

Lab 3 - Data Tidying and Joining

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```
library(tidyverse)
```

Questions

Part 1

```
country_inflation <- read_csv("data/country-inflation.csv")
```

Question 1

- a. `glimpse()` at the `country_inflation` data frame and answer the following questions based on the output. How many rows does `country_inflation` have and what does each row represent? How many columns does `country_inflation` have and what does each column represent?

```
glimpse(country_inflation)
```

Rows: 44

Columns: 30

```
$ country <chr> "Australia", "Austria", "Belgium", "Canada", "Czech Republic",~  
$ `1993` <dbl> 1.753653, 3.631786, 2.754426, 1.865079, 20.813026, 1.257862, 2~  
$ `1994` <dbl> 1.9696348, 2.9534065, 2.3775445, 0.1655629, 10.0394242, 1.9920~  
$ `1995` <dbl> 4.6277666, 2.2433638, 1.4679612, 2.1487603, 8.9905306, 2.08360~  
$ `1996` <dbl> 2.6153846, 1.8609741, 2.0770246, 1.5705311, 8.7587747, 2.12629~  
$ `1997` <dbl> 0.2248876, 1.3059833, 1.6281605, 1.6212164, 8.5961567, 2.18216~  
$ `1998` <dbl> 0.8601346, 0.9224669, 0.9492503, 0.9959425, 10.6983655, 1.8456~
```

```

$ `1999` <dbl> 1.4831294, 0.5689865, 1.1208482, 1.7348430, 2.1354484, 2.49779~
$ `2000` <dbl> 4.4574351, 2.3448684, 2.5445178, 2.7194400, 3.7753883, 2.90327~
$ `2001` <dbl> 4.407135, 2.650000, 2.469258, 2.525120, 4.662676, 2.337875, 2.~
$ `2002` <dbl> 2.981575, 1.810359, 1.645214, 2.258394, 1.902981, 2.424437, 1.~
$ `2003` <dbl> 2.7325960, 1.3555538, 1.5889640, 2.7585632, 0.1187392, 2.07507~
$ `2004` <dbl> 2.3432552, 2.0612068, 2.0972831, 1.8572587, 2.7601078, 1.15435~
$ `2005` <dbl> 2.6918317, 2.2991377, 2.7814326, 2.2135520, 1.8570979, 1.81781~
$ `2006` <dbl> 3.555288, 1.441547, 1.791208, 2.002025, 2.533993, 1.924221, 1.~
$ `2007` <dbl> 2.3276113, 2.1685559, 1.8230563, 2.1383840, 2.8531244, 1.69326~
$ `2008` <dbl> 4.350299, 3.215951, 4.489444, 2.370271, 6.358664, 3.416268, 4.~
$ `2009` <dbl> 1.771117e+00, 5.063094e-01, -5.314567e-02, 2.994668e-01, 1.019~
$ `2010` <dbl> 2.9183400, 1.8135317, 2.1892992, 1.7768715, 1.4727273, 2.31092~
$ `2011` <dbl> 3.303850, 3.286583, 3.532082, 2.912135, 1.917219, 2.758682, 3.~
$ `2012` <dbl> 1.7627802, 2.4856751, 2.8396634, 1.5156782, 3.2876231, 2.39791~
$ `2013` <dbl> 2.44988864, 2.00015749, 1.11309594, 0.93829190, 1.43829787, 0.~
$ `2014` <dbl> 2.48792271, 1.60580560, 0.34000283, 1.90663591, 0.34398859, 0.~
$ `2015` <dbl> 1.50836672, 0.89656529, 0.56142915, 1.12524136, 0.30936455, 0.~
$ `2016` <dbl> 1.276990945, 0.891592367, 1.973852647, 1.428759547, 0.68350420~
$ `2017` <dbl> 1.9486474, 2.0812686, 2.1259709, 1.5968841, 2.4505340, 1.14713~
$ `2018` <dbl> 1.9114009, 1.9983819, 2.0531650, 2.2682257, 2.1494949, 0.81360~
$ `2019` <dbl> 1.6107679, 1.5308955, 1.4368196, 1.9492690, 2.8478760, 0.75813~
$ `2020` <dbl> 0.84690554, 1.38190955, 0.74079181, 0.71699963, 3.16129528, 0.~
$ `2021` <dbl> 2.863910, 2.766667, 2.440249, 3.395193, 3.839845, 1.853045, 2.~

```

This data frame has 44 rows and 30 columns. Columns represent country and rows represent years. Each row indicates the inflation of each country in that specific year. Each column indicates the inflation of a single country for all the years listed.

b. Display a list of the countries included in the dataset.

```

country_inflation %>%
  pull(country)

```

```

[1] "Australia"
[3] "Belgium"
[5] "Czech Republic"
[7] "Finland"
[9] "Germany"
[11] "Hungary"
[13] "Ireland"
[15] "Japan"
[17] "Luxembourg"

```

```

"Austria"
"Canada"
"Denmark"
"France"
"Greece"
"Iceland"
"Italy"
"Korea"
"Mexico"

```

[19] "Netherlands"	"New Zealand"
[21] "Norway"	"Poland"
[23] "Portugal"	"Slovak Republic"
[25] "Spain"	"Sweden"
[27] "Switzerland"	"Türkiye"
[29] "United Kingdom"	"United States"
[31] "Argentina"	"Brazil"
[33] "Chile"	"China (People's Republic of)"
[35] "Estonia"	"India"
[37] "Indonesia"	"Israel"
[39] "Russia"	"Saudi Arabia"
[41] "Slovenia"	"South Africa"
[43] "Colombia"	"Costa Rica"

Question 2

Which countries had the top three highest inflation rates in 2021? Your output should be a data frame with two columns, `country` and `2021`, with inflation rates in descending order, and three rows for the top three countries. Briefly comment on how the inflation rates for these countries compare to the inflation rate for United States in that year.

```
country_inflation %>%
  select(country, `2021`) %>%
  arrange(desc(`2021`)) %>%
  slice_head(n=3)
```

```
# A tibble: 3 x 2
  country `2021`
  <chr>    <dbl>
1 Argentina 48.4
2 Türkiye  19.6
3 Brazil    8.30
```

```
country_inflation %>%
  filter(country=="United States") %>%
  select(`2021`)
```

```
# A tibble: 1 x 1
  `2021`
  <dbl>
1    4.70
```

The inflation rates for Argentina, Türkiye, and Brazil are higher than the inflation rate in the United States in 2021.

Question 3

Which country's inflation change is the largest over this time period? Did inflation increase or decrease between 1993 and 2021 in this country?

```
country_inflation %>%  
  mutate(inf_ratio=`2021`/`1993`) %>%  
  arrange(desc(inf_ratio)) %>%  
  select(country, inf_ratio) %>%  
  print(n=Inf)
```

A tibble: 44 x 2

	country	inf_ratio
	<chr>	<dbl>
1	New Zealand	3.06
2	Canada	1.82
3	Australia	1.63
4	Ireland	1.60
5	United States	1.59
6	Norway	1.52
7	Denmark	1.47
8	Iceland	1.10
9	Netherlands	1.04
10	Finland	1.00
11	United Kingdom	0.962
12	Belgium	0.886
13	France	0.780
14	India	0.773
15	Austria	0.762
16	Luxembourg	0.704
17	Germany	0.702
18	Spain	0.677
19	Mexico	0.583
20	Korea	0.520
21	South Africa	0.475
22	Sweden	0.458
23	Italy	0.405
24	Chile	0.355

25 Türkiye	0.296
26 Hungary	0.228
27 Portugal	0.187
28 Czech Republic	0.184
29 Switzerland	0.177
30 Costa Rica	0.177
31 Indonesia	0.161
32 Colombia	0.156
33 Poland	0.144
34 Israel	0.136
35 Slovak Republic	0.135
36 Greece	0.0849
37 China (People's Republic of)	0.0612
38 Slovenia	0.0604
39 Russia	0.00766
40 Brazil	0.00431
41 Japan	NA
42 Argentina	NA
43 Estonia	NA
44 Saudi Arabia	NA

The inflation change of Brazil is the largest over this time period. Inflation decreased between 1993 and 2021 as indicated by the smallest inflation ratio (0.00431). A ratio less than 1 represents negative change.

Question 4

Reshape (pivot) `country_inflation` such that each row represents a country/year combination, with columns `country`, `year`, and `annual_inflation`. Then, display the resulting data frame and state how many rows and columns it has.

