12.- Exploratory Data Analysis_04_06_turismo_origen_completo_v_01

June 11, 2023

#

CU45_Planificación y promoción del destino en base a los patrones en origen de los turistas

Citizenlab Data Science Methodology > II - Data Processing Domain *** > # 12.- EDA - Exploratory Data Analysis Analysis

0.1 Tasks

- Univariate Analysis
  - Data Structure Analysis
  - Data Types Analysis
  - Statistical Measures
  - Uniques Values
  - Continuous Variables Analysis
  - Categorical Variables analysis
    - Most frequent entry
    - Number of occurrences
- Normaluty Analysis
  - Data Distribution Analysis
    - Skew and Kurtosis
    - Omnibus K-squared test
    - Jarque-Bera tests
  - Visual Normality Checks
    - Histogram Plot
    - Quantile-Quantile Plot
  - Statistical Normality Tests
    - Shapiro-Wilk Test
    - D'Agostino's K^2 Test
    - Anderson-Darling Test
  - Transformations
    - Log
    - Square Root
    - Box-Cox
- Bi-variate Analysis
  - Continuous & Continuous variables analysis
    - Scatter plots
    - Correlation coefficients
      - Pearson
      - Kendall Tau
      - Spearman
    - Pairplot Visualization
  - Categorical & Continuous variables analysis
    - Categorical & Continuous
      - ANOVA
    - Continuous & Categorical
      - Box plots
      - Violin plots
      - Logistic Regression
  - Categorical & Categorical variables analysis
    - Contingency table
    - Pearson's Chi-Squared Test
- Hypothesis Test
  - z-test
  - t-test
- Regression Analysis
- Homogeneity Analysis
  - Chi-square test
- Stationary Analysis

0.2 File

- Input File: CU_45_08_03_turismo_receptor.csv
- Sampled Input File: CU_45_07_03_turismo_receptor.csv
- Output File: No aplica

0.2.1 Encoding

Con la siguiente expresión se evitan problemas con el encoding al ejecutar el notebook. Es posible que deba ser eliminada o adaptada a la máquina en la que se ejecute el código.

[1]:
```
Sys.setlocale(category = "LC_ALL", locale = "es_ES.UTF-8")
```

```
Warning message in Sys.setlocale(category = "LC_ALL", locale = "es_ES.UTF-8"):
"OS reports request to set locale to "es_ES.UTF-8" cannot be honored"
```

”

0.3 Settings

0.3.1 Libraries to use

[3]:
```
library(readr)
library(dplyr)
library(sf)
library(tidyr)
library(ggplot2)
library(summarytools)
library(GGally)
library(nortest)
library(lubridate)
```

0.3.2 Paths

[4]:
```
iPath <- "Data/Input/"
oPath <- "Data/Output/"
```

0.4 Data Load

OPCION A: Seleccionar fichero en ventana para mayor comodidad

Data load using the {tcltk} package. Ucomment the line if using this option

[4]:
```
# file_data <- tcltk::tk_choose.files(multi = FALSE)
```

OPCION B: Especificar el nombre de archivo

[49]:
```
iFile <- "CU_45_08_03_turismo_receptor.csv"
file_data <- paste0(iPath, iFile)
```

```r
if(file.exists(file_data)){
    cat("Se leerán datos del archivo: ", file_data)
} else{
    warning("Cuidado: el archivo no existe.")
}
```

```
Se leerán datos del archivo:  Data/Input/CU_45_08_03_turismo_receptor.csv
```

Data file to dataframe Usar la función adecuada según el formato de entrada (xlsx, csv, json, ...)

[50]:
```r
data <- read_csv(file_data)
```

```
Rows: 50294 Columns: 9
  Column specification



Delimiter: ","
chr (5): mes, pais_orig_cod, pais_orig, mun_dest, CMUN
dbl (3): mun_dest_cod, turistas, Target
lgl (1): is_train

 Use `spec()` to retrieve the full column specification for this
data.
 Specify the column types or set `show_col_types = FALSE` to quiet
this message.
```

0.5 Data Structure

Estructura de los datos:

[7]:
```r
data |> glimpse()
```

```
Rows: 50,294
Columns: 8
$ mes           <chr> "2019-07", "2019-07", "2019-07",
"2019-07", "2019-07", "…
$ pais_orig_cod <chr> "000", "010", "011", "030", "110",
"121", "123", "126", …
$ pais_orig     <chr> "Total", "Total Europa", "Total Unión
Europea", "Total A…
$ mun_dest_cod  <dbl> 28002, 28002, 28002, 28002, 28002,
28002, 28002, 28002, …
$ mun_dest      <chr> "Ajalvir", "Ajalvir", "Ajalvir",
"Ajalvir", "Ajalvir", "…
$ turistas      <dbl> 338, 290, 268, 37, 56, 54, 37, 40, 157,
116, 109, 8461, …
```

```
$ CMUN          <chr> "002", "002", "002", "002", "002",
"002", "002", "002", …
$ Target        <dbl> 338, 290, 268, 37, 56, 54, 37, 40, 157,
116, 109, 8461, …
```

Muestra de los primeros datos:

[8]:
```
data |> slice_head(n = 5)
```

A spec_tbl_df: 5 × 8

mes <chr>	pais_orig_cod <chr>	pais_orig <chr>	mun_dest_cod <dbl>	mun_dest <chr>	turistas <dbl>
2019-07	000	Total	28002	Ajalvir	338
2019-07	010	Total Europa	28002	Ajalvir	290
2019-07	011	Total Unión Europea	28002	Ajalvir	268
2019-07	030	Total América	28002	Ajalvir	37
2019-07	110	Francia	28002	Ajalvir	56

Tamaño de Memoria de los datos

[9]:
```
object.size(data)
```

```
3266976 bytes
```

Structure of non-numerical features

[10]:
```
# Display non-numerical features
data |> select(where(~ !is.numeric(.x))) |> freq()
```

1. A summarytools: 42×5 of type dbl

	Freq	% Valid	% Valid Cum.	% Total	% Total
2019-07	1530	3.042112	3.042112	3.042112	3.042112
2019-08	1603	3.187259	6.229371	3.187259	6.229371
2019-09	1545	3.071937	9.301308	3.071937	9.301308
2019-10	1506	2.994393	12.295701	2.994393	12.29570
2019-11	1432	2.847258	15.142959	2.847258	15.14295
2019-12	1469	2.920826	18.063785	2.920826	18.06378
2020-01	1490	2.962580	21.026365	2.962580	21.02636
2020-02	1349	2.682228	23.708593	2.682228	23.70859
2020-03	1227	2.439655	26.148248	2.439655	26.14824
2020-04	816	1.622460	27.770708	1.622460	27.77070
2020-05	852	1.694039	29.464747	1.694039	29.46474
2020-06	989	1.966437	31.431185	1.966437	31.43118
2020-07	1173	2.332286	33.763471	2.332286	33.76347
2020-08	1182	2.350181	36.113652	2.350181	36.11365
2020-09	1118	2.222929	38.336581	2.222929	38.33658
2020-10	1071	2.129479	40.466060	2.129479	40.46606
2020-11	1036	2.059888	42.525947	2.059888	42.52594
2020-12	1119	2.224917	44.750865	2.224917	44.75086
2021-01	1023	2.034040	46.784905	2.034040	46.78490
2021-02	949	1.886905	48.671810	1.886905	48.67181
2021-03	1055	2.097666	50.769475	2.097666	50.76947
2021-04	983	1.954507	52.723983	1.954507	52.72398
2021-05	1072	2.131467	54.855450	2.131467	54.85545
2021-06	1147	2.280590	57.136040	2.280590	57.13604
2021-07	1257	2.499304	59.635344	2.499304	59.63534
2021-08	1302	2.588778	62.224122	2.588778	62.22412
2021-09	1287	2.558953	64.783076	2.558953	64.78307
2021-10	1314	2.612638	67.395713	2.612638	67.39571
2021-11	1295	2.574860	69.970573	2.574860	69.97057
2021-12	1279	2.543047	72.513620	2.543047	72.51362
2022-01	1282	2.549012	75.062632	2.549012	75.06263
2022-02	1158	2.302462	77.365093	2.302462	77.36509
2022-03	1257	2.499304	79.864397	2.499304	79.86439
2022-04	1335	2.654392	82.518790	2.654392	82.51879
2022-05	1418	2.819422	85.338211	2.819422	85.33821
2022-06	1418	2.819422	88.157633	2.819422	88.15763
2022-07	1473	2.928779	91.086412	2.928779	91.08641
2022-08	1452	2.887024	93.973436	2.887024	93.97343
2022-09	1538	3.058019	97.031455	3.058019	97.03145
2022-10	1493	2.968545	100.000000	2.968545	100.00000
<NA>	0	NA	NA	0.000000	100.00000
Total	50294	100.000000	100.000000	100.000000	100.00000

2. A summarytools: 148 × 5 of type dbl

	Freq	% Valid	% Valid Cum.	% Total	%
000	5588	11.11066926	11.11067	11.11066926	11.
010	5407	10.75078538	21.86145	10.75078538	21.
011	5186	10.31136915	32.17282	10.31136915	32.
020	778	1.54690420	33.71973	1.54690420	33.
030	1682	3.34433531	37.06406	3.34433531	37.
031	1269	2.52316380	39.58723	2.52316380	39.
032	42	0.08350897	39.67074	0.08350897	39.
033	951	1.89088162	41.56162	1.89088162	41.
040	835	1.66023780	43.22186	1.66023780	43.
050	40	0.07953235	43.30139	0.07953235	43.
101	36	0.07157911	43.37297	0.07157911	43.
102	1336	2.65638048	46.02935	2.65638048	46.
103	965	1.91871794	47.94807	1.91871794	47.
104	174	0.34596572	48.29403	0.34596572	48.
106	30	0.05964926	48.35368	0.05964926	48.
107	986	1.96047242	50.31415	1.96047242	50.
109	47	0.09345051	50.40760	0.09345051	50.
110	3396	6.75229650	57.15990	6.75229650	57.
111	40	0.07953235	57.23943	0.07953235	57.
112	79	0.15707639	57.39651	0.15707639	57.
113	411	0.81719489	58.21370	0.81719489	58.
114	26	0.05169603	58.26540	0.05169603	58.
115	1319	2.62257923	60.88798	2.62257923	60.
116	101	0.20081918	61.08880	0.20081918	61.
117	995	1.97836720	63.06717	1.97836720	63.
118	39	0.07754404	63.14471	0.07754404	63.
120	64	0.12725176	63.27196	0.12725176	63.
121	2997	5.95896131	69.23092	5.95896131	69.
122	839	1.66819104	70.89911	1.66819104	70.
123	1278	2.54105858	73.44017	2.54105858	73.
412	36	7.157911e-02	98.21450	7.157911e-02	98.
413	40	7.953235e-02	98.29403	7.953235e-02	98.
414	65	1.292401e-01	98.42327	1.292401e-01	98.
415	67	1.332167e-01	98.55649	1.332167e-01	98.
416	28	5.567264e-02	98.61216	5.567264e-02	98.
417	1	1.988309e-03	98.61415	1.988309e-03	98.
418	27	5.368434e-02	98.66783	5.368434e-02	98.
420	40	7.953235e-02	98.74737	7.953235e-02	98.
421	29	5.766095e-02	98.80503	5.766095e-02	98.
424	1	1.988309e-03	98.80701	1.988309e-03	98.
425	31	6.163757e-02	98.86865	6.163757e-02	98.
426	33	6.561419e-02	98.93427	6.561419e-02	98.
427	44	8.748558e-02	99.02175	8.748558e-02	99.
430	168	3.340359e-01	99.35579	3.340359e-01	99.
432	34	6.760250e-02	99.42339	6.760250e-02	99.
433	3	5.964926e-03	99.42936	5.964926e-03	99.
434	13	2.584801e-02	99.45520	2.584801e-02	99.
435	44	8.748558e-02	99.54269	8.748558e-02	99.
436	59	1.173102e-01	99.66000	1.173102e-01	99.
437	37	7.356742e-02	99.73357	7.356742e-02	99.
442	18	3.578956e-02	99.76936	3.578956e-02	99.

3. A summarytools: 148 × 5 of type dbl

	Freq	% Valid	% Valid Cun
Afganistan	8	0.015906470	0.01590647
Albania	36	0.071579115	0.08748558
Alemania	2019	4.014395355	4.10188094
Andorra	39	0.077544041	4.17942498
Angola	30	0.059649262	4.23907424
Arabia saudita	51	0.101403746	4.34047799
Argelia	41	0.081520659	4.42199865
Argentina	215	0.427486380	4.84948503
Armenia	21	0.041754484	4.89123951
Asia	23	0.045731101	4.93697061
Australia	40	0.079532350	5.01650296
Austria	1336	2.656380483	7.67288345
Azerbaiyan	18	0.035789557	7.70867300
Bahrein	21	0.041754484	7.75042749
Bangladesh	2	0.003976617	7.75440410
Bélgica	965	1.918717939	9.67312204
Benin	1	0.001988309	9.67511035
Bielorrusia / belarus	27	0.053684336	9.72879469
Bolivia	26	0.051696027	9.78049071
Bosnia-herzegovina	18	0.035789557	9.81628027
Brasil	137	0.272398298	10.08867857
Bulgaria	174	0.345965722	10.43464429
Burkina faso	6	0.011929852	10.44657414
Camboya	1	0.001988309	10.44856245
Camerun	27	0.053684336	10.50224679
Canada	51	0.101403746	10.60365053
Chad	1	0.001988309	10.60563884
Chile	68	0.135204995	10.74084384
China	645	1.282459140	12.02330298
Chipre	30	0.059649262	12.08295224
Sri lanka	13	2.584801e-02	52.03205
Sudafrica	32	6.362588e-02	52.09568
Sudan	7	1.391816e-02	52.10960
Suecia	1343	2.670299e+00	54.77989
Suiza	435	8.649143e-01	55.64481
Tailandia	44	8.748558e-02	55.73229
Tanzania	5	9.941544e-03	55.74224
Togo	1	1.988309e-03	55.74422
Total	5588	1.111067e+01	66.85489
Total África	778	1.546904e+00	68.40180
Total América	1682	3.344335e+00	71.74613
Total América del Norte	1269	2.523164e+00	74.26930
Total Asia	835	1.660238e+00	75.92953
Total Centroamérica y Caribe	42	8.350897e-02	76.01304
Total Europa	5407	1.075079e+01	86.76383
Total Oceanía	40	7.953235e-02	86.84336
Total Sudamérica	951	1.890882e+00	88.73424
Total Unión Europea	5186	1.031137e+01	99.04561
Trinidad y tobago	1	1.988309e-03	99.04760
Túnez	40	7.953235e-02	99.12713
Turquia	59	1.173102e-01	99.24444

