e+02 6.859e+01 -2.530 0.011402 \*

df$Product\_LineSprings -2.117e+02 6.252e+01 -3.386 0.000709 \*\*\*

df$Product\_LineSprings China -2.909e+02 7.887e+01 -3.688 0.000226 \*\*\*

df$Product\_LineSprings Trading 4.783e+01 7.435e+01 0.643 0.520045

df$Product\_LineTP 821 -3.746e-01 8.043e+01 -0.005 0.996284

df$Product\_LineTP 821-822 -5.843e+02 3.311e+02 -1.765 0.077562 .

df$PlantChina -1.259e+02 1.107e+02 -1.138 0.255315

df$PlantFRA 1.179e+01 1.340e+02 0.088 0.929926

df$PlantIND 6.578e+01 2.433e+02 0.270 0.786924

df$PlantNorthern Italy 2.244e+01 2.527e+01 0.888 0.374581

df$PlantSouthern Italy 1.789e+01 2.638e+01 0.678 0.497660

df$PlantSpain 1.142e+01 2.452e+01 0.466 0.641501

df$PlantUK 1.902e+01 2.824e+01 0.674 0.500584

df$PlantUSA 7.573e+00 2.629e+01 0.288 0.773357

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 684.6 on 32341 degrees of freedom

Multiple R-squared: 0.05857, Adjusted R-squared: 0.05752

F-statistic: 55.89 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Customer\_Order\_Management\_Local\_Branches~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Customer\_Order\_Management\_Local\_Branches ~ df$Quantity\_units +

df$N\_Parts + df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes +

df$Number\_of\_Deliveries + df$Average\_Delivery\_Batch\_Size\_units +

df$Turnover\_Range\_EURO + df$Customer\_Class + df$Product\_Line +

df$Plant)

Residuals:

Min 1Q Median 3Q Max

-73368 -151 91 211 210042

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 9.281e+02 1.996e+02 4.650 3.33e-06 \*\*\*

df$Quantity\_units -7.399e-03 4.414e-03 -1.676 0.093735 .

df$N\_Parts 3.968e+00 1.062e+00 3.737 0.000186 \*\*\*

df$Assembly\_Labour\_Minutes 4.619e-03 1.432e-02 0.322 0.747078

df$Machinery\_Minutes -1.361e-03 9.517e-03 -0.143 0.886250

df$Number\_of\_Deliveries 1.578e+02 9.745e-01 161.959 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 8.978e-02 1.878e-02 4.780 1.76e-06 \*\*\*

df$Turnover\_Range\_EUROb 20-100 -3.683e+01 4.842e+01 -0.761 0.446913

df$Turnover\_Range\_EUROc 100-250 -2.745e+01 4.797e+01 -0.572 0.567191

df$Turnover\_Range\_EUROd 250-500 7.059e+00 4.815e+01 0.147 0.883430

df$Turnover\_Range\_EUROe >500 -1.347e+02 4.254e+01 -3.167 0.001542 \*\*

df$Turnover\_Range\_EUROStrategic -8.985e+01 5.672e+01 -1.584 0.113191

df$Customer\_ClassOthers 1.076e+02 2.628e+01 4.092 4.28e-05 \*\*\*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -1.145e+03 2.162e+02 -5.298 1.18e-07 \*\*\*

df$Product\_LineCables -1.296e+03 1.978e+02 -6.553 5.72e-11 \*\*\*

df$Product\_LineCables China -8.394e+02 2.463e+02 -3.408 0.000655 \*\*\*

df$Product\_LineHigh-Tech Cables -1.022e+03 6.080e+02 -1.682 0.092614 .