```
inf_long<-country_inflation %>%
  pivot_longer(
    cols = -country,
    names_to = "year",
    values_to = "annual_inflation",
    names_transform = as.numeric
  )
inf_long %>%
  print(n=Inf)
```

A tibble: 1,276 x 3

	country <chr>	year <dbl>	annual_inflation <dbl>
1	Australia	1993	1.75 e+ 0
2	Australia	1994	1.97 e+ 0
3	Australia	1995	4.63 e+ 0
4	Australia	1996	2.62 e+ 0
5	Australia	1997	2.25 e- 1
6	Australia	1998	8.60 e- 1
7	Australia	1999	1.48 e+ 0
8	Australia	2000	4.46 e+ 0
9	Australia	2001	4.41 e+ 0
10	Australia	2002	2.98 e+ 0
11	Australia	2003	2.73 e+ 0
12	Australia	2004	2.34 e+ 0
13	Australia	2005	2.69 e+ 0
14	Australia	2006	3.56 e+ 0
15	Australia	2007	2.33 e+ 0
16	Australia	2008	4.35 e+ 0
17	Australia	2009	1.77 e+ 0
18	Australia	2010	2.92 e+ 0
19	Australia	2011	3.30 e+ 0
20	Australia	2012	1.76 e+ 0
21	Australia	2013	2.45 e+ 0
22	Australia	2014	2.49 e+ 0
23	Australia	2015	1.51 e+ 0
24	Australia	2016	1.28 e+ 0
25	Australia	2017	1.95 e+ 0
26	Australia	2018	1.91 e+ 0
27	Australia	2019	1.61 e+ 0
28	Australia	2020	8.47 e- 1
29	Australia	2021	2.86 e+ 0
30	Austria	1993	3.63 e+ 0
31	Austria	1994	2.95 e+ 0
32	Austria	1995	2.24 e+ 0
33	Austria	1996	1.86 e+ 0
34	Austria	1997	1.31 e+ 0
35	Austria	1998	9.22 e- 1
36	Austria	1999	5.69 e- 1
37	Austria	2000	2.34 e+ 0
38	Austria	2001	2.65 e+ 0
39	Austria	2002	1.81 e+ 0
40	Austria	2003	1.36 e+ 0

41 Austria	2004	2.06 e+ 0
42 Austria	2005	2.30 e+ 0
43 Austria	2006	1.44 e+ 0
44 Austria	2007	2.17 e+ 0
45 Austria	2008	3.22 e+ 0
46 Austria	2009	5.06 e- 1
47 Austria	2010	1.81 e+ 0
48 Austria	2011	3.29 e+ 0
49 Austria	2012	2.49 e+ 0
50 Austria	2013	2.00 e+ 0
51 Austria	2014	1.61 e+ 0
52 Austria	2015	8.97 e- 1
53 Austria	2016	8.92 e- 1
54 Austria	2017	2.08 e+ 0
55 Austria	2018	2.00 e+ 0
56 Austria	2019	1.53 e+ 0
57 Austria	2020	1.38 e+ 0
58 Austria	2021	2.77 e+ 0
59 Belgium	1993	2.75 e+ 0
60 Belgium	1994	2.38 e+ 0
61 Belgium	1995	1.47 e+ 0
62 Belgium	1996	2.08 e+ 0
63 Belgium	1997	1.63 e+ 0
64 Belgium	1998	9.49 e- 1
65 Belgium	1999	1.12 e+ 0
66 Belgium	2000	2.54 e+ 0
67 Belgium	2001	2.47 e+ 0
68 Belgium	2002	1.65 e+ 0
69 Belgium	2003	1.59 e+ 0
70 Belgium	2004	2.10 e+ 0
71 Belgium	2005	2.78 e+ 0
72 Belgium	2006	1.79 e+ 0
73 Belgium	2007	1.82 e+ 0
74 Belgium	2008	4.49 e+ 0
75 Belgium	2009	-5.31 e- 2
76 Belgium	2010	2.19 e+ 0
77 Belgium	2011	3.53 e+ 0
78 Belgium	2012	2.84 e+ 0
79 Belgium	2013	1.11 e+ 0
80 Belgium	2014	3.40 e- 1
81 Belgium	2015	5.61 e- 1
82 Belgium	2016	1.97 e+ 0
83 Belgium	2017	2.13 e+ 0

84	Belgium	2018	2.05 e+ 0
85	Belgium	2019	1.44 e+ 0
86	Belgium	2020	7.41 e- 1
87	Belgium	2021	2.44 e+ 0
88	Canada	1993	1.87 e+ 0
89	Canada	1994	1.66 e- 1
90	Canada	1995	2.15 e+ 0
91	Canada	1996	1.57 e+ 0
92	Canada	1997	1.62 e+ 0
93	Canada	1998	9.96 e- 1
94	Canada	1999	1.73 e+ 0
95	Canada	2000	2.72 e+ 0
96	Canada	2001	2.53 e+ 0
97	Canada	2002	2.26 e+ 0
98	Canada	2003	2.76 e+ 0
99	Canada	2004	1.86 e+ 0
100	Canada	2005	2.21 e+ 0
101	Canada	2006	2.00 e+ 0
102	Canada	2007	2.14 e+ 0
103	Canada	2008	2.37 e+ 0
104	Canada	2009	2.99 e- 1
105	Canada	2010	1.78 e+ 0
106	Canada	2011	2.91 e+ 0
107	Canada	2012	1.52 e+ 0
108	Canada	2013	9.38 e- 1
109	Canada	2014	1.91 e+ 0
110	Canada	2015	1.13 e+ 0
111	Canada	2016	1.43 e+ 0
112	Canada	2017	1.60 e+ 0
113	Canada	2018	2.27 e+ 0
114	Canada	2019	1.95 e+ 0
115	Canada	2020	7.17 e- 1
116	Canada	2021	3.40 e+ 0
117	Czech Republic	1993	2.08 e+ 1
118	Czech Republic	1994	1.00 e+ 1
119	Czech Republic	1995	8.99 e+ 0
120	Czech Republic	1996	8.76 e+ 0
121	Czech Republic	1997	8.60 e+ 0
122	Czech Republic	1998	1.07 e+ 1
123	Czech Republic	1999	2.14 e+ 0
124	Czech Republic	2000	3.78 e+ 0
125	Czech Republic	2001	4.66 e+ 0
126	Czech Republic	2002	1.90 e+ 0

127	Czech Republic	2003	1.19 e- 1
128	Czech Republic	2004	2.76 e+ 0
129	Czech Republic	2005	1.86 e+ 0
130	Czech Republic	2006	2.53 e+ 0
131	Czech Republic	2007	2.85 e+ 0
132	Czech Republic	2008	6.36 e+ 0
133	Czech Republic	2009	1.02 e+ 0
134	Czech Republic	2010	1.47 e+ 0
135	Czech Republic	2011	1.92 e+ 0
136	Czech Republic	2012	3.29 e+ 0
137	Czech Republic	2013	1.44 e+ 0
138	Czech Republic	2014	3.44 e- 1
139	Czech Republic	2015	3.09 e- 1
140	Czech Republic	2016	6.84 e- 1
141	Czech Republic	2017	2.45 e+ 0
142	Czech Republic	2018	2.15 e+ 0
143	Czech Republic	2019	2.85 e+ 0
144	Czech Republic	2020	3.16 e+ 0
145	Czech Republic	2021	3.84 e+ 0
146	Denmark	1993	1.26 e+ 0
147	Denmark	1994	1.99 e+ 0
148	Denmark	1995	2.08 e+ 0
149	Denmark	1996	2.13 e+ 0
150	Denmark	1997	2.18 e+ 0
151	Denmark	1998	1.85 e+ 0