4. A summarytools: 174 × 5 of type dbl

	Freq	% Valid	% Valid Cum.	%
Ajalvir	233	0.463275937	0.4632759	0.
Álamo, El	89	0.176959478	0.6402354	0.
Alcalá de Henares	1366	2.716029745	3.3562652	2.
Alcobendas	1216	2.417783433	5.7740486	2.
Alcorcón	1046	2.079770947	7.8538195	2.
Aldea del Fresno	135	0.268421681	8.1222412	0.
Algete	484	0.962341432	9.0845827	0.
Alpedrete	215	0.427486380	9.5120690	0.
Ambite	39	0.077544041	9.5896131	0.
Anchuelo	97	0.192865948	9.7824790	0.
Aranjuez	802	1.594623613	11.3771026	1.
Arganda del Rey	762	1.515091263	12.8921939	1.
Arroyomolinos	456	0.906668788	13.7988627	0.
Atazar, El	26	0.051696027	13.8505587	0.
Batres	83	0.165029626	14.0155883	0.
Becerril de la Sierra	121	0.240585358	14.2561737	0.
Belmonte de Tajo	66	0.131228377	14.3874021	0.
Berrueco, El	85	0.169006243	14.5564083	0.
Berzosa del Lozoya	1	0.001988309	14.5583966	0.
Boadilla del Monte	822	1.634389788	16.1927864	1.
Boalo, El	203	0.403626675	16.5964131	0.
Braojos	9	0.017894779	16.6143079	0.
Brea de Tajo	60	0.119298525	16.7336064	0.
Brunete	325	0.646200342	17.3798067	0.
Buitrago del Lozoya	155	0.308187855	17.6879946	0.
Bustarviejo	174	0.345965722	18.0339603	0.
Cabanillas de la Sierra	84	0.167017935	18.2009782	0.
Cabrera, La	252	0.501053804	18.7020321	0.
Cadalso de los Vidrios	75	0.149123156	18.8511552	0.
Camarma de Esteruelas	158	0.314152782	19.1653080	0.
Valdaracete	80	1.590647e-01	90.50980	1.
Valdeavero	69	1.371933e-01	90.64700	1.
Valdelaguna	44	8.748558e-02	90.73448	8.
Valdemanco	109	2.167257e-01	90.95121	2.
Valdemaqueda	141	2.803515e-01	91.23156	2.
Valdemorillo	268	5.328667e-01	91.76443	5.
Valdemoro	894	1.777548e+00	93.54197	1.
Valdeolmos-Alalpardo	125	2.485386e-01	93.79051	2.
Valdepiélagos	15	2.982463e-02	93.82034	2.
Valdetorres de Jarama	145	2.883048e-01	94.10864	2.
Valdilecha	114	2.266672e-01	94.33531	2.
Valverde de Alcalá	39	7.754404e-02	94.41285	7.
Velilla de San Antonio	235	4.672526e-01	94.88010	4.
Vellón, El	129	2.564918e-01	95.13660	2.
Venturada	118	2.346204e-01	95.37122	2.
Villa del Prado	197	3.916968e-01	95.76291	3.
Villaconejos	55	1.093570e-01	95.87227	1.
Villalbilla	224	4.453812e-01	96.31765	4.
Villamanrique de Tajo	35	6.959081e-02	96.38724	6.
Villamanta	96	1.908776e-01	96.57812	1.
Villamantilla	5	9.941544e-03	96.58806	9.

5. A summarytools: 174 × 5 of type dbl

	Freq	% Valid	% Valid Cum.	% Total	%
002	233	0.463275937	0.4632759	0.463275937	0.4
004	89	0.176959478	0.6402354	0.176959478	0.6
005	1366	2.716029745	3.3562652	2.716029745	3.3
006	1216	2.417783433	5.7740486	2.417783433	5.7
007	1046	2.079770947	7.8538195	2.079770947	7.8
008	135	0.268421681	8.1222412	0.268421681	8.1
009	484	0.962341432	9.0845827	0.962341432	9.0
010	215	0.427486380	9.5120690	0.427486380	9.5
011	39	0.077544041	9.5896131	0.077544041	9.5
012	97	0.192865948	9.7824790	0.192865948	9.7
013	802	1.594623613	11.3771026	1.594623613	11.
014	762	1.515091263	12.8921939	1.515091263	12.
015	456	0.906668788	13.7988627	0.906668788	13.
016	26	0.051696027	13.8505587	0.051696027	13.
017	83	0.165029626	14.0155883	0.165029626	14.
018	121	0.240585358	14.2561737	0.240585358	14.
019	66	0.131228377	14.3874021	0.131228377	14.
020	1	0.001988309	14.3893904	0.001988309	14.
021	85	0.169006243	14.5583966	0.169006243	14.
022	822	1.634389788	16.1927864	1.634389788	16.
023	203	0.403626675	16.5964131	0.403626675	16.
024	9	0.017894779	16.6143079	0.017894779	16.
025	60	0.119298525	16.7336064	0.119298525	16.
026	325	0.646200342	17.3798067	0.646200342	17.
027	155	0.308187855	17.6879946	0.308187855	17.
028	174	0.345965722	18.0339603	0.345965722	18.
029	84	0.167017935	18.2009782	0.167017935	18.
030	252	0.501053804	18.7020321	0.501053804	18.
031	75	0.149123156	18.8511552	0.149123156	18.
032	158	0.314152782	19.1653080	0.314152782	19.
158	109	2.167257e-01	88.97284	2.167257e-01	88.
159	141	2.803515e-01	89.25319	2.803515e-01	89.
160	268	5.328667e-01	89.78606	5.328667e-01	89.
161	894	1.777548e+00	91.56361	1.777548e+00	91.
162	125	2.485386e-01	91.81214	2.485386e-01	91.
163	15	2.982463e-02	91.84197	2.982463e-02	91.
164	145	2.883048e-01	92.13027	2.883048e-01	92.
165	114	2.266672e-01	92.35694	2.266672e-01	92.
166	39	7.754404e-02	92.43449	7.754404e-02	92.
167	235	4.672526e-01	92.90174	4.672526e-01	92.
168	129	2.564918e-01	93.15823	2.564918e-01	93.
169	118	2.346204e-01	93.39285	2.346204e-01	93.
170	55	1.093570e-01	93.50221	1.093570e-01	93.
171	197	3.916968e-01	93.89390	3.916968e-01	93.
172	224	4.453812e-01	94.33929	4.453812e-01	94.
173	35	6.959081e-02	94.40888	6.959081e-02	94.
174	96	1.908776e-01	94.59975	1.908776e-01	94.
175	5	9.941544e-03	94.60969	9.941544e-03	94.
176	406	8.072534e-01	95.41695	8.072534e-01	95.
177	266	5.288901e-01	95.94584	5.288901e-01	95.
178	65	1.292401e-01	96.07508	1.292401e-01	96.

Structure of numerical features

[11]:
```
data |> select(where(is.numeric)) |> descr()
```

A summarytools: 15 × 3 of type dbl

	mun_dest_cod	Target	turistas
Mean	2.810040e+04	1.053161e+03	1.053161e+03
Std.Dev	1.244046e+02	1.129686e+04	1.129686e+04
Min	2.800200e+04	3.000000e+01	3.000000e+01
Q1	2.804700e+04	5.100000e+01	5.100000e+01
Median	2.807900e+04	9.900000e+01	9.900000e+01
Q3	2.812900e+04	2.540000e+02	2.540000e+02
Max	2.890300e+04	5.363690e+05	5.363690e+05
MAD	6.375180e+01	8.747340e+01	8.747340e+01
IQR	8.200000e+01	2.030000e+02	2.030000e+02
CV	4.427147e-03	1.072661e+01	1.072661e+01
Skewness	5.244307e+00	2.642307e+01	2.642307e+01
SE.Skewness	1.092206e-02	1.092206e-02	1.092206e-02
Kurtosis	3.125743e+01	8.506590e+02	8.506590e+02
N.Valid	5.029400e+04	5.029400e+04	5.029400e+04
Pct.Valid	1.000000e+02	1.000000e+02	1.000000e+02

0.6 Data Types

Tipo de datos

[12]:
```
sapply(data, class)
glimpse(data)
```

mes 'character' **pais_orig_cod** 'character' **pais_orig** 'character' **mun_dest_cod** 'numeric' **mun_dest** 'character' **turistas** 'numeric' **CMUN** 'character' **Target** 'numeric'

```
Rows: 50,294
Columns: 8
$ mes           <chr> "2019-07", "2019-07", "2019-07",
"2019-07", "2019-07", "…
$ pais_orig_cod <chr> "000", "010", "011", "030", "110",
"121", "123", "126", …
$ pais_orig     <chr> "Total", "Total Europa", "Total Unión
Europea", "Total A…
$ mun_dest_cod  <dbl> 28002, 28002, 28002, 28002, 28002,
28002, 28002, 28002, …
$ mun_dest      <chr> "Ajalvir", "Ajalvir", "Ajalvir",
"Ajalvir", "Ajalvir", "…
$ turistas      <dbl> 338, 290, 268, 37, 56, 54, 37, 40, 157,
116, 109, 8461, …
$ CMUN          <chr> "002", "002", "002", "002", "002",
"002", "002", "002", …
$ Target        <dbl> 338, 290, 268, 37, 56, 54, 37, 40, 157,
116, 109, 8461, …
```

0.7 Statistical Measures

[13]:
```
data  |> descr()
```

A summarytools: 15 × 3 of type dbl

	mun_dest_cod	Target	turistas
Mean	2.810040e+04	1.053161e+03	1.053161e+03
Std.Dev	1.244046e+02	1.129686e+04	1.129686e+04
Min	2.800200e+04	3.000000e+01	3.000000e+01
Q1	2.804700e+04	5.100000e+01	5.100000e+01
Median	2.807900e+04	9.900000e+01	9.900000e+01
Q3	2.812900e+04	2.540000e+02	2.540000e+02
Max	2.890300e+04	5.363690e+05	5.363690e+05
MAD	6.375180e+01	8.747340e+01	8.747340e+01
IQR	8.200000e+01	2.030000e+02	2.030000e+02
CV	4.427147e-03	1.072661e+01	1.072661e+01
Skewness	5.244307e+00	2.642307e+01	2.642307e+01
SE.Skewness	1.092206e-02	1.092206e-02	1.092206e-02
Kurtosis	3.125743e+01	8.506590e+02	8.506590e+02
N.Valid	5.029400e+04	5.029400e+04	5.029400e+04
Pct.Valid	1.000000e+02	1.000000e+02	1.000000e+02

0.8 Uniques values

[14]:
```
# Rthe number of unique values in each column.
data |> summarise(across(everything(), n_distinct))
```

A tibble: 1 × 8

mes	pais_orig_cod	pais_orig	mun_dest_cod	mun_dest	turistas	CMUN	Target
<int>	<int>	<int>	<int>	<int>	<int>	<int>	<int>
40	146	146	172	172	4103	172	4103

0.9 CrossTab

Select columns

No Aplica

[15]:
```
# data |> select(where(~ !is.numeric(.x))) |> colnames()
# Column1 <- "xxx"
# Column2 <- "yyy"
```

Operation

[16]:
```
# Referencia cruzada de variables
# ctable(data[[Column1], data[[Column2]])
```