df$Product\_LineMIVI -2.503e+03 2.610e+02 -9.592 < 2e-16 \*\*\*

df$Product\_LinePlugs and Caps -1.215e+03 1.870e+02 -6.496 8.39e-11 \*\*\*

df$Product\_LineProfiles -1.396e+03 1.875e+02 -7.447 9.78e-14 \*\*\*

df$Product\_LineProfiles Trading -1.131e+03 2.557e+02 -4.422 9.81e-06 \*\*\*

df$Product\_LinePull Cables 2.233e+03 3.061e+02 7.296 3.03e-13 \*\*\*

df$Product\_LinePull Cables China -2.677e+02 5.453e+02 -0.491 0.623532

df$Product\_LineResidual Springs -1.183e+03 2.014e+02 -5.875 4.28e-09 \*\*\*

df$Product\_LineSprings -1.318e+03 1.835e+02 -7.180 7.11e-13 \*\*\*

df$Product\_LineSprings China -1.221e+03 2.316e+02 -5.273 1.35e-07 \*\*\*

df$Product\_LineSprings Trading -8.604e+02 2.183e+02 -3.942 8.11e-05 \*\*\*

df$Product\_LineTP 821 -1.925e+03 2.361e+02 -8.152 3.69e-16 \*\*\*

df$Product\_LineTP 821-822 -6.313e+03 9.720e+02 -6.496 8.39e-11 \*\*\*

df$PlantChina -2.057e+02 3.250e+02 -0.633 0.526733

df$PlantFRA 2.645e+01 3.935e+02 0.067 0.946413

df$PlantIND 1.789e+02 7.144e+02 0.250 0.802258

df$PlantNorthern Italy -8.067e+01 7.420e+01 -1.087 0.276984

df$PlantSouthern Italy -5.416e+01 7.746e+01 -0.699 0.484462

df$PlantSpain -9.707e+01 7.198e+01 -1.349 0.177502

df$PlantUK -9.394e+01 8.291e+01 -1.133 0.257208

df$PlantUSA 3.672e+02 7.720e+01 4.756 1.98e-06 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2010 on 32341 degrees of freedom

Multiple R-squared: 0.4771, Adjusted R-squared: 0.4765

F-statistic: 819.8 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Sales\_Development~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Sales\_Development ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-10595.6 -73.7 -18.8 24.3 23397.8

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.113e+02 4.432e+01 2.512 0.01201 \*

df$Quantity\_units 3.581e-03 9.803e-04 3.653 0.00026 \*\*\*

df$N\_Parts 5.714e+00 2.358e-01 24.229 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes 4.832e-03 3.181e-03 1.519 0.12867

df$Machinery\_Minutes -2.728e-04 2.113e-03 -0.129 0.89728

df$Number\_of\_Deliveries 1.110e+01 2.164e-01 51.296 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -2.316e-03 4.171e-03 -0.555 0.57872

df$Turnover\_Range\_EUROb 20-100 -1.274e+01 1.075e+01 -1.185 0.23609

df$Turnover\_Range\_EUROc 100-250 -3.157e+00 1.065e+01 -0.296 0.76694

df$Turnover\_Range\_EUROd 250-500 -1.127e+00 1.069e+01 -0.105 0.91604

df$Turnover\_Range\_EUROe >500 3.953e+01 9.448e+00 4.184 2.87e-05 \*\*\*

df$Turnover\_Range\_EUROStrategic 8.521e+01 1.260e+01 6.765 1.36e-11 \*\*\*

df$Customer\_ClassOthers -2.464e+01 5.837e+00 -4.221 2.44e-05 \*\*\*

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -2.141e+02 4.801e+01 -4.460 8.22e-06 \*\*\*

df$Product\_LineCables -3.964e+02 4.392e+01 -9.024 < 2e-16 \*\*\*

df$Product\_LineCables China 6.975e+01 5.470e+01 1.275 0.20223

df$Product\_LineHigh-Tech Cables -1.534e+02 1.350e+02 -1.136 0.25592

df$Product\_LineMIVI -2.866e+02 5.796e+01 -4.945 7.67e-07 \*\*\*

df$Product\_LinePlugs and Caps -2.106e+02 4.152e+01 -5.072 3.96e-07 \*\*\*

df$Product\_LineProfiles -2.276e+02 4.163e+01 -5.466 4.63e-08 \*\*\*

df$Product\_LineProfiles Trading -2.309e+01 5.678e+01 -0.407 0.68423

df$Product\_LinePull Cables 6.993e+02 6.798e+01 10.288 < 2e-16 \*\*\*

df$Product\_LinePull Cables China 4.727e+02 1.211e+02 3.904 9.48e-05 \*\*\*

df$Product\_LineResidual Springs -6.540e+01 4.472e+01 -1.463 0.14360

df$Product\_LineSprings -1.045e+02 4.076e+01 -2.564 0.01036 \*

df$Product\_LineSprings China -1.636e+02 5.143e+01 -3.181 0.00147 \*\*

df$Product\_LineSprings Trading -3.257e+01 4.848e+01 -0.672 0.50168

df$Product\_LineTP 821 -2.910e+02 5.244e+01 -5.550 2.88e-08 \*\*\*

df$Product\_LineTP 821-822 3.589e+02 2.158e+02 1.663 0.09637 .