152	Denmark	1999	2.50 e+ 0
153	Denmark	2000	2.90 e+ 0
154	Denmark	2001	2.34 e+ 0
155	Denmark	2002	2.42 e+ 0
156	Denmark	2003	2.08 e+ 0
157	Denmark	2004	1.15 e+ 0
158	Denmark	2005	1.82 e+ 0
159	Denmark	2006	1.92 e+ 0
160	Denmark	2007	1.69 e+ 0
161	Denmark	2008	3.42 e+ 0
162	Denmark	2009	1.30 e+ 0
163	Denmark	2010	2.31 e+ 0
164	Denmark	2011	2.76 e+ 0
165	Denmark	2012	2.40 e+ 0
166	Denmark	2013	7.89 e- 1
167	Denmark	2014	5.64 e- 1
168	Denmark	2015	4.52 e- 1
169	Denmark	2016	2.50 e- 1

170 Denmark	2017	1.15 e+ 0
171 Denmark	2018	8.14 e- 1
172 Denmark	2019	7.58 e- 1
173 Denmark	2020	4.21 e- 1
174 Denmark	2021	1.85 e+ 0
175 Finland	1993	2.19 e+ 0
176 Finland	1994	1.09 e+ 0
177 Finland	1995	7.91 e- 1
178 Finland	1996	6.29 e- 1
179 Finland	1997	1.19 e+ 0
180 Finland	1998	1.40 e+ 0
181 Finland	1999	1.16 e+ 0
182 Finland	2000	3.04 e+ 0
183 Finland	2001	2.58 e+ 0
184 Finland	2002	1.57 e+ 0
185 Finland	2003	8.77 e- 1
186 Finland	2004	1.87 e- 1
187 Finland	2005	6.24 e- 1
188 Finland	2006	1.57 e+ 0
189 Finland	2007	2.51 e+ 0
190 Finland	2008	4.07 e+ 0
191 Finland	2009	-1.22 e-14
192 Finland	2010	1.18 e+ 0
193 Finland	2011	3.42 e+ 0
194 Finland	2012	2.81 e+ 0
195 Finland	2013	1.48 e+ 0
196 Finland	2014	1.04 e+ 0
197 Finland	2015	-2.08 e- 1
198 Finland	2016	3.57 e- 1
199 Finland	2017	7.54 e- 1
200 Finland	2018	1.08 e+ 0
201 Finland	2019	1.02 e+ 0
202 Finland	2020	2.91 e- 1
203 Finland	2021	2.19 e+ 0
204 France	1993	2.10 e+ 0
205 France	1994	1.66 e+ 0
206 France	1995	1.80 e+ 0
207 France	1996	1.98 e+ 0
208 France	1997	1.20 e+ 0
209 France	1998	6.51 e- 1
210 France	1999	5.37 e- 1
211 France	2000	1.68 e+ 0
212 France	2001	1.63 e+ 0

213 France	2002	1.92 e+ 0
214 France	2003	2.10 e+ 0
215 France	2004	2.14 e+ 0
216 France	2005	1.75 e+ 0
217 France	2006	1.68 e+ 0
218 France	2007	1.49 e+ 0
219 France	2008	2.81 e+ 0
220 France	2009	8.76 e- 2
221 France	2010	1.53 e+ 0
222 France	2011	2.11 e+ 0
223 France	2012	1.95 e+ 0
224 France	2013	8.64 e- 1
225 France	2014	5.08 e- 1
226 France	2015	3.75 e- 2
227 France	2016	1.83 e- 1
228 France	2017	1.03 e+ 0
229 France	2018	1.85 e+ 0
230 France	2019	1.11 e+ 0
231 France	2020	4.76 e- 1
232 France	2021	1.64 e+ 0
233 Germany	1993	4.47 e+ 0
234 Germany	1994	2.69 e+ 0
235 Germany	1995	1.71 e+ 0
236 Germany	1996	1.45 e+ 0
237 Germany	1997	1.94 e+ 0
238 Germany	1998	9.11 e- 1
239 Germany	1999	5.85 e- 1
240 Germany	2000	1.44 e+ 0
241 Germany	2001	1.98 e+ 0
242 Germany	2002	1.42 e+ 0
243 Germany	2003	1.03 e+ 0
244 Germany	2004	1.67 e+ 0
245 Germany	2005	1.55 e+ 0
246 Germany	2006	1.58 e+ 0
247 Germany	2007	2.30 e+ 0
248 Germany	2008	2.63 e+ 0
249 Germany	2009	3.13 e- 1
250 Germany	2010	1.10 e+ 0
251 Germany	2011	2.08 e+ 0
252 Germany	2012	2.01 e+ 0
253 Germany	2013	1.50 e+ 0
254 Germany	2014	9.07 e- 1
255 Germany	2015	5.14 e- 1

256 Germany	2016	4.92 e- 1
257 Germany	2017	1.51 e+ 0
258 Germany	2018	1.73 e+ 0
259 Germany	2019	1.45 e+ 0
260 Germany	2020	5.07 e- 1
261 Germany	2021	3.14 e+ 0
262 Greece	1993	1.44 e+ 1
263 Greece	1994	1.09 e+ 1
264 Greece	1995	8.93 e+ 0
265 Greece	1996	8.19 e+ 0
266 Greece	1997	5.54 e+ 0
267 Greece	1998	4.77 e+ 0
268 Greece	1999	2.64 e+ 0
269 Greece	2000	3.15 e+ 0
270 Greece	2001	3.37 e+ 0
271 Greece	2002	3.63 e+ 0
272 Greece	2003	3.53 e+ 0
273 Greece	2004	2.90 e+ 0
274 Greece	2005	3.55 e+ 0
275 Greece	2006	3.20 e+ 0
276 Greece	2007	2.90 e+ 0
277 Greece	2008	4.15 e+ 0
278 Greece	2009	1.21 e+ 0
279 Greece	2010	4.71 e+ 0
280 Greece	2011	3.33 e+ 0
281 Greece	2012	1.50 e+ 0
282 Greece	2013	-9.21 e- 1
283 Greece	2014	-1.31 e+ 0
284 Greece	2015	-1.74 e+ 0
285 Greece	2016	-8.26 e- 1
286 Greece	2017	1.12 e+ 0
287 Greece	2018	6.26 e- 1
288 Greece	2019	2.53 e- 1
289 Greece	2020	-1.25 e+ 0
290 Greece	2021	1.22 e+ 0
291 Hungary	1993	2.25 e+ 1
292 Hungary	1994	1.89 e+ 1
293 Hungary	1995	2.83 e+ 1
294 Hungary	1996	2.35 e+ 1
295 Hungary	1997	1.83 e+ 1
296 Hungary	1998	1.42 e+ 1
297 Hungary	1999	1.000e+ 1
298 Hungary	2000	9.80 e+ 0

299 Hungary	2001	9.12 e+ 0
300 Hungary	2002	5.27 e+ 0
301 Hungary	2003	4.66 e+ 0
302 Hungary	2004	6.74 e+ 0
303 Hungary	2005	3.56 e+ 0
304 Hungary	2006	3.93 e+ 0
305 Hungary	2007	7.96 e+ 0
306 Hungary	2008	6.04 e+ 0
307 Hungary	2009	4.21 e+ 0
308 Hungary	2010	4.86 e+ 0
309 Hungary	2011	3.93 e+ 0
310 Hungary	2012	5.65 e+ 0
311 Hungary	2013	1.73 e+ 0
312 Hungary	2014	-2.28 e- 1
313 Hungary	2015	-6.16 e- 2
314 Hungary	2016	3.95 e- 1
315 Hungary	2017	2.35 e+ 0
316 Hungary	2018	2.85 e+ 0
317 Hungary	2019	3.34 e+ 0
318 Hungary	2020	3.33 e+ 0
319 Hungary	2021	5.11 e+ 0