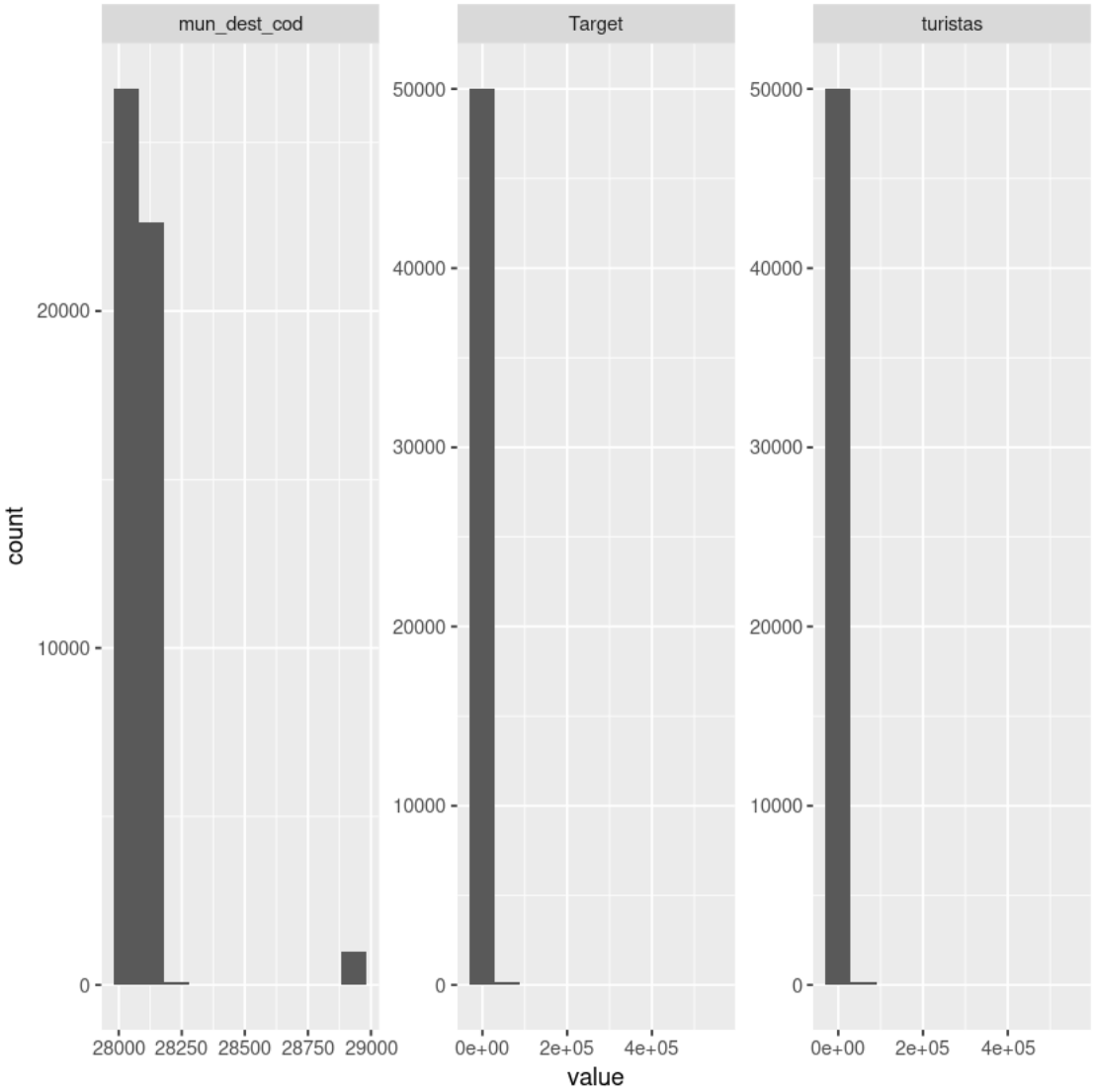
0.10 Analyzing Numerical Variables

0.10.1 Selecting continuous variables

[17]:
```
# Numeric colums
cdata <- data |> select(where(is.numeric))
```

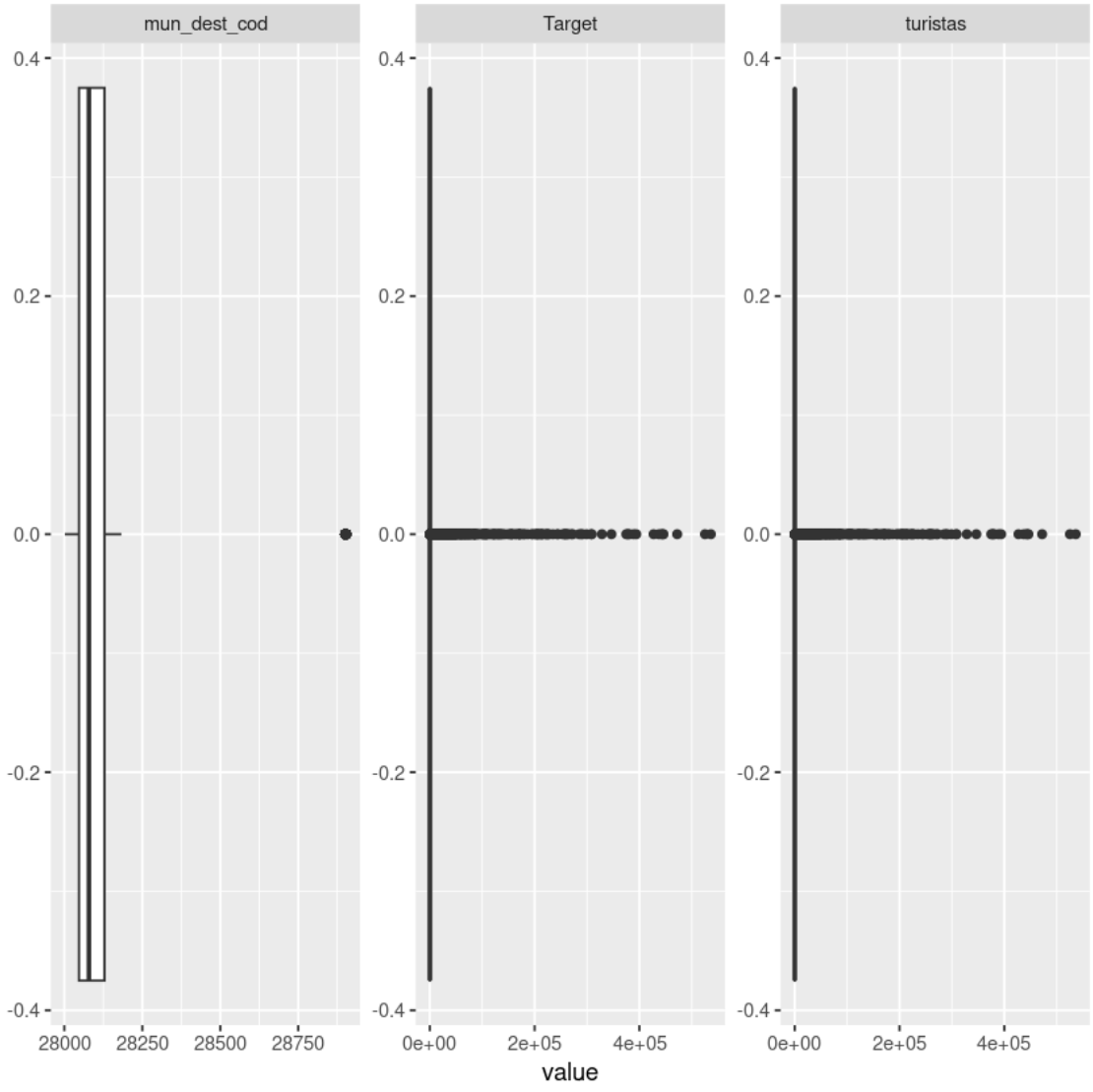
0.10.2 Histograms

[18]:
```
cdata |>
  pivot_longer(cols = everything()) |>
  ggplot(aes(x = value)) +
  geom_histogram(bins = 10) +
  facet_wrap(~name, scales = "free")
```



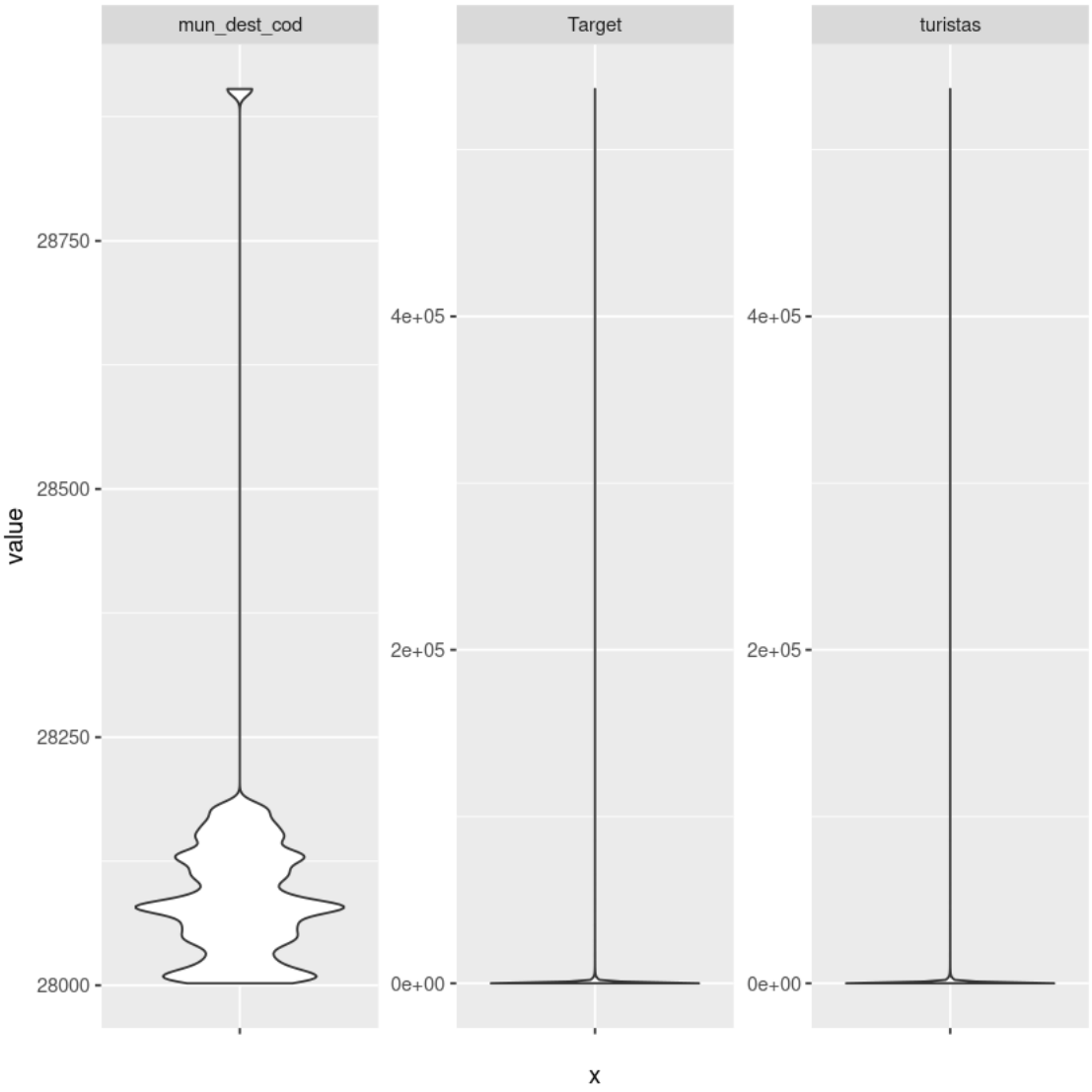
0.10.3 Box plot

[19]:
```
cdata |>
  pivot_longer(cols = everything()) |>
  ggplot(aes(x = value)) +
  geom_boxplot() +
  facet_wrap(~name, scales = "free")
```



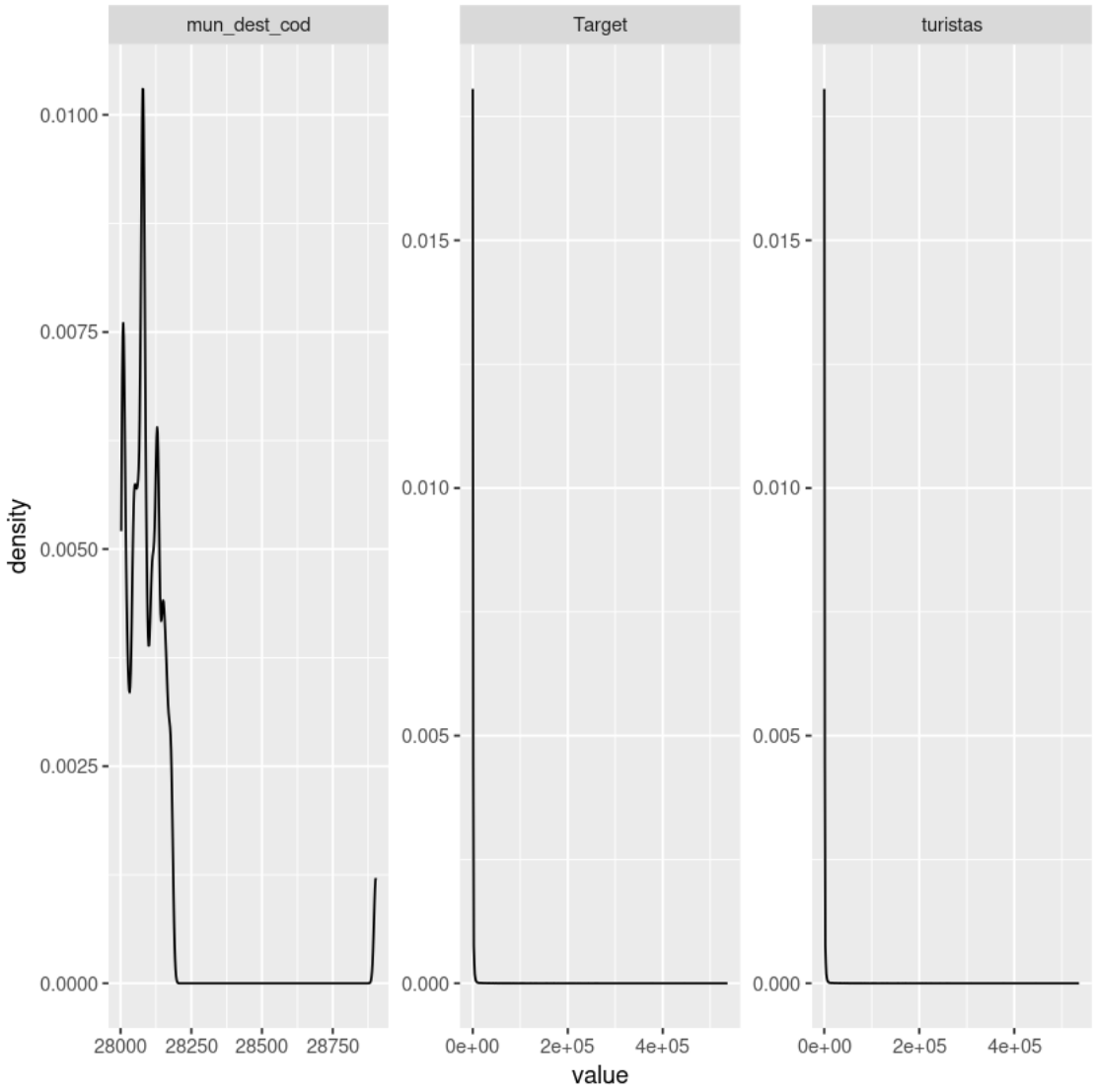
0.10.4 Violin plot

[20]:
```
cdata |>
  pivot_longer(cols = everything()) |>
  ggplot(aes(x = "", y = value)) +
  geom_violin() +
  facet_wrap(~name, scales = "free")
```



0.10.5 Distribution plot

[21]:
```
cdata |>
  pivot_longer(cols = everything()) |>
  ggplot(aes(x = value)) +
  geom_density() +
  facet_wrap(~name, scales = "free")
```



0.11 Analyzing Categorical Variables

0.11.1 Selecting categorical variables

[22]:
```
# Category colums
char_cols <- data |> select(where(~ !is.numeric(.x))) |> colnames()
char_cols
```

1. 'mes' 2. 'pais_orig_cod' 3. 'pais_orig' 4. 'mun_dest' 5. 'CMUN'

[23]:
```
# Category colums
char_data <- data |> select(where(~ !is.numeric(.x)))
char_data
```

mes	pais_orig_cod	pais_orig	mun_dest	CMUN
<chr>	<chr>	<chr>	<chr>	<chr>
2019-07	000	Total	Ajalvir	002
2019-07	010	Total Europa	Ajalvir	002
2019-07	011	Total Unión Europea	Ajalvir	002
2019-07	030	Total América	Ajalvir	002
2019-07	110	Francia	Ajalvir	002
2019-07	121	Países Bajos	Ajalvir	002
2019-07	123	Portugal	Ajalvir	002
2019-07	126	Alemania	Ajalvir	002
2019-07	000	Total	Álamo, El	004
2019-07	010	Total Europa	Álamo, El	004
2019-07	011	Total Unión Europea	Álamo, El	004
2019-07	000	Total	Alcalá de Henares	005
2019-07	010	Total Europa	Alcalá de Henares	005
2019-07	011	Total Unión Europea	Alcalá de Henares	005
2019-07	020	Total África	Alcalá de Henares	005
2019-07	030	Total América	Alcalá de Henares	005
2019-07	031	Total América del Norte	Alcalá de Henares	005
2019-07	033	Total Sudamérica	Alcalá de Henares	005
2019-07	040	Total Asia	Alcalá de Henares	005
2019-07	102	Austria	Alcalá de Henares	005
2019-07	103	Bélgica	Alcalá de Henares	005
2019-07	104	Bulgaria	Alcalá de Henares	005
2019-07	107	Dinamarca	Alcalá de Henares	005
2019-07	110	Francia	Alcalá de Henares	005
2019-07	112	Hungria	Alcalá de Henares	005
2019-07	113	Irlanda	Alcalá de Henares	005
2019-07	115	Italia	Alcalá de Henares	005
2019-07	117	Luxemburgo	Alcalá de Henares	005
2019-07	121	Países Bajos	Alcalá de Henares	005
2019-07	122	Polonia	Alcalá de Henares	005
⋮	⋮	⋮	⋮	⋮
2022-10	010	Total Europa	Zarzalejo	183
2022-10	011	Total Unión Europea	Zarzalejo	183
2022-10	000	Total	Lozoyuela-Navas-Sieteiglesias	901
2022-10	010	Total Europa	Lozoyuela-Navas-Sieteiglesias	901
2022-10	011	Total Unión Europea	Lozoyuela-Navas-Sieteiglesias	901
2022-10	110	Francia	Lozoyuela-Navas-Sieteiglesias	901
2022-10	000	Total	Puentes Viejas	902
2022-10	010	Total Europa	Puentes Viejas	902
2022-10	011	Total Unión Europea	Puentes Viejas	902
2022-10	131	Suecia	Puentes Viejas	902
2022-10	000	Total	Tres Cantos	903
2022-10	010	Total Europa	Tres Cantos	903
2022-10	011	Total Unión Europea	Tres Cantos	903
2022-10	030	Total América	Tres Cantos	903
2022-10	031	Total América del Norte	Tres Cantos	903
2022-10	033	Total Sudamérica	Tres Cantos	903
2022-10	040	Total Asia	Tres Cantos	903
2022-10	102	Austria	Tres Cantos	903
2022-10	110	Francia	Tres Cantos	903
2022-10	115	Italia	Tres Cantos	903