df$PlantChina -2.174e+02 7.218e+01 -3.012 0.00259 \*\*

df$PlantFRA 4.888e+01 8.739e+01 0.559 0.57599

df$PlantIND 1.248e+02 1.587e+02 0.786 0.43161

df$PlantNorthern Italy 9.723e+01 1.648e+01 5.900 3.67e-09 \*\*\*

df$PlantSouthern Italy 7.217e+01 1.720e+01 4.195 2.73e-05 \*\*\*

df$PlantSpain 1.017e+02 1.599e+01 6.363 2.00e-10 \*\*\*

df$PlantUK 5.867e+00 1.841e+01 0.319 0.75001

df$PlantUSA -2.251e+01 1.714e+01 -1.313 0.18921

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 446.3 on 32341 degrees of freedom

Multiple R-squared: 0.1969, Adjusted R-squared: 0.1961

F-statistic: 220.3 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Offer\_Development~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Offer\_Development ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-18328 -41 9 35 38748

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.441e+02 4.961e+01 2.904 0.003687 \*\*

df$Quantity\_units 4.017e-04 1.097e-03 0.366 0.714330

df$N\_Parts 4.534e+00 2.640e-01 17.176 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes -9.037e-04 3.560e-03 -0.254 0.799647

df$Machinery\_Minutes -4.715e-03 2.366e-03 -1.993 0.046270 \*

df$Number\_of\_Deliveries 3.215e+01 2.423e-01 132.685 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units 1.207e-02 4.670e-03 2.585 0.009734 \*\*

df$Turnover\_Range\_EUROb 20-100 -1.213e+01 1.204e+01 -1.008 0.313448

df$Turnover\_Range\_EUROc 100-250 3.807e+00 1.192e+01 0.319 0.749511

df$Turnover\_Range\_EUROd 250-500 -2.329e+00 1.197e+01 -0.195 0.845695

df$Turnover\_Range\_EUROe >500 -1.664e+00 1.058e+01 -0.157 0.874980

df$Turnover\_Range\_EUROStrategic 2.146e+01 1.410e+01 1.522 0.127985

df$Customer\_ClassOthers -1.006e+01 6.534e+00 -1.540 0.123559

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -2.097e+02 5.374e+01 -3.903 9.52e-05 \*\*\*

df$Product\_LineCables -3.780e+02 4.917e+01 -7.687 1.55e-14 \*\*\*

df$Product\_LineCables China -1.958e+02 6.123e+01 -3.198 0.001385 \*\*

df$Product\_LineHigh-Tech Cables -1.849e+02 1.511e+02 -1.223 0.221198

df$Product\_LineMIVI -4.957e+02 6.488e+01 -7.640 2.22e-14 \*\*\*

df$Product\_LinePlugs and Caps -2.328e+02 4.648e+01 -5.008 5.53e-07 \*\*\*

df$Product\_LineProfiles -3.041e+02 4.660e+01 -6.525 6.92e-11 \*\*\*

df$Product\_LineProfiles Trading -1.729e+02 6.357e+01 -2.720 0.006525 \*\*

df$Product\_LinePull Cables 2.315e+03 7.609e+01 30.428 < 2e-16 \*\*\*

df$Product\_LinePull Cables China 4.099e+02 1.356e+02 3.024 0.002496 \*\*

df$Product\_LineResidual Springs -1.982e+02 5.006e+01 -3.958 7.56e-05 \*\*\*

df$Product\_LineSprings -2.430e+02 4.563e+01 -5.325 1.02e-07 \*\*\*

df$Product\_LineSprings China -2.575e+02 5.757e+01 -4.472 7.76e-06 \*\*\*

df$Product\_LineSprings Trading -6.637e+01 5.427e+01 -1.223 0.221297

df$Product\_LineTP 821 -8.894e+01 5.870e+01 -1.515 0.129745

df$Product\_LineTP 821-822 8.125e+02 2.416e+02 3.363 0.000773 \*\*\*

df$PlantChina 1.495e+02 8.080e+01 1.850 0.064325 .

df$PlantFRA 2.903e+01 9.783e+01 0.297 0.766638

df$PlantIND 1.029e+02 1.776e+02 0.580 0.562147

df$PlantNorthern Italy 1.755e+01 1.845e+01 0.951 0.341541

df$PlantSouthern Italy 2.522e+01 1.926e+01 1.310 0.190244

df$PlantSpain 4.032e+01 1.789e+01 2.253 0.024251 \*

df$PlantUK 1.161e+01 2.061e+01 0.563 0.573291

df$PlantUSA 2.223e+01 1.919e+01 1.159 0.246648

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 499.6 on 32341 degrees of freedom