320 Iceland	1993	4.04 e+ 0
321 Iceland	1994	1.55 e+ 0
322 Iceland	1995	1.65 e+ 0
323 Iceland	1996	2.26 e+ 0
324 Iceland	1997	1.82 e+ 0
325 Iceland	1998	1.66 e+ 0
326 Iceland	1999	3.23 e+ 0
327 Iceland	2000	5.14 e+ 0
328 Iceland	2001	6.41 e+ 0
329 Iceland	2002	5.20 e+ 0
330 Iceland	2003	2.06 e+ 0
331 Iceland	2004	3.16 e+ 0
332 Iceland	2005	3.99 e+ 0
333 Iceland	2006	6.69 e+ 0
334 Iceland	2007	5.05 e+ 0
335 Iceland	2008	1.27 e+ 1
336 Iceland	2009	1.20 e+ 1
337 Iceland	2010	5.40 e+ 0
338 Iceland	2011	4.00 e+ 0
339 Iceland	2012	5.19 e+ 0
340 Iceland	2013	3.87 e+ 0
341 Iceland	2014	2.04 e+ 0

342	Iceland	2015	1.63 e+ 0
343	Iceland	2016	1.70 e+ 0
344	Iceland	2017	1.76 e+ 0
345	Iceland	2018	2.68 e+ 0
346	Iceland	2019	3.01 e+ 0
347	Iceland	2020	2.85 e+ 0
348	Iceland	2021	4.44 e+ 0
349	Ireland	1993	1.47 e+ 0
350	Ireland	1994	2.31 e+ 0
351	Ireland	1995	2.52 e+ 0
352	Ireland	1996	1.75 e+ 0
353	Ireland	1997	1.53 e+ 0
354	Ireland	1998	2.42 e+ 0
355	Ireland	1999	1.63 e+ 0
356	Ireland	2000	5.59 e+ 0
357	Ireland	2001	4.87 e+ 0
358	Ireland	2002	4.61 e+ 0
359	Ireland	2003	3.49 e+ 0
360	Ireland	2004	2.20 e+ 0
361	Ireland	2005	2.43 e+ 0
362	Ireland	2006	3.93 e+ 0
363	Ireland	2007	4.90 e+ 0
364	Ireland	2008	4.06 e+ 0
365	Ireland	2009	-4.48 e+ 0
366	Ireland	2010	-9.22 e- 1
367	Ireland	2011	2.56 e+ 0
368	Ireland	2012	1.70 e+ 0
369	Ireland	2013	5.09 e- 1
370	Ireland	2014	1.83 e- 1
371	Ireland	2015	-2.90 e- 1
372	Ireland	2016	8.31 e- 3
373	Ireland	2017	3.41 e- 1
374	Ireland	2018	4.88 e- 1
375	Ireland	2019	9.39 e- 1
376	Ireland	2020	-3.35 e- 1
377	Ireland	2021	2.36 e+ 0
378	Italy	1993	4.63 e+ 0
379	Italy	1994	4.05 e+ 0
380	Italy	1995	5.24 e+ 0
381	Italy	1996	4.01 e+ 0
382	Italy	1997	2.04 e+ 0
383	Italy	1998	1.96 e+ 0
384	Italy	1999	1.66 e+ 0

385 Italy	2000	2.54 e+ 0
386 Italy	2001	2.79 e+ 0
387 Italy	2002	2.47 e+ 0
388 Italy	2003	2.67 e+ 0
389 Italy	2004	2.21 e+ 0
390 Italy	2005	1.99 e+ 0
391 Italy	2006	2.09 e+ 0
392 Italy	2007	1.83 e+ 0
393 Italy	2008	3.35 e+ 0
394 Italy	2009	7.75 e- 1
395 Italy	2010	1.53 e+ 0
396 Italy	2011	2.78 e+ 0
397 Italy	2012	3.04 e+ 0
398 Italy	2013	1.22 e+ 0
399 Italy	2014	2.41 e- 1
400 Italy	2015	3.88 e- 2
401 Italy	2016	-9.40 e- 2
402 Italy	2017	1.23 e+ 0
403 Italy	2018	1.14 e+ 0
404 Italy	2019	6.11 e- 1
405 Italy	2020	-1.38 e- 1
406 Italy	2021	1.87 e+ 0
407 Japan	1993	1.3 e+ 0
408 Japan	1994	7 e- 1
409 Japan	1995	-1 e- 1
410 Japan	1996	1 e- 1
411 Japan	1997	1.8 e+ 0
412 Japan	1998	6 e- 1
413 Japan	1999	-3 e- 1
414 Japan	2000	-7 e- 1
415 Japan	2001	-7 e- 1
416 Japan	2002	-9 e- 1
417 Japan	2003	-3 e- 1
418 Japan	2004	0
419 Japan	2005	-3 e- 1
420 Japan	2006	3 e- 1
421 Japan	2007	0
422 Japan	2008	1.4 e+ 0
423 Japan	2009	-1.4 e+ 0
424 Japan	2010	-7 e- 1
425 Japan	2011	-3 e- 1
426 Japan	2012	0
427 Japan	2013	4 e- 1

428	Japan	2014	2.7	e+ 0
429	Japan	2015	8	e- 1
430	Japan	2016	-1	e- 1
431	Japan	2017	4.84	e- 1
432	Japan	2018	9.89	e- 1
433	Japan	2019	4.69	e- 1
434	Japan	2020	-2.50	e- 2
435	Japan	2021	NA	
436	Korea	1993	4.80	e+ 0
437	Korea	1994	6.27	e+ 0
438	Korea	1995	4.48	e+ 0
439	Korea	1996	4.92	e+ 0
440	Korea	1997	4.44	e+ 0
441	Korea	1998	7.51	e+ 0
442	Korea	1999	8.13	e- 1
443	Korea	2000	2.26	e+ 0
444	Korea	2001	4.07	e+ 0
445	Korea	2002	2.76	e+ 0
446	Korea	2003	3.51	e+ 0
447	Korea	2004	3.59	e+ 0
448	Korea	2005	2.75	e+ 0
449	Korea	2006	2.24	e+ 0
450	Korea	2007	2.53	e+ 0
451	Korea	2008	4.67	e+ 0
452	Korea	2009	2.76	e+ 0
453	Korea	2010	2.94	e+ 0
454	Korea	2011	4.03	e+ 0
455	Korea	2012	2.19	e+ 0
456	Korea	2013	1.30	e+ 0
457	Korea	2014	1.27	e+ 0
458	Korea	2015	7.06	e- 1
459	Korea	2016	9.72	e- 1
460	Korea	2017	1.94	e+ 0
461	Korea	2018	1.48	e+ 0
462	Korea	2019	3.83	e- 1
463	Korea	2020	5.37	e- 1
464	Korea	2021	2.50	e+ 0
465	Luxembourg	1993	3.59	e+ 0
466	Luxembourg	1994	2.19	e+ 0
467	Luxembourg	1995	1.87	e+ 0
468	Luxembourg	1996	1.18	e+ 0
469	Luxembourg	1997	1.37	e+ 0
470	Luxembourg	1998	9.59	e- 1

471	Luxembourg	1999	1.03 e+ 0
472	Luxembourg	2000	3.15 e+ 0
473	Luxembourg	2001	2.66 e+ 0
474	Luxembourg	2002	2.07 e+ 0
475	Luxembourg	2003	2.05 e+ 0
476	Luxembourg	2004	2.23 e+ 0
477	Luxembourg	2005	2.49 e+ 0
478	Luxembourg	2006	2.67 e+ 0
479	Luxembourg	2007	2.31 e+ 0
480	Luxembourg	2008	3.40 e+ 0
481	Luxembourg	2009	3.68 e- 1
482	Luxembourg	2010	2.27 e+ 0
483	Luxembourg	2011	3.41 e+ 0
484	Luxembourg	2012	2.66 e+ 0
485	Luxembourg	2013	1.73 e+ 0
486	Luxembourg	2014	6.29 e- 1
487	Luxembourg	2015	4.75 e- 1
488	Luxembourg	2016	2.91 e- 1
489	Luxembourg	2017	1.73 e+ 0
490	Luxembourg	2018	1.53 e+ 0
491	Luxembourg	2019	1.74 e+ 0