A tibble: 50294 × 5

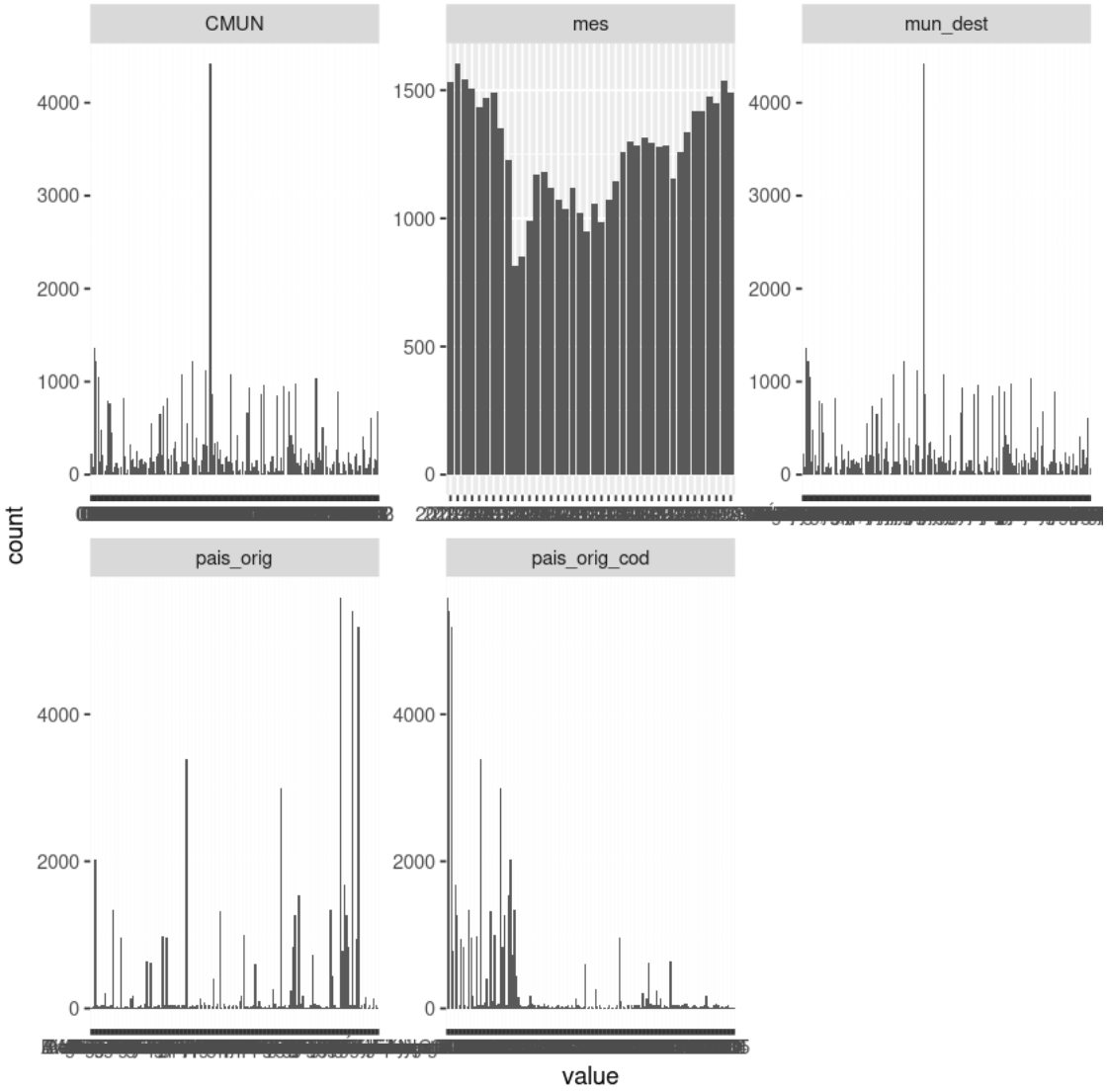
0.11.2 Most frequent entry

- Ver salida de `summarytools::freq()` arriba

[24]:
```
# Calculate and visualizate the ratio of the most frequent entry for each␣
↪feature
```

0.11.3 Visualization of categorical variables

[26]:
```
# returns a visualization of the number and frequency of categorical features
char_data |>
  pivot_longer(cols = everything()) |>
  ggplot(aes(x = value)) +
  geom_bar() +
  facet_wrap(~name, scales = "free")
```



0.12 Statistical Normality Tests

[27]:
```
cdata_long <- cdata |>
  pivot_longer(cols = everything())
```

0.12.1 Test de Anderson-Darling

[28]:
```
tapply(cdata_long$value, cdata_long$name, ad.test)
```

```
$mun_dest_cod

        Anderson-Darling normality test

data:  X[[i]]
A = 5712.5, p-value < 2.2e-16


$Target

        Anderson-Darling normality test

data:  X[[i]]
A = 17161, p-value < 2.2e-16


$turistas

        Anderson-Darling normality test

data:  X[[i]]
A = 17161, p-value < 2.2e-16
```

0.12.2 Test de Lilliefors

[29]:
```
tapply(cdata_long$value, cdata_long$name, lillie.test)
```

```
$mun_dest_cod

        Lilliefors (Kolmogorov-Smirnov) normality test

data:  X[[i]]
D = 0.23731, p-value < 2.2e-16
```

```
$Target

        Lilliefors (Kolmogorov-Smirnov) normality test

data:  X[[i]]
D = 0.46392, p-value < 2.2e-16

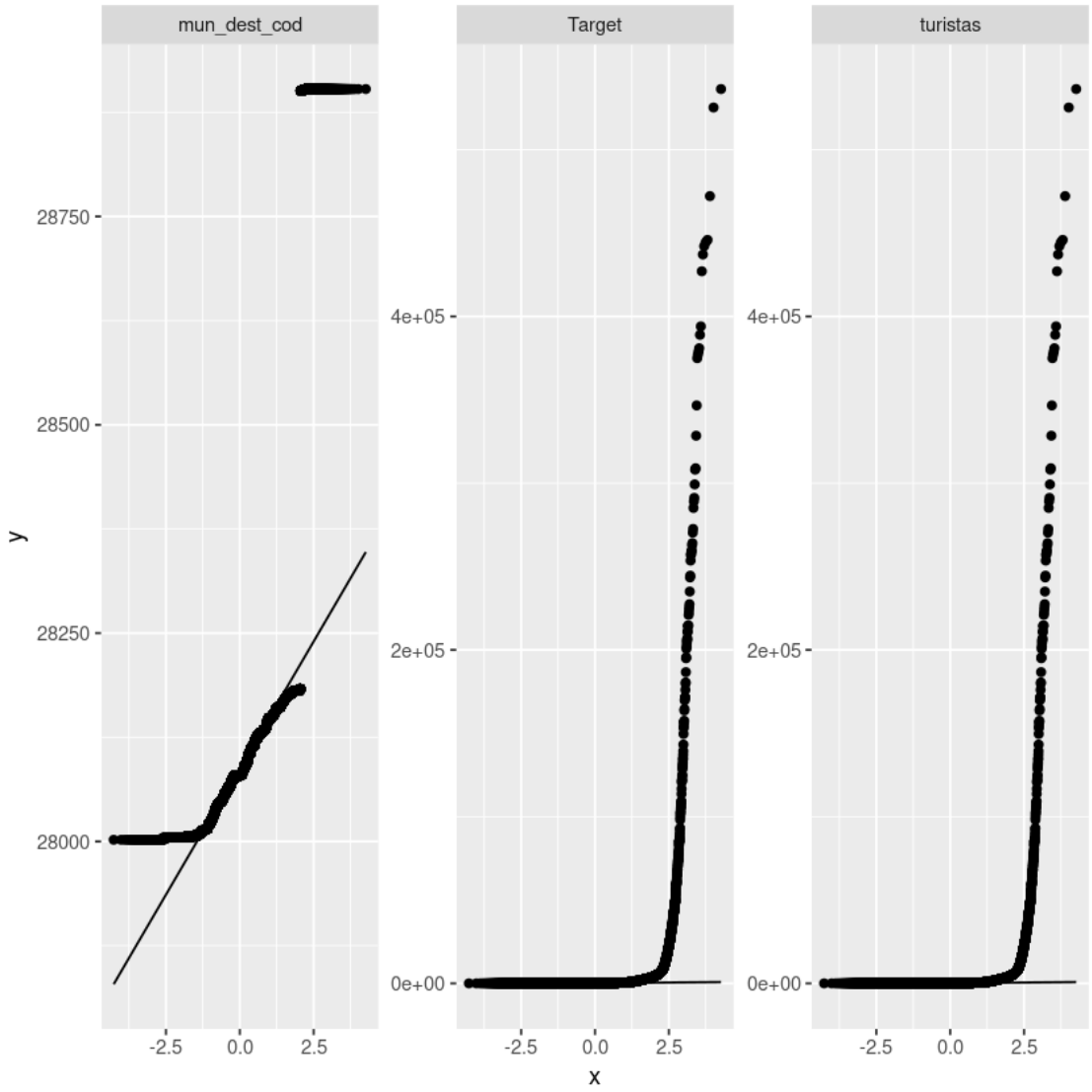

$turistas

        Lilliefors (Kolmogorov-Smirnov) normality test

data:  X[[i]]
D = 0.46392, p-value < 2.2e-16
```

0.12.3 QQ-plots

[30]:
```
cdata |>
  pivot_longer(cols = everything()) |>
  ggplot(aes(sample = value)) +
  geom_qq() +
  geom_qq_line() +
  facet_wrap(~name, scales = "free")
```



0.13 Bivariate analysis

- Ver gráficos de dispersión y ggpairs arriba
- Completar si es necesario con alguna comparación específica (gráfico de dispersión o boxplot por grupos)

Correlaciones

[31]:
```
cor(cdata, use = "pairwise.complete.obs")
```

A matrix: 3 × 3 of type dbl

	mun_dest_cod	turistas	Target
mun_dest_cod	1.00000000	-0.01279775	-0.01279775
turistas	-0.01279775	1.00000000	1.00000000
Target	-0.01279775	1.00000000	1.00000000

0.14 Regression analysis

[36]:
```
data
```

mes	pais_orig_cod	pais_orig	mun_dest_cod	mun_dest
<chr>	<chr>	<chr>	<dbl>	<chr>
2019-07	000	Total	28002	Ajalvir
2019-07	010	Total Europa	28002	Ajalvir
2019-07	011	Total Unión Europea	28002	Ajalvir
2019-07	030	Total América	28002	Ajalvir
2019-07	110	Francia	28002	Ajalvir
2019-07	121	Países Bajos	28002	Ajalvir
2019-07	123	Portugal	28002	Ajalvir
2019-07	126	Alemania	28002	Ajalvir
2019-07	000	Total	28004	Álamo, El
2019-07	010	Total Europa	28004	Álamo, El
2019-07	011	Total Unión Europea	28004	Álamo, El
2019-07	000	Total	28005	Alcalá de Her
2019-07	010	Total Europa	28005	Alcalá de Her
2019-07	011	Total Unión Europea	28005	Alcalá de Her
2019-07	020	Total África	28005	Alcalá de Her
2019-07	030	Total América	28005	Alcalá de Her
2019-07	031	Total América del Norte	28005	Alcalá de Her
2019-07	033	Total Sudamérica	28005	Alcalá de Her
2019-07	040	Total Asia	28005	Alcalá de Her
2019-07	102	Austria	28005	Alcalá de Her
2019-07	103	Bélgica	28005	Alcalá de Her
2019-07	104	Bulgaria	28005	Alcalá de Her
2019-07	107	Dinamarca	28005	Alcalá de Her
2019-07	110	Francia	28005	Alcalá de Her
2019-07	112	Hungria	28005	Alcalá de Her
2019-07	113	Irlanda	28005	Alcalá de Her
2019-07	115	Italia	28005	Alcalá de Her
2019-07	117	Luxemburgo	28005	Alcalá de Her
2019-07	121	Países Bajos	28005	Alcalá de Her
2019-07	122	Polonia	28005	Alcalá de Her
2022-10	010	Total Europa	28183	Zarzalejo
2022-10	011	Total Unión Europea	28183	Zarzalejo
2022-10	000	Total	28901	Lozoyuela-Na
2022-10	010	Total Europa	28901	Lozoyuela-Na
2022-10	011	Total Unión Europea	28901	Lozoyuela-Na
2022-10	110	Francia	28901	Lozoyuela-Na
2022-10	000	Total	28902	Puentes Vieja
2022-10	010	Total Europa	28902	Puentes Vieja
2022-10	011	Total Unión Europea	28902	Puentes Vieja
2022-10	131	Suecia	28902	Puentes Vieja
2022-10	000	Total	28903	Tres Cantos
2022-10	010	Total Europa	28903	Tres Cantos
2022-10	011	Total Unión Europea	28903	Tres Cantos
2022-10	030	Total América	28903	Tres Cantos
2022-10	031	Total América del Norte	28903	Tres Cantos
2022-10	033	Total Sudamérica	28903	Tres Cantos
2022-10	040	Total Asia	28903	Tres Cantos
2022-10	102	Austria	28903	Tres Cantos
2022-10	110	Francia	28903	Tres Cantos
2022-10	115	Italia	28903	Tres Cantos