Multiple R-squared: 0.4383, Adjusted R-squared: 0.4377

F-statistic: 701.1 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Customer\_Service~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Customer\_Service ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-8976 -49 -8 34 153688

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 3.074e+01 9.969e+01 0.308 0.757795

df$Quantity\_units 7.241e-03 2.205e-03 3.284 0.001025 \*\*

df$N\_Parts 5.355e+00 5.305e-01 10.095 < 2e-16 \*\*\*

df$Assembly\_Labour\_Minutes -1.529e-02 7.154e-03 -2.137 0.032599 \*

df$Machinery\_Minutes -5.876e-04 4.754e-03 -0.124 0.901638

df$Number\_of\_Deliveries 4.674e+00 4.868e-01 9.601 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -1.578e-02 9.383e-03 -1.682 0.092528 .

df$Turnover\_Range\_EUROb 20-100 -1.991e+01 2.419e+01 -0.823 0.410524

df$Turnover\_Range\_EUROc 100-250 -1.566e+01 2.396e+01 -0.654 0.513390

df$Turnover\_Range\_EUROd 250-500 -2.677e+01 2.405e+01 -1.113 0.265688

df$Turnover\_Range\_EUROe >500 2.959e+01 2.125e+01 1.392 0.163883

df$Turnover\_Range\_EUROStrategic 1.445e+02 2.834e+01 5.098 3.44e-07 \*\*\*

df$Customer\_ClassOthers -2.564e+01 1.313e+01 -1.953 0.050828 .

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -2.375e+02 1.080e+02 -2.200 0.027828 \*

df$Product\_LineCables -3.267e+02 9.880e+01 -3.306 0.000946 \*\*\*

df$Product\_LineCables China 8.928e+01 1.230e+02 0.726 0.468070

df$Product\_LineHigh-Tech Cables -2.885e+01 3.037e+02 -0.095 0.924305

df$Product\_LineMIVI -1.411e+02 1.304e+02 -1.082 0.279225

df$Product\_LinePlugs and Caps -5.480e+01 9.340e+01 -0.587 0.557417

df$Product\_LineProfiles -1.259e+02 9.364e+01 -1.345 0.178645

df$Product\_LineProfiles Trading 1.092e+01 1.277e+02 0.085 0.931884

df$Product\_LinePull Cables 1.967e+03 1.529e+02 12.867 < 2e-16 \*\*\*

df$Product\_LinePull Cables China -3.410e+02 2.724e+02 -1.252 0.210674

df$Product\_LineResidual Springs -3.175e+01 1.006e+02 -0.316 0.752283

df$Product\_LineSprings -7.406e+01 9.168e+01 -0.808 0.419221

df$Product\_LineSprings China -6.267e+01 1.157e+02 -0.542 0.587945

df$Product\_LineSprings Trading 6.414e+01 1.090e+02 0.588 0.556394

df$Product\_LineTP 821 1.933e+02 1.180e+02 1.639 0.101326

df$Product\_LineTP 821-822 -3.638e+02 4.855e+02 -0.749 0.453627

df$PlantChina -2.070e+02 1.624e+02 -1.275 0.202264

df$PlantFRA 7.533e+00 1.966e+02 0.038 0.969433

df$PlantIND 4.970e+01 3.569e+02 0.139 0.889239

df$PlantNorthern Italy 1.695e+01 3.707e+01 0.457 0.647545

df$PlantSouthern Italy 1.513e+01 3.870e+01 0.391 0.695783

df$PlantSpain 2.561e+01 3.596e+01 0.712 0.476394

df$PlantUK 1.155e+00 4.142e+01 0.028 0.977745

df$PlantUSA -8.686e+01 3.856e+01 -2.253 0.024295 \*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1004 on 32341 degrees of freedom

Multiple R-squared: 0.03075, Adjusted R-squared: 0.02967

F-statistic: 28.5 on 36 and 32341 DF, p-value: < 2.2e-16

> mlr<-lm(df$Cost\_of\_Poor\_Quality~df$Quantity\_units+df$N\_Parts+df$Assembly\_Labour\_Minutes+df$Machinery\_Minutes+

+ df$Number\_of\_Deliveries+df$Average\_Delivery\_Batch\_Size\_units+

+ df$Turnover\_Range\_EURO+df$Customer\_Class+df$Product\_Line+df$Plant)

> summary(mlr)