492	Luxembourg	2020	8.20 e- 1
493	Luxembourg	2021	2.53 e+ 0
494	Mexico	1993	9.75 e+ 0
495	Mexico	1994	6.97 e+ 0
496	Mexico	1995	3.50 e+ 1
497	Mexico	1996	3.44 e+ 1
498	Mexico	1997	2.06 e+ 1
499	Mexico	1998	1.59 e+ 1
500	Mexico	1999	1.66 e+ 1
501	Mexico	2000	9.49 e+ 0
502	Mexico	2001	6.37 e+ 0
503	Mexico	2002	5.03 e+ 0
504	Mexico	2003	4.55 e+ 0
505	Mexico	2004	4.69 e+ 0
506	Mexico	2005	3.99 e+ 0
507	Mexico	2006	3.63 e+ 0
508	Mexico	2007	3.97 e+ 0
509	Mexico	2008	5.12 e+ 0
510	Mexico	2009	5.30 e+ 0
511	Mexico	2010	4.16 e+ 0
512	Mexico	2011	3.41 e+ 0
513	Mexico	2012	4.11 e+ 0

514	Mexico	2013	3.81 e+ 0
515	Mexico	2014	4.02 e+ 0
516	Mexico	2015	2.72 e+ 0
517	Mexico	2016	2.82 e+ 0
518	Mexico	2017	6.04 e+ 0
519	Mexico	2018	4.90 e+ 0
520	Mexico	2019	3.64 e+ 0
521	Mexico	2020	3.40 e+ 0
522	Mexico	2021	5.69 e+ 0
523	Netherlands	1993	2.58 e+ 0
524	Netherlands	1994	2.80 e+ 0
525	Netherlands	1995	1.92 e+ 0
526	Netherlands	1996	1.95 e+ 0
527	Netherlands	1997	2.11 e+ 0
528	Netherlands	1998	1.96 e+ 0
529	Netherlands	1999	2.16 e+ 0
530	Netherlands	2000	2.36 e+ 0
531	Netherlands	2001	4.16 e+ 0
532	Netherlands	2002	3.29 e+ 0
533	Netherlands	2003	2.09 e+ 0
534	Netherlands	2004	1.26 e+ 0
535	Netherlands	2005	1.69 e+ 0
536	Netherlands	2006	1.10 e+ 0
537	Netherlands	2007	1.61 e+ 0
538	Netherlands	2008	2.49 e+ 0
539	Netherlands	2009	1.19 e+ 0
540	Netherlands	2010	1.28 e+ 0
541	Netherlands	2011	2.34 e+ 0
542	Netherlands	2012	2.46 e+ 0
543	Netherlands	2013	2.51 e+ 0
544	Netherlands	2014	9.76 e- 1
545	Netherlands	2015	6.00 e- 1
546	Netherlands	2016	3.17 e- 1
547	Netherlands	2017	1.38 e+ 0
548	Netherlands	2018	1.70 e+ 0
549	Netherlands	2019	2.63 e+ 0
550	Netherlands	2020	1.27 e+ 0
551	Netherlands	2021	2.68 e+ 0
552	New Zealand	1993	1.29 e+ 0
553	New Zealand	1994	1.75 e+ 0
554	New Zealand	1995	3.75 e+ 0
555	New Zealand	1996	2.29 e+ 0
556	New Zealand	1997	1.19 e+ 0

557	New Zealand	1998	1.27 e+ 0
558	New Zealand	1999	-1.14 e- 1
559	New Zealand	2000	2.62 e+ 0
560	New Zealand	2001	2.63 e+ 0
561	New Zealand	2002	2.68 e+ 0
562	New Zealand	2003	1.75 e+ 0
563	New Zealand	2004	2.29 e+ 0
564	New Zealand	2005	3.04 e+ 0
565	New Zealand	2006	3.37 e+ 0
566	New Zealand	2007	2.38 e+ 0
567	New Zealand	2008	3.96 e+ 0
568	New Zealand	2009	2.12 e+ 0
569	New Zealand	2010	2.30 e+ 0
570	New Zealand	2011	4.03 e+ 0
571	New Zealand	2012	1.06 e+ 0
572	New Zealand	2013	1.13 e+ 0
573	New Zealand	2014	1.23 e+ 0
574	New Zealand	2015	2.93 e- 1
575	New Zealand	2016	6.46 e- 1
576	New Zealand	2017	1.85 e+ 0
577	New Zealand	2018	1.60 e+ 0
578	New Zealand	2019	1.62 e+ 0
579	New Zealand	2020	1.71 e+ 0
580	New Zealand	2021	3.94 e+ 0
581	Norway	1993	2.29 e+ 0
582	Norway	1994	1.38 e+ 0
583	Norway	1995	2.46 e+ 0
584	Norway	1996	1.26 e+ 0
585	Norway	1997	2.57 e+ 0
586	Norway	1998	2.25 e+ 0
587	Norway	1999	2.37 e+ 0
588	Norway	2000	3.09 e+ 0
589	Norway	2001	3.00 e+ 0
590	Norway	2002	1.29 e+ 0
591	Norway	2003	2.49 e+ 0
592	Norway	2004	4.54 e- 1
593	Norway	2005	1.53 e+ 0
594	Norway	2006	2.33 e+ 0
595	Norway	2007	7.13 e- 1
596	Norway	2008	3.75 e+ 0
597	Norway	2009	2.20 e+ 0
598	Norway	2010	2.42 e+ 0
599	Norway	2011	1.28 e+ 0

600 Norway	2012	6.97 e- 1
601 Norway	2013	2.12 e+ 0
602 Norway	2014	2.04 e+ 0
603 Norway	2015	2.17 e+ 0
604 Norway	2016	3.55 e+ 0
605 Norway	2017	1.88 e+ 0
606 Norway	2018	2.76 e+ 0
607 Norway	2019	2.17 e+ 0
608 Norway	2020	1.29 e+ 0
609 Norway	2021	3.48 e+ 0
610 Poland	1993	3.55 e+ 1
611 Poland	1994	3.22 e+ 1
612 Poland	1995	2.81 e+ 1
613 Poland	1996	1.99 e+ 1
614 Poland	1997	1.49 e+ 1
615 Poland	1998	1.19 e+ 1
616 Poland	1999	7.26 e+ 0
617 Poland	2000	1.01 e+ 1
618 Poland	2001	5.48 e+ 0
619 Poland	2002	1.94 e+ 0
620 Poland	2003	8.42 e- 1
621 Poland	2004	3.49 e+ 0
622 Poland	2005	2.13 e+ 0
623 Poland	2006	1.03 e+ 0
624 Poland	2007	2.49 e+ 0
625 Poland	2008	4.22 e+ 0
626 Poland	2009	3.45 e+ 0
627 Poland	2010	2.58 e+ 0
628 Poland	2011	4.27 e+ 0
629 Poland	2012	3.7 e+ 0
630 Poland	2013	9 e- 1
631 Poland	2014	-2.5 e- 2
632 Poland	2015	-9.33 e- 1
633 Poland	2016	-5.83 e- 1
634 Poland	2017	1.98 e+ 0
635 Poland	2018	1.67 e+ 0
636 Poland	2019	2.31 e+ 0
637 Poland	2020	3.4 e+ 0
638 Poland	2021	5.1 e+ 0
639 Portugal	1993	6.78 e+ 0
640 Portugal	1994	5.42 e+ 0
641 Portugal	1995	4.22 e+ 0
642 Portugal	1996	3.07 e+ 0

643	Portugal	1997	2.34 e+ 0
644	Portugal	1998	2.57 e+ 0
645	Portugal	1999	2.34 e+ 0
646	Portugal	2000	2.85 e+ 0
647	Portugal	2001	4.37 e+ 0
648	Portugal	2002	3.60 e+ 0
649	Portugal	2003	3.22 e+ 0
650	Portugal	2004	2.37 e+ 0
651	Portugal	2005	2.28 e+ 0