A spec_tbl_df: 50294 × 8

0.14.1 Modelo completo regresión lineal simple

[51]:
```
cdata_filtered <- data |>
    filter(is_train == TRUE) |>
    na.omit()

modelo <- lm(Target ~ ., data = cdata_filtered)
summary(modelo)
```

```
Call:
lm(formula = Target ~ ., data = cdata_filtered)

Residuals:
       Min         1Q     Median         3Q        Max
-1.917e-10  1.000e-13  3.000e-13  5.000e-13  7.369e-09

Coefficients: (316 not defined because of singularities)
                                            Estimate Std. Error    t value
(Intercept)                                1.209e-09  8.511e-10  1.420e+00
mes2019-08                                -2.335e-13  1.476e-12 -1.580e-01
mes2019-09                                -5.683e-13  1.503e-12 -3.780e-01
mes2019-10                                 1.292e-12  1.512e-12  8.540e-01
mes2019-11                                 1.023e-13  1.527e-12  6.700e-02
mes2019-12                                -6.341e-13  1.523e-12 -4.160e-01
mes2020-01                                -4.834e-13  1.507e-12 -3.210e-01
mes2020-02                                -2.197e-12  1.553e-12 -1.414e+00
mes2020-03                                -4.146e-12  1.591e-12 -2.605e+00
mes2020-04                                -1.024e-11  1.791e-12 -5.717e+00
mes2020-05                                -9.243e-12  1.787e-12 -5.171e+00
mes2020-06                                -7.842e-12  1.699e-12 -4.616e+00
mes2020-07                                -6.084e-12  1.613e-12 -3.771e+00
mes2020-08                                -6.220e-12  1.613e-12 -3.855e+00
mes2020-09                                -6.516e-12  1.634e-12 -3.987e+00
mes2020-10                                -6.570e-12  1.652e-12 -3.978e+00
mes2020-11                                -7.209e-12  1.687e-12 -4.272e+00
mes2020-12                                -6.234e-12  1.642e-12 -3.797e+00
mes2021-01                                -7.429e-12  1.683e-12 -4.414e+00
mes2021-02                                -8.040e-12  1.733e-12 -4.640e+00
mes2021-03                                -6.717e-12  1.653e-12 -4.063e+00
mes2021-04                                -7.431e-12  1.703e-12 -4.363e+00
mes2021-05                                -6.389e-12  1.653e-12 -3.864e+00
mes2021-06                                -5.024e-12  1.635e-12 -3.074e+00
mes2021-07                                -5.341e-12  1.581e-12 -3.377e+00
mes2021-08                                -3.862e-12  1.568e-12 -2.463e+00
mes2021-09                                -3.676e-12  1.567e-12 -2.346e+00
mes2021-10                                -3.089e-12  1.563e-12 -1.977e+00
mes2021-11                                -2.209e-12  1.570e-12 -1.407e+00
```

mes2021-12	-2.944e-12	1.569e-12	-1.876e+00
mes2022-01	-4.033e-12	1.572e-12	-2.566e+00
mes2022-02	-4.545e-12	1.605e-12	-2.832e+00
mes2022-03	-2.458e-12	1.588e-12	-1.548e+00
mes2022-04	-1.212e-12	1.552e-12	-7.810e-01
mes2022-05	-1.078e-12	1.531e-12	-7.040e-01
mes2022-06	-1.448e-12	1.539e-12	-9.410e-01
mes2022-07	-1.888e-12	1.522e-12	-1.241e+00
mes2022-08	-3.188e-12	1.519e-12	-2.099e+00
mes2022-09	6.727e-13	1.511e-12	4.450e-01
mes2022-10	1.908e-12	1.517e-12	1.257e+00
pais_orig_cod010	-2.485e-12	7.930e-13	-3.134e+00
pais_orig_cod011	-4.060e-12	8.037e-13	-5.052e+00
pais_orig_cod020	-2.300e-11	1.652e-12	-1.392e+01
pais_orig_cod030	-1.316e-11	1.215e-12	-1.083e+01
pais_orig_cod031	-1.733e-11	1.340e-12	-1.293e+01
pais_orig_cod032	-8.530e-11	6.384e-12	-1.336e+01
pais_orig_cod033	-1.966e-11	1.510e-12	-1.302e+01
pais_orig_cod040	-2.122e-11	1.598e-12	-1.329e+01
pais_orig_cod050	-9.539e-11	6.397e-12	-1.491e+01
pais_orig_cod101	-9.516e-11	6.777e-12	-1.404e+01
pais_orig_cod102	-1.903e-11	1.321e-12	-1.441e+01
pais_orig_cod103	-2.140e-11	1.516e-12	-1.411e+01
pais_orig_cod104	-4.023e-11	3.194e-12	-1.260e+01
pais_orig_cod106	-9.787e-11	7.124e-12	-1.374e+01
pais_orig_cod107	-2.186e-11	1.503e-12	-1.454e+01
pais_orig_cod109	-8.466e-11	5.838e-12	-1.450e+01
pais_orig_cod110	-1.056e-11	9.221e-13	-1.146e+01
pais_orig_cod111	-9.376e-11	7.002e-12	-1.339e+01
pais_orig_cod112	-6.161e-11	4.572e-12	-1.347e+01
pais_orig_cod113	-2.807e-11	2.164e-12	-1.297e+01
pais_orig_cod114	-9.861e-11	7.836e-12	-1.258e+01
pais_orig_cod115	-1.898e-11	1.332e-12	-1.424e+01
pais_orig_cod116	-5.499e-11	4.119e-12	-1.335e+01
pais_orig_cod117	-2.248e-11	1.487e-12	-1.512e+01
pais_orig_cod118	-9.540e-11	6.486e-12	-1.471e+01
pais_orig_cod120	-6.597e-11	5.956e-12	-1.108e+01
pais_orig_cod121	-1.186e-11	9.652e-13	-1.229e+01
pais_orig_cod122	-2.270e-11	1.588e-12	-1.429e+01
pais_orig_cod123	-1.958e-11	1.347e-12	-1.454e+01
pais_orig_cod124	-9.644e-11	6.580e-12	-1.466e+01
pais_orig_cod125	-1.739e-11	1.256e-12	-1.385e+01
pais_orig_cod126	-1.562e-11	1.133e-12	-1.379e+01
pais_orig_cod128	-2.349e-11	1.699e-12	-1.382e+01
pais_orig_cod131	-1.945e-11	1.311e-12	-1.483e+01
pais_orig_cod132	-2.748e-11	2.152e-12	-1.277e+01
pais_orig_cod135	-3.873e-11	3.486e-12	-1.111e+01
pais_orig_cod136	-7.845e-11	5.576e-12	-1.407e+01

pais_orig_cod137	-9.780e-11	6.890e-12	-1.419e+01
pais_orig_cod138	-9.836e-11	7.676e-12	-1.281e+01
pais_orig_cod139	-9.738e-11	7.123e-12	-1.367e+01
pais_orig_cod141	-9.189e-11	6.476e-12	-1.419e+01
pais_orig_cod142	-4.149e-11	3.325e-12	-1.248e+01
pais_orig_cod143	-6.784e-11	5.297e-12	-1.281e+01
pais_orig_cod144	-9.446e-11	6.998e-12	-1.350e+01
pais_orig_cod145	-9.913e-11	9.355e-12	-1.060e+01
pais_orig_cod146	-9.647e-11	6.679e-12	-1.444e+01
pais_orig_cod147	-9.478e-11	7.669e-12	-1.236e+01
pais_orig_cod148	-9.902e-11	9.355e-12	-1.059e+01
pais_orig_cod154	-7.590e-11	5.758e-12	-1.318e+01
pais_orig_cod156	-9.956e-11	1.077e-11	-9.240e+00
pais_orig_cod157	-9.695e-11	7.123e-12	-1.361e+01
pais_orig_cod158	-9.948e-11	1.242e-11	-8.011e+00
pais_orig_cod174	-9.557e-11	7.830e-12	-1.221e+01
pais_orig_cod201	-1.001e-10	1.857e-11	-5.389e+00
pais_orig_cod202	-9.818e-11	7.836e-12	-1.253e+01
pais_orig_cod203	-9.626e-11	6.487e-12	-1.484e+01
pais_orig_cod208	-9.729e-11	8.006e-12	-1.215e+01
pais_orig_cod210	-1.001e-10	3.706e-11	-2.701e+00
pais_orig_cod211	-9.726e-11	7.249e-12	-1.342e+01
pais_orig_cod213	-9.160e-11	6.301e-12	-1.454e+01
pais_orig_cod215	-1.006e-10	2.143e-11	-4.697e+00
pais_orig_cod217	-9.753e-11	7.123e-12	-1.369e+01
pais_orig_cod218	-9.772e-11	1.662e-11	-5.881e+00
pais_orig_cod220	-4.324e-11	3.592e-12	-1.204e+01
pais_orig_cod221	-9.652e-11	6.580e-12	-1.467e+01
pais_orig_cod224	-9.817e-11	7.383e-12	-1.330e+01
pais_orig_cod226	-1.002e-10	3.706e-11	-2.703e+00
pais_orig_cod227	-9.756e-11	6.890e-12	-1.416e+01
pais_orig_cod228	-2.500e-11	1.836e-12	-1.362e+01
pais_orig_cod229	-1.029e-10	3.706e-11	-2.775e+00
pais_orig_cod230	-9.880e-11	7.836e-12	-1.261e+01
pais_orig_cod231	-9.919e-11	1.036e-11	-9.575e+00
pais_orig_cod233	-1.002e-10	3.706e-11	-2.705e+00
pais_orig_cod234	-3.276e-11	2.750e-12	-1.191e+01
pais_orig_cod236	-9.746e-11	7.123e-12	-1.368e+01
pais_orig_cod239	-9.454e-11	6.307e-12	-1.499e+01
pais_orig_cod243	-1.012e-10	1.518e-11	-6.664e+00
pais_orig_cod245	-1.004e-10	1.857e-11	-5.407e+00
pais_orig_cod246	-1.003e-10	3.706e-11	-2.706e+00
pais_orig_cod247	-1.003e-10	3.706e-11	-2.706e+00
pais_orig_cod248	-9.628e-11	6.889e-12	-1.398e+01
pais_orig_cod249	-9.973e-11	1.857e-11	-5.371e+00
pais_orig_cod250	-9.955e-11	1.125e-11	-8.851e+00
pais_orig_cod252	-2.150e-11	2.623e-11	-8.200e-01
pais_orig_cod301	-7.954e-11	5.969e-12	-1.333e+01

pais_orig_cod302	-1.899e-11	1.486e-12	-1.278e+01
pais_orig_cod303	-3.787e-11	4.205e-12	-9.007e+00
pais_orig_cod314	-9.461e-11	6.998e-12	-1.352e+01
pais_orig_cod315	-9.995e-11	9.356e-12	-1.068e+01
pais_orig_cod317	-9.627e-11	6.888e-12	-1.398e+01
pais_orig_cod319	-9.588e-11	6.397e-12	-1.499e+01
pais_orig_cod321	-9.590e-11	6.486e-12	-1.479e+01
pais_orig_cod322	-9.972e-11	1.316e-11	-7.576e+00
pais_orig_cod323	-9.650e-11	7.122e-12	-1.355e+01
pais_orig_cod324	-9.608e-11	6.781e-12	-1.417e+01
pais_orig_cod326	-9.420e-11	6.576e-12	-1.432e+01
pais_orig_cod327	-1.003e-10	3.706e-11	-2.706e+00
pais_orig_cod340	-3.289e-11	3.005e-12	-1.095e+01
pais_orig_cod341	-9.646e-11	8.386e-12	-1.150e+01
pais_orig_cod342	-4.380e-11	3.604e-12	-1.215e+01
pais_orig_cod343	-2.545e-11	1.804e-12	-1.411e+01
pais_orig_cod344	-6.349e-11	5.193e-12	-1.222e+01
pais_orig_cod345	-8.205e-11	6.120e-12	-1.340e+01
pais_orig_cod347	-8.633e-11	6.209e-12	-1.390e+01
pais_orig_cod348	-3.353e-11	2.748e-12	-1.220e+01
pais_orig_cod350	-7.164e-11	5.752e-12	-1.245e+01
pais_orig_cod351	-4.434e-11	3.747e-12	-1.184e+01
pais_orig_cod401	-8.315e-11	1.517e-11	-5.481e+00
pais_orig_cod402	-8.004e-11	5.830e-12	-1.373e+01
pais_orig_cod403	-9.952e-11	8.601e-12	-1.157e+01
pais_orig_cod404	-1.012e-10	2.622e-11	-3.858e+00
pais_orig_cod407	-2.441e-11	1.767e-12	-1.382e+01
pais_orig_cod408	-7.926e-11	5.899e-12	-1.344e+01
pais_orig_cod409	-9.500e-11	7.247e-12	-1.311e+01
pais_orig_cod410	-8.654e-11	6.292e-12	-1.375e+01
pais_orig_cod411	-9.626e-11	6.781e-12	-1.420e+01
pais_orig_cod412	-9.734e-11	7.123e-12	-1.367e+01
pais_orig_cod413	-9.701e-11	6.781e-12	-1.431e+01
pais_orig_cod414	-6.249e-11	5.625e-12	-1.111e+01
pais_orig_cod415	-6.668e-11	5.098e-12	-1.308e+01
pais_orig_cod416	-9.830e-11	8.388e-12	-1.172e+01
pais_orig_cod417	-1.001e-10	3.706e-11	-2.702e+00
pais_orig_cod418	-9.455e-11	8.184e-12	-1.155e+01
pais_orig_cod420	-9.636e-11	7.122e-12	-1.353e+01
pais_orig_cod421	-9.783e-11	7.525e-12	-1.300e+01
pais_orig_cod424	-1.021e-10	3.706e-11	-2.754e+00
pais_orig_cod425	-9.821e-11	7.250e-12	-1.355e+01
pais_orig_cod426	-9.802e-11	7.250e-12	-1.352e+01
pais_orig_cod427	-8.631e-11	6.129e-12	-1.408e+01
pais_orig_cod430	-4.018e-11	3.350e-12	-1.199e+01
pais_orig_cod432	-9.679e-11	7.249e-12	-1.335e+01
pais_orig_cod433	-1.006e-10	2.622e-11	-3.834e+00
pais_orig_cod434	-1.002e-10	1.179e-11	-8.503e+00

pais_orig_cod435	-8.239e-11	6.282e-12	-1.312e+01
pais_orig_cod436	-7.238e-11	5.622e-12	-1.287e+01
pais_orig_cod437	-9.728e-11	6.782e-12	-1.435e+01
pais_orig_cod442	-9.934e-11	9.355e-12	-1.062e+01
pais_orig_cod443	-9.870e-11	8.008e-12	-1.233e+01
pais_orig_cod447	-9.994e-11	1.518e-11	-6.584e+00
pais_orig_cod499	-9.478e-11	8.824e-12	-1.074e+01
pais_orig_cod501	-9.531e-11	7.381e-12	-1.291e+01
pais_orig_cod502	-1.000e-10	3.706e-11	-2.699e+00
pais_orig_cod504	-9.990e-11	1.036e-11	-9.644e+00
pais_orig_cod505	-9.935e-11	2.143e-11	-4.637e+00
pais_origAlbania	NA	NA	NA
pais_origAlemania	NA	NA	NA
pais_origAndorra	NA	NA	NA
pais_origAngola	NA	NA	NA
pais_origArabia saudita	NA	NA	NA
pais_origArgelia	NA	NA	NA
pais_origArgentina	NA	NA	NA
pais_origArmenia	NA	NA	NA
pais_origAsia	NA	NA	NA
pais_origAustralia	NA	NA	NA
pais_origAustria	NA	NA	NA
pais_origAzerbaiyan	NA	NA	NA
pais_origBahrein	NA	NA	NA
pais_origBangladesh	NA	NA	NA
pais_origBélgica	NA	NA	NA
pais_origBielorrusia / belarus	NA	NA	NA
pais_origBolivia	NA	NA	NA
pais_origBosnia-herzegovina	NA	NA	NA
pais_origBrasil	NA	NA	NA
pais_origBulgaria	NA	NA	NA
pais_origBurkina faso	NA	NA	NA
pais_origCamboya	NA	NA	NA
pais_origCamerun	NA	NA	NA
pais_origCanada	NA	NA	NA
pais_origChad	NA	NA	NA
pais_origChile	NA	NA	NA
pais_origChina	NA	NA	NA
pais_origChipre	NA	NA	NA
pais_origColombia	NA	NA	NA
pais_origCongo	NA	NA	NA
pais_origCosta de marfil	NA	NA	NA
pais_origCosta rica	NA	NA	NA
pais_origCroacia	NA	NA	NA
pais_origCuba	NA	NA	NA
pais_origDinamarca	NA	NA	NA
pais_origEcuador	NA	NA	NA
pais_origEE.UU.	NA	NA	NA