Call:

lm(formula = df$Cost\_of\_Poor\_Quality ~ df$Quantity\_units + df$N\_Parts +

df$Assembly\_Labour\_Minutes + df$Machinery\_Minutes + df$Number\_of\_Deliveries +

df$Average\_Delivery\_Batch\_Size\_units + df$Turnover\_Range\_EURO +

df$Customer\_Class + df$Product\_Line + df$Plant)

Residuals:

Min 1Q Median 3Q Max

-11069 -27 14 39 87405

Coefficients: (1 not defined because of singularities)

Estimate Std. Error t value Pr(>|t|)

(Intercept) 4.797e+01 1.164e+02 0.412 0.68027

df$Quantity\_units 7.311e-03 2.575e-03 2.839 0.00452 \*\*

df$N\_Parts 1.530e+00 6.194e-01 2.470 0.01350 \*

df$Assembly\_Labour\_Minutes 8.362e-03 8.354e-03 1.001 0.31686

df$Machinery\_Minutes -8.964e-04 5.551e-03 -0.161 0.87172

df$Number\_of\_Deliveries 8.024e+00 5.685e-01 14.116 < 2e-16 \*\*\*

df$Average\_Delivery\_Batch\_Size\_units -1.348e-02 1.096e-02 -1.231 0.21848

df$Turnover\_Range\_EUROb 20-100 -4.702e+00 2.824e+01 -0.166 0.86777

df$Turnover\_Range\_EUROc 100-250 8.892e+00 2.798e+01 0.318 0.75063

df$Turnover\_Range\_EUROd 250-500 9.933e+00 2.808e+01 0.354 0.72359

df$Turnover\_Range\_EUROe >500 2.415e+01 2.482e+01 0.973 0.33053

df$Turnover\_Range\_EUROStrategic 2.920e+02 3.309e+01 8.826 < 2e-16 \*\*\*

df$Customer\_ClassOthers -1.138e+00 1.533e+01 -0.074 0.94085

df$Customer\_ClassStrategic NA NA NA NA

df$Product\_LineBuilding Materials -1.158e+02 1.261e+02 -0.919 0.35824

df$Product\_LineCables -1.810e+02 1.154e+02 -1.569 0.11677

df$Product\_LineCables China 6.824e+02 1.437e+02 4.750 2.04e-06 \*\*\*

df$Product\_LineHigh-Tech Cables -1.693e+02 3.546e+02 -0.477 0.63315

df$Product\_LineMIVI -4.342e+02 1.522e+02 -2.852 0.00434 \*\*

df$Product\_LinePlugs and Caps -1.799e+02 1.091e+02 -1.649 0.09909 .

df$Product\_LineProfiles -2.068e+02 1.093e+02 -1.891 0.05862 .

df$Product\_LineProfiles Trading -1.300e+02 1.492e+02 -0.872 0.38342

df$Product\_LinePull Cables -7.810e+02 1.785e+02 -4.374 1.22e-05 \*\*\*

df$Product\_LinePull Cables China -2.319e+02 3.181e+02 -0.729 0.46593

df$Product\_LineResidual Springs -1.253e+02 1.175e+02 -1.067 0.28606

df$Product\_LineSprings -1.445e+02 1.071e+02 -1.350 0.17702

df$Product\_LineSprings China 3.088e+02 1.351e+02 2.286 0.02226 \*

df$Product\_LineSprings Trading 1.336e+03 1.273e+02 10.495 < 2e-16 \*\*\*

df$Product\_LineTP 821 2.749e+02 1.377e+02 1.996 0.04593 \*

df$Product\_LineTP 821-822 -5.244e+02 5.669e+02 -0.925 0.35501

df$PlantChina -1.414e+02 1.896e+02 -0.746 0.45563

df$PlantFRA 1.030e+02 2.296e+02 0.449 0.65350

df$PlantIND 1.330e+02 4.167e+02 0.319 0.74956

df$PlantNorthern Italy 8.455e+01 4.328e+01 1.953 0.05077 .

df$PlantSouthern Italy 8.362e+01 4.518e+01 1.851 0.06424 .

df$PlantSpain 6.033e+01 4.199e+01 1.437 0.15074

df$PlantUK 6.090e+01 4.836e+01 1.259 0.20795

df$PlantUSA 8.458e+01 4.503e+01 1.878 0.06034 .

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1172 on 32341 degrees of freedom

Multiple R-squared: 0.03561, Adjusted R-squared: 0.03453

F-statistic: 33.17 on 36 and 32341 DF, p-value: < 2.2e-16