652	Portugal	2006	3.11 e+ 0
653	Portugal	2007	2.45 e+ 0
654	Portugal	2008	2.59 e+ 0
655	Portugal	2009	-8.36 e- 1
656	Portugal	2010	1.40 e+ 0
657	Portugal	2011	3.65 e+ 0
658	Portugal	2012	2.77 e+ 0
659	Portugal	2013	2.74 e- 1
660	Portugal	2014	-2.78 e- 1
661	Portugal	2015	4.88 e- 1
662	Portugal	2016	6.07 e- 1
663	Portugal	2017	1.37 e+ 0
664	Portugal	2018	9.94 e- 1
665	Portugal	2019	3.38 e- 1
666	Portugal	2020	-1.24 e- 2
667	Portugal	2021	1.27 e+ 0
668	Slovak Republic	1993	2.33 e+ 1
669	Slovak Republic	1994	1.34 e+ 1
670	Slovak Republic	1995	9.84 e+ 0
671	Slovak Republic	1996	5.78 e+ 0
672	Slovak Republic	1997	6.14 e+ 0
673	Slovak Republic	1998	6.67 e+ 0
674	Slovak Republic	1999	1.06 e+ 1
675	Slovak Republic	2000	1.20 e+ 1
676	Slovak Republic	2001	7.33 e+ 0
677	Slovak Republic	2002	3.13 e+ 0
678	Slovak Republic	2003	8.55 e+ 0
679	Slovak Republic	2004	7.55 e+ 0
680	Slovak Republic	2005	2.71 e+ 0
681	Slovak Republic	2006	4.48 e+ 0
682	Slovak Republic	2007	2.76 e+ 0
683	Slovak Republic	2008	4.60 e+ 0
684	Slovak Republic	2009	1.62 e+ 0
685	Slovak Republic	2010	9.57 e- 1

686	Slovak Republic	2011	3.92 e+ 0
687	Slovak Republic	2012	3.61 e+ 0
688	Slovak Republic	2013	1.40 e+ 0
689	Slovak Republic	2014	-7.62 e- 2
690	Slovak Republic	2015	-3.25 e- 1
691	Slovak Republic	2016	-5.20 e- 1
692	Slovak Republic	2017	1.31 e+ 0
693	Slovak Republic	2018	2.51 e+ 0
694	Slovak Republic	2019	2.66 e+ 0
695	Slovak Republic	2020	1.94 e+ 0
696	Slovak Republic	2021	3.15 e+ 0
697	Spain	1993	4.57 e+ 0
698	Spain	1994	4.72 e+ 0
699	Spain	1995	4.67 e+ 0
700	Spain	1996	3.56 e+ 0
701	Spain	1997	1.97 e+ 0
702	Spain	1998	1.83 e+ 0
703	Spain	1999	2.31 e+ 0
704	Spain	2000	3.43 e+ 0
705	Spain	2001	3.59 e+ 0
706	Spain	2002	3.07 e+ 0
707	Spain	2003	3.04 e+ 0
708	Spain	2004	3.04 e+ 0
709	Spain	2005	3.37 e+ 0
710	Spain	2006	3.52 e+ 0
711	Spain	2007	2.79 e+ 0
712	Spain	2008	4.08 e+ 0
713	Spain	2009	-2.88 e- 1
714	Spain	2010	1.80 e+ 0
715	Spain	2011	3.20 e+ 0
716	Spain	2012	2.45 e+ 0
717	Spain	2013	1.41 e+ 0
718	Spain	2014	-1.51 e- 1
719	Spain	2015	-5.00 e- 1
720	Spain	2016	-2.03 e- 1
721	Spain	2017	1.96 e+ 0
722	Spain	2018	1.67 e+ 0
723	Spain	2019	7.00 e- 1
724	Spain	2020	-3.23 e- 1
725	Spain	2021	3.09 e+ 0
726	Sweden	1993	4.73 e+ 0
727	Sweden	1994	2.16 e+ 0
728	Sweden	1995	2.46 e+ 0

729 Sweden	1996	5.33 e- 1
730 Sweden	1997	6.58 e- 1
731 Sweden	1998	-2.67 e- 1
732 Sweden	1999	4.62 e- 1
733 Sweden	2000	8.99 e- 1
734 Sweden	2001	2.41 e+ 0
735 Sweden	2002	2.16 e+ 0
736 Sweden	2003	1.93 e+ 0
737 Sweden	2004	3.74 e- 1
738 Sweden	2005	4.53 e- 1
739 Sweden	2006	1.36 e+ 0
740 Sweden	2007	2.21 e+ 0
741 Sweden	2008	3.44 e+ 0
742 Sweden	2009	-4.94 e- 1
743 Sweden	2010	1.16 e+ 0
744 Sweden	2011	2.96 e+ 0
745 Sweden	2012	8.88 e- 1
746 Sweden	2013	-4.43 e- 2
747 Sweden	2014	-1.80 e- 1
748 Sweden	2015	-4.68 e- 2
749 Sweden	2016	9.84 e- 1
750 Sweden	2017	1.79 e+ 0
751 Sweden	2018	1.95 e+ 0
752 Sweden	2019	1.78 e+ 0
753 Sweden	2020	4.97 e- 1
754 Sweden	2021	2.16 e+ 0
755 Switzerland	1993	3.29 e+ 0
756 Switzerland	1994	8.52 e- 1
757 Switzerland	1995	1.80 e+ 0
758 Switzerland	1996	8.12 e- 1
759 Switzerland	1997	5.20 e- 1
760 Switzerland	1998	1.79 e- 2
761 Switzerland	1999	8.06 e- 1
762 Switzerland	2000	1.56 e+ 0
763 Switzerland	2001	9.89 e- 1
764 Switzerland	2002	6.43 e- 1
765 Switzerland	2003	6.38 e- 1
766 Switzerland	2004	8.03 e- 1
767 Switzerland	2005	1.17 e+ 0
768 Switzerland	2006	1.06 e+ 0
769 Switzerland	2007	7.32 e- 1
770 Switzerland	2008	2.43 e+ 0
771 Switzerland	2009	-4.80 e- 1

772	Switzerland	2010	6.88 e- 1
773	Switzerland	2011	2.31 e- 1
774	Switzerland	2012	-6.93 e- 1
775	Switzerland	2013	-2.17 e- 1
776	Switzerland	2014	-1.32 e- 2
777	Switzerland	2015	-1.14 e+ 0
778	Switzerland	2016	-4.35 e- 1
779	Switzerland	2017	5.34 e- 1
780	Switzerland	2018	9.36 e- 1
781	Switzerland	2019	3.63 e- 1
782	Switzerland	2020	-7.26 e- 1
783	Switzerland	2021	5.82 e- 1
784	Türkiye	1993	6.61 e+ 1
785	Türkiye	1994	1.05 e+ 2
786	Türkiye	1995	8.91 e+ 1
787	Türkiye	1996	8.04 e+ 1
788	Türkiye	1997	8.57 e+ 1
789	Türkiye	1998	8.46 e+ 1
790	Türkiye	1999	6.49 e+ 1
791	Türkiye	2000	5.49 e+ 1
792	Türkiye	2001	5.44 e+ 1
793	Türkiye	2002	4.50 e+ 1
794	Türkiye	2003	2.16 e+ 1
795	Türkiye	2004	8.60 e+ 0
796	Türkiye	2005	8.18 e+ 0
797	Türkiye	2006	9.60 e+ 0
798	Türkiye	2007	8.76 e+ 0
799	Türkiye	2008	1.04 e+ 1
800	Türkiye	2009	6.25 e+ 0
801	Türkiye	2010	8.57 e+ 0
802	Türkiye	2011	6.47 e+ 0
803	Türkiye	2012	8.89 e+ 0
804	Türkiye	2013	7.49 e+ 0
805	Türkiye	2014	8.85 e+ 0