pais_origEgipto	NA	NA	NA
pais_origEl salvador	NA	NA	NA
pais_origEmiratos arabes unidos	NA	NA	NA
pais_origEslovaquia	NA	NA	NA
pais_origEslovenia	NA	NA	NA
pais_origEstonia	NA	NA	NA
pais_origFiji	NA	NA	NA
pais_origFilipinas	NA	NA	NA
pais_origFinlandia	NA	NA	NA
pais_origFrancia	NA	NA	NA
pais_origGabon	NA	NA	NA
pais_origGeorgia	NA	NA	NA
pais_origGhana	NA	NA	NA
pais_origGibraltar	NA	NA	NA
pais_origGrecia	NA	NA	NA
pais_origGuatemala	NA	NA	NA
pais_origGuinea ecuatorial	NA	NA	NA
pais_origHonduras	NA	NA	NA
pais_origHungria	NA	NA	NA
pais_origIndia	NA	NA	NA
pais_origIndonesia	NA	NA	NA
pais_origIran	NA	NA	NA
pais_origIraq	NA	NA	NA
pais_origIrlanda	NA	NA	NA
pais_origIslandia	NA	NA	NA
pais_origIsrael	NA	NA	NA
pais_origItalia	NA	NA	NA
pais_origJamaica	NA	NA	NA
pais_origJapón	NA	NA	NA
pais_origJordania	NA	NA	NA
pais_origKazajstan	NA	NA	NA
pais_origKenia	NA	NA	NA
pais_origKuwait	NA	NA	NA
pais_origLetonia	NA	NA	NA
pais_origLibano	NA	NA	NA
pais_origLibia	NA	NA	NA
pais_origLiechtenstein	NA	NA	NA
pais_origLituania	NA	NA	NA
pais_origLuxemburgo	NA	NA	NA
pais_origMacedonia	NA	NA	NA
pais_origMalasia	NA	NA	NA
pais_origMalawi	NA	NA	NA
pais_origMali	NA	NA	NA
pais_origMalta	NA	NA	NA
pais_origMarruecos	NA	NA	NA
pais_origMauritania	NA	NA	NA
pais_origMexico	NA	NA	NA
pais_origMoldavia / moldava	NA	NA	NA

pais_origMontenegro	NA	NA	NA
pais_origMozambique	NA	NA	NA
pais_origNepal	NA	NA	NA
pais_origNicaragua	NA	NA	NA
pais_origNiger	NA	NA	NA
pais_origNigeria	NA	NA	NA
pais_origNoruega	NA	NA	NA
pais_origNueva zelanda	NA	NA	NA
pais_origOman	NA	NA	NA
pais_origPaíses Bajos	NA	NA	NA
pais_origPakistan	NA	NA	NA
pais_origPanama	NA	NA	NA
pais_origPapua nueva guinea	NA	NA	NA
pais_origParaguay	NA	NA	NA
pais_origPeru	NA	NA	NA
pais_origPolonia	NA	NA	NA
pais_origPortugal	NA	NA	NA
pais_origQatar	NA	NA	NA
pais_origReino Unido	NA	NA	NA
pais_origRepública Checa	NA	NA	NA
pais_origRepublica de corea - corea del sur	NA	NA	NA
pais_origRepublica de guinea	NA	NA	NA
pais_origRepublica de mauricio	NA	NA	NA
pais_origRepublica democratica del congo	NA	NA	NA
pais_origRepublica dominicana	NA	NA	NA
pais_origRumania	NA	NA	NA
pais_origRusia	NA	NA	NA
pais_origSenegal	NA	NA	NA
pais_origSerbia	NA	NA	NA
pais_origSingapur	NA	NA	NA
pais_origSiria	NA	NA	NA
pais_origSri lanka	NA	NA	NA
pais_origSudafrica	NA	NA	NA
pais_origSudan	NA	NA	NA
pais_origSuecia	NA	NA	NA
pais_origSuiza	NA	NA	NA
pais_origTailandia	NA	NA	NA
pais_origTanzania	NA	NA	NA
pais_origTogo	NA	NA	NA
pais_origTotal	NA	NA	NA
pais_origTotal África	NA	NA	NA
pais_origTotal América	NA	NA	NA
pais_origTotal América del Norte	NA	NA	NA
pais_origTotal Asia	NA	NA	NA
pais_origTotal Centroamérica y Caribe	NA	NA	NA
pais_origTotal Europa	NA	NA	NA
pais_origTotal Oceanía	NA	NA	NA
pais_origTotal Sudamérica	NA	NA	NA

pais_origTotal Unión Europea	NA	NA	NA
pais_origTrinidad y tobago	NA	NA	NA
pais_origTúnez	NA	NA	NA
pais_origTurquia	NA	NA	NA
pais_origUcrania	NA	NA	NA
pais_origUganda	NA	NA	NA
pais_origUruguay	NA	NA	NA
pais_origUzbekistan	NA	NA	NA
pais_origVenezuela	NA	NA	NA
pais_origVietnan	NA	NA	NA
pais_origZimbabwe	NA	NA	NA
mun_dest_cod	-4.274e-14	3.035e-14	-1.408e+00
mun_destÁlamo, El	-4.461e-12	5.168e-12	-8.630e-01
mun_destAlcalá de Henares	1.872e-11	2.906e-12	6.441e+00
mun_destAlcobendas	1.795e-11	2.917e-12	6.153e+00
mun_destAlcorcón	1.224e-11	2.930e-12	4.176e+00
mun_destAldea del Fresno	-4.805e-12	4.405e-12	-1.091e+00
mun_destAlgete	5.252e-12	3.230e-12	1.626e+00
mun_destAlpedrete	-8.036e-13	3.849e-12	-2.090e-01
mun_destAmbite	-6.936e-12	7.991e-12	-8.680e-01
mun_destAnchuelo	-6.051e-12	4.940e-12	-1.225e+00
mun_destAranjuez	1.027e-11	2.953e-12	3.479e+00
mun_destArganda del Rey	9.354e-12	2.960e-12	3.160e+00
mun_destArroyomolinos	5.680e-12	3.173e-12	1.790e+00
mun_destAtazar, El	-6.639e-12	7.972e-12	-8.330e-01
mun_destBatres	-5.851e-12	5.036e-12	-1.162e+00
mun_destBecerril de la Sierra	-4.615e-12	4.528e-12	-1.019e+00
mun_destBelmonte de Tajo	-6.715e-12	5.665e-12	-1.185e+00
mun_destBerrueco, El	-5.310e-12	5.125e-12	-1.036e+00
mun_destBoadilla del Monte	1.079e-11	2.864e-12	3.767e+00
mun_destBoalo, El	-1.156e-12	3.778e-12	-3.060e-01
mun_destBraojos	-7.532e-12	1.422e-11	-5.300e-01
mun_destBrea de Tajo	-5.218e-12	5.777e-12	-9.030e-01
mun_destBrunete	3.653e-12	3.359e-12	1.088e+00
mun_destBuitrago del Lozoya	-2.148e-12	4.121e-12	-5.210e-01
mun_destBustarviejo	-1.657e-12	4.022e-12	-4.120e-01
mun_destCabanillas de la Sierra	-5.474e-12	4.933e-12	-1.110e+00
mun_destCabrera, La	2.997e-12	3.473e-12	8.630e-01
mun_destCadalso de los Vidrios	-5.102e-12	5.211e-12	-9.790e-01
mun_destCamarma de Esteruelas	-2.131e-12	4.048e-12	-5.270e-01
mun_destCampo Real	-1.961e-12	3.975e-12	-4.930e-01
mun_destCanencia	-4.009e-12	4.588e-12	-8.740e-01
mun_destCarabaña	-2.557e-12	4.279e-12	-5.980e-01
mun_destCasarrubuelos	-3.417e-12	4.528e-12	-7.550e-01
mun_destCenicientos	-4.513e-12	5.267e-12	-8.570e-01
mun_destCercedilla	-7.971e-13	3.833e-12	-2.080e-01
mun_destChapinería	-8.207e-12	1.142e-11	-7.190e-01
mun_destChinchón	2.316e-13	3.695e-12	6.300e-02

mun_destCiempozuelos	8.627e-12	2.945e-12	2.929e+00
mun_destCobeña	-2.979e-12	4.216e-12	-7.070e-01
mun_destCollado Mediano	4.358e-13	3.723e-12	1.170e-01
mun_destCollado Villalba	1.080e-11	2.813e-12	3.838e+00
mun_destColmenar de Oreja	-5.773e-13	3.860e-12	-1.500e-01
mun_destColmenar del Arroyo	-6.872e-12	1.531e-11	-4.490e-01
mun_destColmenar Viejo	9.297e-12	2.868e-12	3.241e+00
mun_destColmenarejo	2.247e-14	3.610e-12	6.000e-03
mun_destCorpa	-4.588e-12	7.386e-12	-6.210e-01
mun_destCoslada	1.200e-11	2.775e-12	4.323e+00
mun_destCubas de la Sagra	-9.468e-13	3.969e-12	-2.390e-01
mun_destDaganzo de Arriba	2.902e-12	3.413e-12	8.500e-01
mun_destEscorial, El	4.771e-12	3.224e-12	1.480e+00
mun_destEstremera	-2.207e-12	4.276e-12	-5.160e-01
mun_destFresnedillas de la Oliva	-4.907e-12	1.421e-11	-3.450e-01
mun_destFresno de Torote	-4.169e-12	5.111e-12	-8.160e-01
mun_destFuenlabrada	1.492e-11	2.714e-12	5.497e+00
mun_destFuente el Saz de Jarama	-1.850e-12	4.207e-12	-4.400e-01
mun_destFuentidueña de Tajo	-2.371e-12	4.236e-12	-5.600e-01
mun_destGalapagar	8.728e-12	2.959e-12	2.950e+00
mun_destGarganta de los Montes	-2.607e-12	4.601e-12	-5.660e-01
mun_destGascones	-5.657e-12	2.153e-11	-2.630e-01
mun_destGetafe	1.805e-11	2.730e-12	6.613e+00
mun_destGriñón	-2.764e-13	3.892e-12	-7.100e-02
mun_destGuadalix de la Sierra	-9.782e-13	4.079e-12	-2.400e-01
mun_destGuadarrama	5.910e-12	3.205e-12	1.844e+00
mun_destHorcajo de la Sierra-Aoslos	-2.351e-12	4.753e-12	-4.950e-01
mun_destHorcajuelo de la Sierra	-3.804e-12	7.958e-12	-4.780e-01
mun_destHoyo de Manzanares	-3.064e-13	4.137e-12	-7.400e-02
mun_destHumanes de Madrid	5.473e-12	3.425e-12	1.598e+00
mun_destLeganés	1.612e-11	2.814e-12	5.728e+00
mun_destLoeches	5.005e-12	3.464e-12	1.445e+00
mun_destLozoya	-4.911e-12	8.293e-12	-5.920e-01
mun_destLozoyuela-Navas-Sieteiglesias	3.530e-11	2.627e-11	1.344e+00
mun_destMadrid	9.221e-11	2.822e-12	3.267e+01
mun_destMajadahonda	1.370e-11	2.948e-12	4.646e+00
mun_destManzanares el Real	1.581e-12	3.859e-12	4.100e-01
mun_destMeco	7.204e-12	3.446e-12	2.091e+00
mun_destMejorada del Campo	6.552e-12	3.443e-12	1.903e+00
mun_destMiraflores de la Sierra	4.845e-13	4.152e-12	1.170e-01
mun_destMolar, El	4.104e-12	3.674e-12	1.117e+00
mun_destMolinos, Los	-2.499e-12	4.922e-12	-5.080e-01
mun_destMontejo de la Sierra	-2.155e-12	7.881e-12	-2.730e-01
mun_destMoraleja de Enmedio	9.463e-13	4.047e-12	2.340e-01
mun_destMoralzarzal	1.843e-12	3.923e-12	4.700e-01
mun_destMorata de Tajuña	-1.057e-13	4.445e-12	-2.400e-02
mun_destMóstoles	1.650e-11	3.043e-12	5.423e+00
mun_destNavacerrada	-1.110e-12	4.675e-12	-2.370e-01

mun_destNavalafuente	-2.391e-12	7.309e-12	-3.270e-01
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mun_destNavarredonda y San Mamés	-2.488e-12	7.436e-12	-3.350e-01
mun_destNavas del Rey	-4.013e-12	6.271e-12	-6.400e-01
mun_destNuevo Baztán	-2.368e-13	4.501e-12	-5.300e-02
mun_destOlmeda de las Fuentes	-6.895e-12	3.715e-11	-1.860e-01
mun_destOrusco de Tajuña	-1.718e-12	7.164e-12	-2.400e-01
mun_destParacuellos de Jarama	1.434e-11	3.389e-12	4.232e+00
mun_destParla	1.582e-11	3.297e-12	4.799e+00
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mun_destPerales de Tajuña	1.113e-12	4.495e-12	2.480e-01
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mun_destRozas de Madrid, Las	1.739e-11	3.687e-12	4.717e+00
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mun_destSan Fernando de Henares	1.691e-11	3.754e-12	4.505e+00
mun_destSan Lorenzo de El Escorial	9.141e-12	4.052e-12	2.256e+00
mun_destSan Martín de la Vega	8.432e-12	4.204e-12	2.006e+00
mun_destSan Martín de Valdeiglesias	4.714e-12	4.513e-12	1.045e+00
mun_destSan Sebastián de los Reyes	1.734e-11	3.824e-12	4.535e+00
mun_destSanta María de la Alameda	8.019e-13	5.142e-12	1.560e-01
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mun_destSantos de la Humosa, Los	8.323e-12	4.386e-12	1.898e+00
mun_destSerna del Monte, La	-2.662e-12	1.448e-11	-1.840e-01
mun_destSerranillos del Valle	1.046e-13	5.334e-12	2.000e-02
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mun_destSoto del Real	4.950e-12	4.730e-12	1.047e+00
mun_destTalamanca de Jarama	2.357e-12	5.057e-12	4.660e-01

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mun_destTorrejón de Velasco	5.224e-12	4.747e-12	1.100e+00
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mun_destTorrelodones	1.187e-11	4.417e-12	2.688e+00
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mun_destTorres de la Alameda	8.600e-12	4.708e-12	1.827e+00
mun_destTres Cantos	4.621e-11	2.619e-11	1.765e+00
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pais_orig_cod322               3.64e-14 ***
pais_orig_cod323                < 2e-16 ***
pais_orig_cod324                < 2e-16 ***
pais_orig_cod326                < 2e-16 ***
pais_orig_cod327               0.006817 **
pais_orig_cod340                < 2e-16 ***
pais_orig_cod341                < 2e-16 ***
pais_orig_cod342                < 2e-16 ***
pais_orig_cod343                < 2e-16 ***
pais_orig_cod344                < 2e-16 ***
pais_orig_cod345                < 2e-16 ***
pais_orig_cod347                < 2e-16 ***
pais_orig_cod348                < 2e-16 ***
pais_orig_cod350                < 2e-16 ***
pais_orig_cod351                < 2e-16 ***
pais_orig_cod401               4.25e-08 ***
pais_orig_cod402                < 2e-16 ***
pais_orig_cod403                < 2e-16 ***
pais_orig_cod404               0.000114 ***
pais_orig_cod407                < 2e-16 ***
pais_orig_cod408                < 2e-16 ***
pais_orig_cod409                < 2e-16 ***
pais_orig_cod410                < 2e-16 ***
pais_orig_cod411                < 2e-16 ***
pais_orig_cod412                < 2e-16 ***
pais_orig_cod413                < 2e-16 ***
pais_orig_cod414                < 2e-16 ***
pais_orig_cod415                < 2e-16 ***
pais_orig_cod416                < 2e-16 ***
pais_orig_cod417               0.006897 **
pais_orig_cod418                < 2e-16 ***
pais_orig_cod420                < 2e-16 ***
pais_orig_cod421                < 2e-16 ***
pais_orig_cod424               0.005896 **
pais_orig_cod425                < 2e-16 ***
pais_orig_cod426                < 2e-16 ***
pais_orig_cod427                < 2e-16 ***
pais_orig_cod430                < 2e-16 ***
pais_orig_cod432                < 2e-16 ***
pais_orig_cod433               0.000126 ***
pais_orig_cod434                < 2e-16 ***
```

```
pais_orig_cod435                    < 2e-16 ***
pais_orig_cod436                    < 2e-16 ***
pais_orig_cod437                    < 2e-16 ***
pais_orig_cod442                    < 2e-16 ***
pais_orig_cod443                    < 2e-16 ***
pais_orig_cod447                   4.65e-11 ***
pais_orig_cod499                    < 2e-16 ***
pais_orig_cod501                    < 2e-16 ***
pais_orig_cod502                   0.006960 **
pais_orig_cod504                    < 2e-16 ***
pais_orig_cod505                   3.55e-06 ***
pais_origAlbania                         NA
pais_origAlemania                        NA
pais_origAndorra                         NA
pais_origAngola                          NA
pais_origArabia saudita                  NA
pais_origArgelia                         NA
pais_origArgentina                       NA
pais_origArmenia                         NA
pais_origAsia                            NA
pais_origAustralia                       NA
pais_origAustria                         NA
pais_origAzerbaiyan                      NA
pais_origBahrein                         NA
pais_origBangladesh                      NA
pais_origBélgica                         NA
pais_origBielorrusia / belarus           NA
pais_origBolivia                         NA
pais_origBosnia-herzegovina              NA
pais_origBrasil                          NA
pais_origBulgaria                        NA
pais_origBurkina faso                    NA
pais_origCamboya                         NA
pais_origCamerun                         NA
pais_origCanada                          NA
pais_origChad                            NA
pais_origChile                           NA
pais_origChina                           NA
pais_origChipre                          NA
pais_origColombia                        NA
pais_origCongo                           NA
pais_origCosta de marfil                 NA
pais_origCosta rica                      NA
pais_origCroacia                         NA
pais_origCuba                            NA
pais_origDinamarca                       NA
pais_origEcuador                         NA
pais_origEE.UU.                          NA
```

pais_origEgipto	NA
pais_origEl salvador	NA
pais_origEmiratos arabes unidos	NA
pais_origEslovaquia	NA
pais_origEslovenia	NA
pais_origEstonia	NA
pais_origFiji	NA
pais_origFilipinas	NA
pais_origFinlandia	NA
pais_origFrancia	NA
pais_origGabon	NA
pais_origGeorgia	NA
pais_origGhana	NA
pais_origGibraltar	NA
pais_origGrecia	NA
pais_origGuatemala	NA
pais_origGuinea ecuatorial	NA
pais_origHonduras	NA
pais_origHungria	NA
pais_origIndia	NA
pais_origIndonesia	NA
pais_origIran	NA
pais_origIraq	NA
pais_origIrlanda	NA
pais_origIslandia	NA
pais_origIsrael	NA
pais_origItalia	NA
pais_origJamaica	NA
pais_origJapón	NA
pais_origJordania	NA
pais_origKazajstan	NA
pais_origKenia	NA
pais_origKuwait	NA
pais_origLetonia	NA
pais_origLibano	NA
pais_origLibia	NA
pais_origLiechtenstein	NA
pais_origLituania	NA
pais_origLuxemburgo	NA
pais_origMacedonia	NA
pais_origMalasia	NA
pais_origMalawi	NA
pais_origMali	NA
pais_origMalta	NA
pais_origMarruecos	NA
pais_origMauritania	NA
pais_origMexico	NA
pais_origMoldavia / moldava	NA

pais_origMontenegro	NA
pais_origMozambique	NA
pais_origNepal	NA
pais_origNicaragua	NA
pais_origNiger	NA
pais_origNigeria	NA
pais_origNoruega	NA
pais_origNueva zelanda	NA
pais_origOman	NA
pais_origPaíses Bajos	NA
pais_origPakistan	NA
pais_origPanama	NA
pais_origPapua nueva guinea	NA
pais_origParaguay	NA
pais_origPeru	NA
pais_origPolonia	NA
pais_origPortugal	NA
pais_origQatar	NA
pais_origReino Unido	NA
pais_origRepública Checa	NA
pais_origRepublica de corea - corea del sur	NA
pais_origRepublica de guinea	NA
pais_origRepublica de mauricio	NA
pais_origRepublica democratica del congo	NA
pais_origRepublica dominicana	NA
pais_origRumania	NA
pais_origRusia	NA
pais_origSenegal	NA
pais_origSerbia	NA
pais_origSingapur	NA
pais_origSiria	NA
pais_origSri lanka	NA
pais_origSudafrica	NA
pais_origSudan	NA
pais_origSuecia	NA
pais_origSuiza	NA
pais_origTailandia	NA
pais_origTanzania	NA
pais_origTogo	NA
pais_origTotal	NA
pais_origTotal África	NA
pais_origTotal América	NA
pais_origTotal América del Norte	NA
pais_origTotal Asia	NA
pais_origTotal Centroamérica y Caribe	NA
pais_origTotal Europa	NA
pais_origTotal Oceanía	NA
pais_origTotal Sudamérica	NA

```
pais_origTotal Unión Europea                    NA
pais_origTrinidad y tobago                      NA
pais_origTúnez                                  NA
pais_origTurquia                                NA
pais_origUcrania                                NA
pais_origUganda                                 NA
pais_origUruguay                                NA
pais_origUzbekistan                             NA
pais_origVenezuela                              NA
pais_origVietnan                                NA
pais_origZimbabwe                               NA
mun_dest_cod                              0.159058
mun_destÁlamo, El                         0.387992
mun_destAlcalá de Henares                 1.20e-10 ***
mun_destAlcobendas                        7.67e-10 ***
mun_destAlcorcón                          2.98e-05 ***
mun_destAldea del Fresno                  0.275332
mun_destAlgete                            0.103960
mun_destAlpedrete                         0.834627
mun_destAmbite                            0.385439
mun_destAnchuelo                          0.220619
mun_destAranjuez                          0.000504 ***
mun_destArganda del Rey                   0.001578 **
mun_destArroyomolinos                     0.073403 .
mun_destAtazar, El                        0.405011
mun_destBatres                            0.245282
mun_destBecerril de la Sierra             0.308130
mun_destBelmonte de Tajo                  0.235881
mun_destBerrueco, El                      0.300206
mun_destBoadilla del Monte                0.000166 ***
mun_destBoalo, El                         0.759671
mun_destBraojos                           0.596269
mun_destBrea de Tajo                      0.366433
mun_destBrunete                           0.276707
mun_destBuitrago del Lozoya               0.602133
mun_destBustarviejo                       0.680282
mun_destCabanillas de la Sierra           0.267193
mun_destCabrera, La                       0.388145
mun_destCadalso de los Vidrios            0.327569
mun_destCamarma de Esteruelas             0.598535
mun_destCampo Real                        0.621744
mun_destCanencia                          0.382235
mun_destCarabaña                          0.550107
mun_destCasarrubuelos                     0.450434
mun_destCenicientos                       0.391547
mun_destCercedilla                        0.835264
mun_destChapinería                        0.472302
mun_destChinchón                          0.950033
```

```
mun_destCiempozuelos                    0.003399 **
mun_destCobeña                          0.479794
mun_destCollado Mediano                 0.906810
mun_destCollado Villalba                0.000124 ***
mun_destColmenar de Oreja               0.881097
mun_destColmenar del Arroyo             0.653476
mun_destColmenar Viejo                  0.001192 **
mun_destColmenarejo                     0.995034
mun_destCorpa                           0.534507
mun_destCoslada                         1.55e-05 ***
mun_destCubas de la Sagra               0.811462
mun_destDaganzo de Arriba               0.395162
mun_destEscorial, El                    0.138952
mun_destEstremera                       0.605719
mun_destFresnedillas de la Oliva        0.729828
mun_destFresno de Torote                0.414697
mun_destFuenlabrada                     3.88e-08 ***
mun_destFuente el Saz de Jarama         0.660120
mun_destFuentidueña de Tajo             0.575623
mun_destGalapagar                       0.003180 **
mun_destGarganta de los Montes          0.571061
mun_destGascones                        0.792694
mun_destGetafe                          3.81e-11 ***
mun_destGriñón                          0.943391
mun_destGuadalix de la Sierra           0.810472
mun_destGuadarrama                      0.065171 .
mun_destHorcajo de la Sierra-Aoslos     0.620852
mun_destHorcajuelo de la Sierra         0.632653
mun_destHoyo de Manzanares              0.940973
mun_destHumanes de Madrid               0.110010
mun_destLeganés                         1.02e-08 ***
mun_destLoeches                         0.148539
mun_destLozoya                          0.553735
mun_destLozoyuela-Navas-Sieteiglesias   0.179056
mun_destMadrid                           < 2e-16 ***
mun_destMajadahonda                     3.39e-06 ***
mun_destManzanares el Real              0.682108
mun_destMeco                            0.036545 *
mun_destMejorada del Campo              0.057026 .
mun_destMiraflores de la Sierra         0.907104
mun_destMolar, El                       0.263993
mun_destMolinos, Los                    0.611735
mun_destMontejo de la Sierra            0.784531
mun_destMoraleja de Enmedio             0.815141
mun_destMoralzarzal                     0.638546
mun_destMorata de Tajuña                0.981021
mun_destMóstoles                        5.90e-08 ***
mun_destNavacerrada                     0.812314
```

```
mun_destNavalafuente                    0.743561
mun_destNavalagamella                   0.985210
mun_destNavalcarnero                    0.011826 *
mun_destNavarredonda y San Mamés        0.737920
mun_destNavas del Rey                   0.522203
mun_destNuevo Baztán                    0.958044
mun_destOlmeda de las Fuentes           0.852763
mun_destOrusco de Tajuña                0.810542
mun_destParacuellos de Jarama           2.32e-05 ***
mun_destParla                           1.60e-06 ***
mun_destPatones                         0.632160
mun_destPedrezuela                      0.815086
mun_destPelayos de la Presa             0.840364
mun_destPerales de Tajuña               0.804427
mun_destPezuela de las Torres           0.914727
mun_destPinilla del Valle               0.980859
mun_destPinto                           9.02e-06 ***
mun_destPiñuécar-Gandullas              0.733090
mun_destPozuelo de Alarcón              1.31e-06 ***
mun_destPozuelo del Rey                 0.838349
mun_destPrádena del Rincón              0.930837
mun_destPuebla de la Sierra             0.848478
mun_destPuentes Viejas                  0.183072
mun_destQuijorna                        0.934117
mun_destRascafría                       0.460724
mun_destRedueña                         0.920091
mun_destRibatejada                      0.859269
mun_destRivas-Vaciamadrid               3.89e-05 ***
mun_destRobledillo de la Jara           0.854474
mun_destRobledo de Chavela              0.532684
mun_destRobregordo                      0.969656
mun_destRozas de Madrid, Las            2.40e-06 ***
mun_destRozas de Puerto Real            0.868453
mun_destSan Agustín del Guadalix        0.109179
mun_destSan Fernando de Henares         6.67e-06 ***
mun_destSan Lorenzo de El Escorial      0.024073 *
mun_destSan Martín de la Vega           0.044911 *
mun_destSan Martín de Valdeiglesias     0.296219
mun_destSan Sebastián de los Reyes      5.77e-06 ***
mun_destSanta María de la Alameda       0.876071
mun_destSantorcaz                       0.896277
mun_destSantos de la Humosa, Los        0.057756 .
mun_destSerna del Monte, La             0.854089
mun_destSerranillos del Valle           0.984356
mun_destSevilla la Nueva                0.593117
mun_destSomosierra                      0.972470
mun_destSoto del Real                   0.295329
mun_destTalamanca de Jarama             0.641162
```