806	Türkiye	2015	7.67 e+ 0
807	Türkiye	2016	7.78 e+ 0
808	Türkiye	2017	1.11 e+ 1
809	Türkiye	2018	1.63 e+ 1
810	Türkiye	2019	1.52 e+ 1
811	Türkiye	2020	1.23 e+ 1
812	Türkiye	2021	1.96 e+ 1
813	United Kingdom	1993	2.6 e+ 0
814	United Kingdom	1994	2.2 e+ 0

815	United Kingdom	1995	2.7	e+ 0
816	United Kingdom	1996	2.9	e+ 0
817	United Kingdom	1997	2.2	e+ 0
818	United Kingdom	1998	1.8	e+ 0
819	United Kingdom	1999	1.7	e+ 0
820	United Kingdom	2000	1.2	e+ 0
821	United Kingdom	2001	1.6	e+ 0
822	United Kingdom	2002	1.5	e+ 0
823	United Kingdom	2003	1.4	e+ 0
824	United Kingdom	2004	1.4	e+ 0
825	United Kingdom	2005	2.1	e+ 0
826	United Kingdom	2006	2.5	e+ 0
827	United Kingdom	2007	2.4	e+ 0
828	United Kingdom	2008	3.5	e+ 0
829	United Kingdom	2009	2	e+ 0
830	United Kingdom	2010	2.5	e+ 0
831	United Kingdom	2011	3.8	e+ 0
832	United Kingdom	2012	2.6	e+ 0
833	United Kingdom	2013	2.3	e+ 0
834	United Kingdom	2014	1.5	e+ 0
835	United Kingdom	2015	4	e- 1
836	United Kingdom	2016	1	e+ 0
837	United Kingdom	2017	2.6	e+ 0
838	United Kingdom	2018	2.3	e+ 0
839	United Kingdom	2019	1.7	e+ 0
840	United Kingdom	2020	1	e+ 0
841	United Kingdom	2021	2.5	e+ 0
842	United States	1993	2.95	e+ 0
843	United States	1994	2.61	e+ 0
844	United States	1995	2.81	e+ 0
845	United States	1996	2.93	e+ 0
846	United States	1997	2.34	e+ 0
847	United States	1998	1.55	e+ 0
848	United States	1999	2.19	e+ 0
849	United States	2000	3.38	e+ 0
850	United States	2001	2.83	e+ 0
851	United States	2002	1.59	e+ 0
852	United States	2003	2.27	e+ 0
853	United States	2004	2.68	e+ 0
854	United States	2005	3.39	e+ 0
855	United States	2006	3.23	e+ 0
856	United States	2007	2.85	e+ 0
857	United States	2008	3.84	e+ 0

858	United States	2009	-3.56 e- 1
859	United States	2010	1.64 e+ 0
860	United States	2011	3.16 e+ 0
861	United States	2012	2.07 e+ 0
862	United States	2013	1.46 e+ 0
863	United States	2014	1.62 e+ 0
864	United States	2015	1.19 e- 1
865	United States	2016	1.26 e+ 0
866	United States	2017	2.13 e+ 0
867	United States	2018	2.44 e+ 0
868	United States	2019	1.81 e+ 0
869	United States	2020	1.23 e+ 0
870	United States	2021	4.70 e+ 0
871	Argentina	1993	NA
872	Argentina	1994	NA
873	Argentina	1995	NA
874	Argentina	1996	NA
875	Argentina	1997	NA
876	Argentina	1998	NA
877	Argentina	1999	NA
878	Argentina	2000	NA
879	Argentina	2001	NA
880	Argentina	2002	NA
881	Argentina	2003	NA
882	Argentina	2004	NA
883	Argentina	2005	NA
884	Argentina	2006	NA
885	Argentina	2007	NA
886	Argentina	2008	NA
887	Argentina	2009	NA
888	Argentina	2010	NA
889	Argentina	2011	NA
890	Argentina	2012	NA
891	Argentina	2013	NA
892	Argentina	2014	NA
893	Argentina	2015	NA
894	Argentina	2016	NA
895	Argentina	2017	NA
896	Argentina	2018	3.43 e+ 1
897	Argentina	2019	5.35 e+ 1
898	Argentina	2020	4.20 e+ 1
899	Argentina	2021	4.84 e+ 1
900	Brazil	1993	1.93 e+ 3

901 Brazil	1994	2.08 e+ 3
902 Brazil	1995	6.60 e+ 1
903 Brazil	1996	1.58 e+ 1
904 Brazil	1997	6.93 e+ 0
905 Brazil	1998	3.20 e+ 0
906 Brazil	1999	4.86 e+ 0
907 Brazil	2000	7.04 e+ 0
908 Brazil	2001	6.84 e+ 0
909 Brazil	2002	8.45 e+ 0
910 Brazil	2003	1.47 e+ 1
911 Brazil	2004	6.60 e+ 0
912 Brazil	2005	6.87 e+ 0
913 Brazil	2006	4.18 e+ 0
914 Brazil	2007	3.64 e+ 0
915 Brazil	2008	5.68 e+ 0
916 Brazil	2009	4.89 e+ 0
917 Brazil	2010	5.04 e+ 0
918 Brazil	2011	6.64 e+ 0
919 Brazil	2012	5.40 e+ 0
920 Brazil	2013	6.20 e+ 0
921 Brazil	2014	6.33 e+ 0
922 Brazil	2015	9.03 e+ 0
923 Brazil	2016	8.74 e+ 0
924 Brazil	2017	3.45 e+ 0
925 Brazil	2018	3.66 e+ 0
926 Brazil	2019	3.73 e+ 0
927 Brazil	2020	3.21 e+ 0
928 Brazil	2021	8.30 e+ 0
929 Chile	1993	1.27 e+ 1
930 Chile	1994	1.14 e+ 1
931 Chile	1995	8.23 e+ 0
932 Chile	1996	7.36 e+ 0
933 Chile	1997	6.13 e+ 0
934 Chile	1998	5.11 e+ 0
935 Chile	1999	3.34 e+ 0
936 Chile	2000	3.84 e+ 0
937 Chile	2001	3.57 e+ 0
938 Chile	2002	2.49 e+ 0
939 Chile	2003	2.81 e+ 0
940 Chile	2004	1.05 e+ 0
941 Chile	2005	3.05 e+ 0
942 Chile	2006	3.39 e+ 0
943 Chile	2007	4.41 e+ 0

944	Chile	2008	8.72 e+ 0
945	Chile	2009	3.53 e- 1
946	Chile	2010	1.41 e+ 0
947	Chile	2011	3.34 e+ 0
948	Chile	2012	3.01 e+ 0
949	Chile	2013	1.79 e+ 0
950	Chile	2014	4.72 e+ 0
951	Chile	2015	4.35 e+ 0
952	Chile	2016	3.79 e+ 0
953	Chile	2017	2.18 e+ 0
954	Chile	2018	2.43 e+ 0
955	Chile	2019	2.56 e+ 0
956	Chile	2020	3.05 e+ 0
957	Chile	2021	4.52 e+ 0
958	China (People's Republic of)	1993	1.47 e+ 1
959	China (People's Republic of)	1994	2.41 e+ 1
960	China (People's Republic of)	1995	1.71 e+ 1
961	China (People's Republic of)	1996	8.3 e+ 0
962	China (People's Republic of)	1997	2.8 e+ 0