```
mun_destTielmes                          0.887571
mun_destTitulcia                         0.970956
mun_destTorrejón de Ardoz                8.34e-06 ***
mun_destTorrejón de la Calzada           0.412209
mun_destTorrejón de Velasco              0.271167
mun_destTorrelaguna                      0.619467
mun_destTorrelodones                     0.007195 **
mun_destTorremocha de Jarama             0.853034
mun_destTorres de la Alameda             0.067764 .
mun_destTres Cantos                      0.077653 .
mun_destValdaracete                      0.975157
mun_destValdeavero                       0.870538
mun_destValdelaguna                      0.996163
mun_destValdemanco                       0.955634
mun_destValdemaqueda                     0.551415
mun_destValdemorillo                     0.155826
mun_destValdemoro                        4.62e-05 ***
mun_destValdeolmos-Alalpardo             0.793509
mun_destValdepiélagos                    0.892073
mun_destValdetorres de Jarama            0.607370
mun_destValdilecha                       0.868101
mun_destValverde de Alcalá               0.975686
mun_destVelilla de San Antonio           0.130683
mun_destVellón, El                       0.677521
mun_destVenturada                        0.842423
mun_destVilla del Prado                  0.339837
mun_destVillaconejos                     0.979559
mun_destVillalbilla                      0.219552
mun_destVillamanrique de Tajo            0.879902
mun_destVillamanta                       0.881592
mun_destVillamantilla                    0.870781
mun_destVillanueva de la Cañada          0.019577 *
mun_destVillanueva de Perales            0.874877
mun_destVillanueva del Pardillo          0.130505
mun_destVillar del Olmo                  0.776590
mun_destVillarejo de Salvanés            0.374057
mun_destVillaviciosa de Odón             0.001667 **
mun_destZarzalejo                              NA
turistas                                 < 2e-16 ***
CMUN004                                        NA
CMUN005                                        NA
CMUN006                                        NA
CMUN007                                        NA
CMUN008                                        NA
CMUN009                                        NA
CMUN010                                        NA
CMUN011                                        NA
CMUN012                                        NA
```

CMUN013	NA
CMUN014	NA
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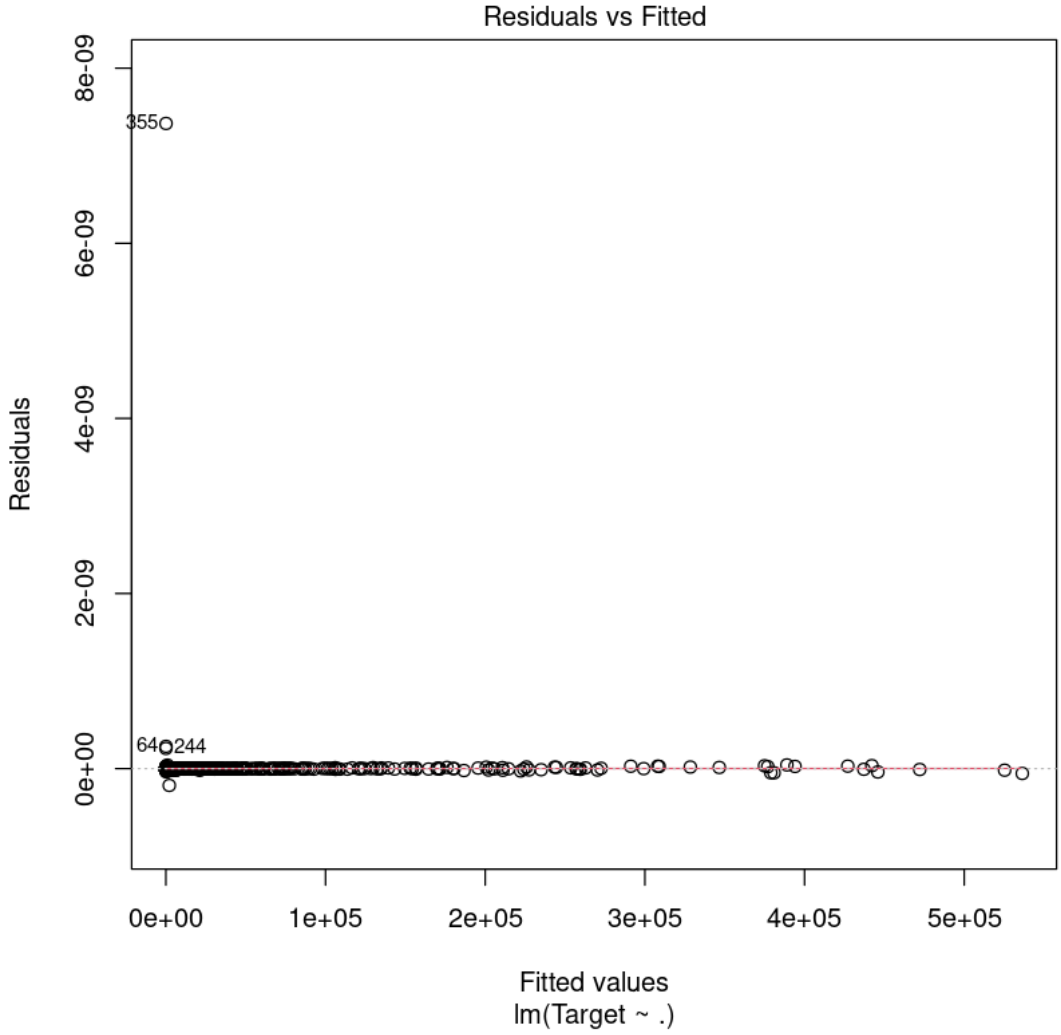
CMUN166	NA
CMUN167	NA
CMUN168	NA

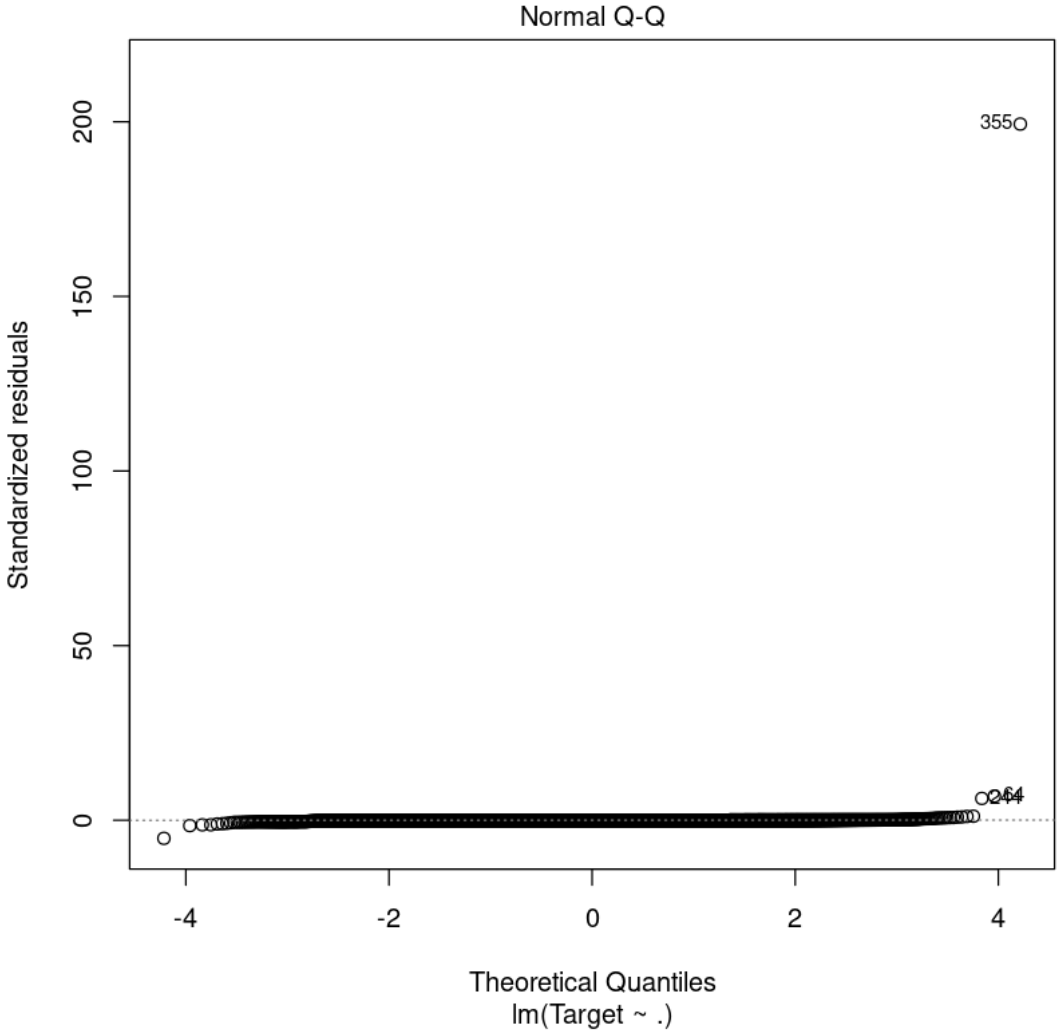
```
CMUN169                                                 NA
CMUN170                                                 NA
CMUN171                                                 NA
CMUN172                                                 NA
CMUN173                                                 NA
CMUN174                                                 NA
CMUN175                                                 NA
CMUN176                                                 NA
CMUN177                                                 NA
CMUN178                                                 NA
CMUN179                                                 NA
CMUN180                                                 NA
CMUN181                                                 NA
CMUN183                                                 NA
CMUN901                                                 NA
CMUN902                                                 NA
CMUN903                                                 NA
is_trainTRUE                                            NA
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 3.702e-11 on 39880 degrees of freedom
Multiple R-squared:      1,        Adjusted R-squared:      1
F-statistic: 1.113e+31 on 354 and 39880 DF,  p-value: < 2.2e-16
```

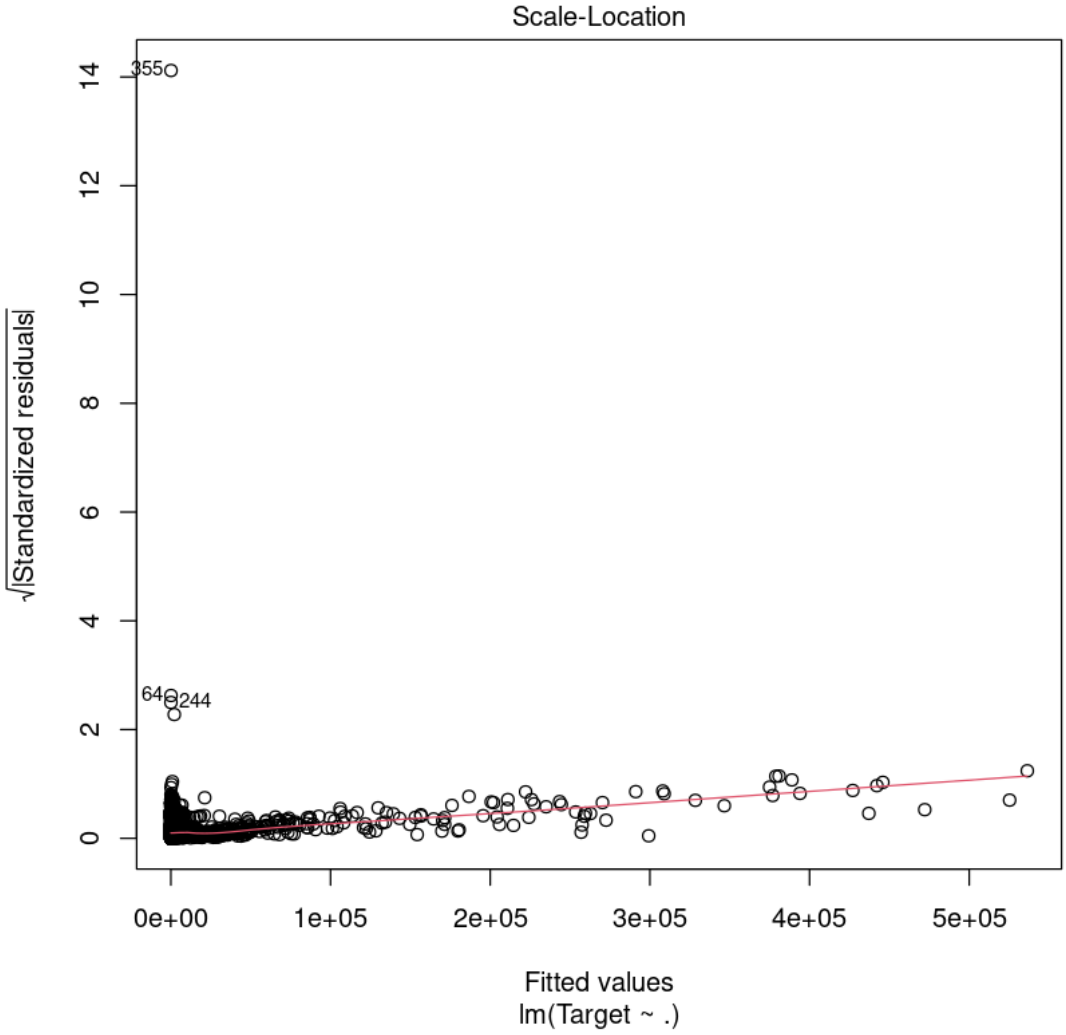
[52]:
```
plot(modelo)
```

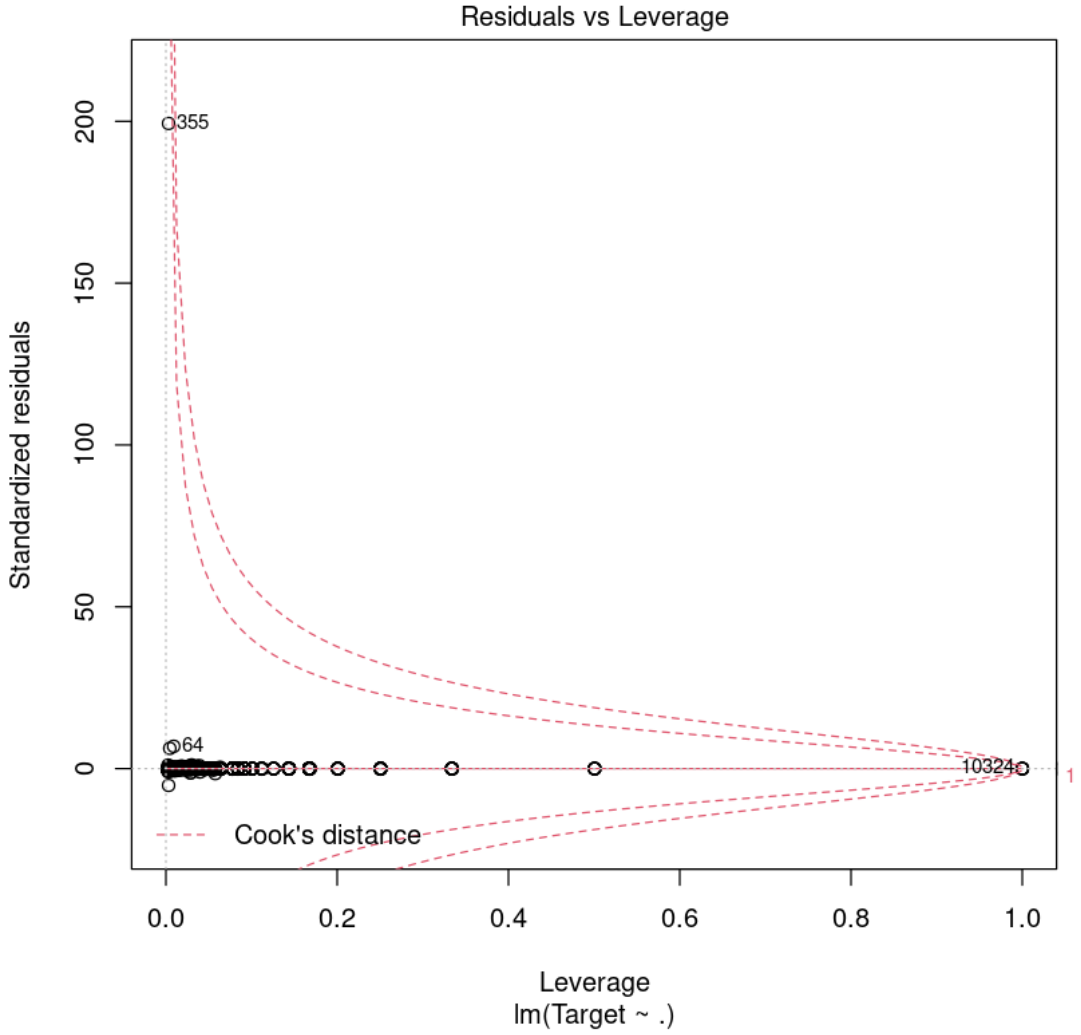
```
Warning message:
"not plotting observations with leverage one:
  4903, 15214, 23294, 26869, 31579, 33197, 37631"
```


Residuals vs Fitted
Residuals
8e-09
6e-09
4e-09
2e-09
0e+00
355
64
244
0e+00
1e+05
2e+05
3e+05
4e+05
5e+05
Fitted values
lm(Target ~ .)




```
Warning message in sqrt(crit * p * (1 - hh)/hh):
"NaNs produced"
Warning message in sqrt(crit * p * (1 - hh)/hh):
"NaNs produced"
```


Scale-Location
√|Standardized residuals|
355
64
244
0
2
4
6
8
10
12
14
0e+00
1e+05
2e+05
3e+05
4e+05
5e+05
Fitted values
lm(Target ~ .)



0.14.2 Selección de variables

Este entrenamiento puede tardar mucho tiempo en completarse. En tal caso, ejecutar solo cuando sea realmente necesario.

[53]:
```
modelo2 <- step(modelo, trace = FALSE)
summary(modelo2)
```

```
Warning message:
"attempting model selection on an essentially perfect fit is nonsense"
```

0.15 Stationary analysis

Este entrenamiento puede tardar mucho tiempo en completarse. En tal caso, ejecutar solo cuando sea realmente necesario.

- Si hay una variable fecha, usarla
- Si hay mes, o semana, convertir a fecha

[ ]:
```
tsdata <- data |>
    mutate(fecha = as.Date(parse_date_time(paste(ano, semana, 1, sep="/"),'Y/W/
 ↪w')))
```

[ ]:
```
names(data)
```

Todas las series, probablemente habría que filtrar por geografía

[ ]:
```
tsdata |>
  mutate(across(c(n_vacunas, nombre_zona), as.character))
  pivot_longer(cols = n_vacunas:interes_gripe) |>
  ggplot(aes(x = fecha, y = value)) +
  geom_line() +
  facet_wrap(~name, scales = "free")
```

[ ]:
```

```

[ ]:
```

```

[ ]:
```

```