963	China (People's Republic of)	1998	-8 e- 1
964	China (People's Republic of)	1999	-1.4 e+ 0
965	China (People's Republic of)	2000	4 e- 1
966	China (People's Republic of)	2001	7 e- 1
967	China (People's Republic of)	2002	-8 e- 1
968	China (People's Republic of)	2003	1.2 e+ 0
969	China (People's Republic of)	2004	3.9 e+ 0
970	China (People's Republic of)	2005	1.8 e+ 0
971	China (People's Republic of)	2006	1.5 e+ 0
972	China (People's Republic of)	2007	4.8 e+ 0
973	China (People's Republic of)	2008	5.9 e+ 0
974	China (People's Republic of)	2009	-7 e- 1
975	China (People's Republic of)	2010	3.3 e+ 0
976	China (People's Republic of)	2011	5.4 e+ 0
977	China (People's Republic of)	2012	2.6 e+ 0
978	China (People's Republic of)	2013	2.6 e+ 0
979	China (People's Republic of)	2014	2 e+ 0
980	China (People's Republic of)	2015	1.4 e+ 0
981	China (People's Republic of)	2016	2 e+ 0
982	China (People's Republic of)	2017	1.6 e+ 0
983	China (People's Republic of)	2018	2.1 e+ 0
984	China (People's Republic of)	2019	2.9 e+ 0
985	China (People's Republic of)	2020	2.5 e+ 0
986	China (People's Republic of)	2021	9 e- 1

987 Estonia	1993	NA
988 Estonia	1994	NA
989 Estonia	1995	NA
990 Estonia	1996	NA
991 Estonia	1997	NA
992 Estonia	1998	8.74 e+ 0
993 Estonia	1999	3.30 e+ 0
994 Estonia	2000	4.02 e+ 0
995 Estonia	2001	5.75 e+ 0
996 Estonia	2002	3.57 e+ 0
997 Estonia	2003	1.33 e+ 0
998 Estonia	2004	3.05 e+ 0
999 Estonia	2005	4.08 e+ 0
1000 Estonia	2006	4.44 e+ 0
1001 Estonia	2007	6.60 e+ 0
1002 Estonia	2008	1.04 e+ 1
1003 Estonia	2009	-7.84 e- 2
1004 Estonia	2010	2.97 e+ 0
1005 Estonia	2011	4.98 e+ 0
1006 Estonia	2012	3.93 e+ 0
1007 Estonia	2013	2.78 e+ 0
1008 Estonia	2014	-1.06 e- 1
1009 Estonia	2015	-4.92 e- 1
1010 Estonia	2016	1.49 e- 1
1011 Estonia	2017	3.42 e+ 0
1012 Estonia	2018	3.44 e+ 0
1013 Estonia	2019	2.28 e+ 0
1014 Estonia	2020	-4.45 e- 1
1015 Estonia	2021	4.65 e+ 0
1016 India	1993	6.33 e+ 0
1017 India	1994	1.02 e+ 1
1018 India	1995	1.02 e+ 1
1019 India	1996	8.98 e+ 0
1020 India	1997	7.16 e+ 0
1021 India	1998	1.32 e+ 1
1022 India	1999	4.67 e+ 0
1023 India	2000	4.01 e+ 0
1024 India	2001	3.78 e+ 0
1025 India	2002	4.30 e+ 0
1026 India	2003	3.81 e+ 0
1027 India	2004	3.77 e+ 0
1028 India	2005	4.25 e+ 0
1029 India	2006	5.80 e+ 0

1030	India	2007	6.37 e+ 0
1031	India	2008	8.35 e+ 0
1032	India	2009	1.09 e+ 1
1033	India	2010	1.20 e+ 1
1034	India	2011	8.86 e+ 0
1035	India	2012	9.31 e+ 0
1036	India	2013	1.09 e+ 1
1037	India	2014	6.35 e+ 0
1038	India	2015	5.87 e+ 0
1039	India	2016	4.94 e+ 0
1040	India	2017	2.49 e+ 0
1041	India	2018	4.86 e+ 0
1042	India	2019	7.66 e+ 0
1043	India	2020	5.56 e+ 0
1044	India	2021	4.89 e+ 0
1045	Indonesia	1993	9.67 e+ 0
1046	Indonesia	1994	8.53 e+ 0
1047	Indonesia	1995	9.42 e+ 0
1048	Indonesia	1996	7.97 e+ 0
1049	Indonesia	1997	6.23 e+ 0
1050	Indonesia	1998	5.85 e+ 1
1051	Indonesia	1999	2.05 e+ 1
1052	Indonesia	2000	3.69 e+ 0
1053	Indonesia	2001	1.15 e+ 1
1054	Indonesia	2002	1.19 e+ 1
1055	Indonesia	2003	6.76 e+ 0
1056	Indonesia	2004	6.06 e+ 0
1057	Indonesia	2005	1.05 e+ 1
1058	Indonesia	2006	1.31 e+ 1
1059	Indonesia	2007	6.41 e+ 0
1060	Indonesia	2008	1.02 e+ 1
1061	Indonesia	2009	4.39 e+ 0
1062	Indonesia	2010	5.13 e+ 0
1063	Indonesia	2011	5.36 e+ 0
1064	Indonesia	2012	4.28 e+ 0
1065	Indonesia	2013	6.41 e+ 0
1066	Indonesia	2014	6.39 e+ 0
1067	Indonesia	2015	6.36 e+ 0
1068	Indonesia	2016	3.53 e+ 0
1069	Indonesia	2017	3.81 e+ 0
1070	Indonesia	2018	3.20 e+ 0
1071	Indonesia	2019	3.03 e+ 0
1072	Indonesia	2020	1.92 e+ 0

1073	Indonesia	2021	1.56 e+ 0
1074	Israel	1993	1.10 e+ 1
1075	Israel	1994	1.23 e+ 1
1076	Israel	1995	9.94 e+ 0
1077	Israel	1996	1.14 e+ 1
1078	Israel	1997	8.96 e+ 0
1079	Israel	1998	5.50 e+ 0
1080	Israel	1999	5.18 e+ 0
1081	Israel	2000	1.05 e+ 0
1082	Israel	2001	1.15 e+ 0
1083	Israel	2002	5.76 e+ 0
1084	Israel	2003	7.26 e- 1
1085	Israel	2004	-4.12 e- 1
1086	Israel	2005	1.31 e+ 0
1087	Israel	2006	2.06 e+ 0
1088	Israel	2007	4.60 e- 1
1089	Israel	2008	4.56 e+ 0
1090	Israel	2009	3.34 e+ 0
1091	Israel	2010	2.72 e+ 0
1092	Israel	2011	3.48 e+ 0
1093	Israel	2012	1.69 e+ 0
1094	Israel	2013	1.58 e+ 0
1095	Israel	2014	4.86 e- 1
1096	Israel	2015	-6.34 e- 1
1097	Israel	2016	-5.46 e- 1
1098	Israel	2017	2.45 e- 1
1099	Israel	2018	8.17 e- 1
1100	Israel	2019	8.44 e- 1
1101	Israel	2020	-5.88 e- 1
1102	Israel	2021	1.49 e+ 0
1103	Russia	1993	8.74 e+ 2
1104	Russia	1994	3.08 e+ 2
1105	Russia	1995	1.97 e+ 2
1106	Russia	1996	4.78 e+ 1
1107	Russia	1997	1.48 e+ 1
1108	Russia	1998	2.77 e+ 1
1109	Russia	1999	8.57 e+ 1
1110	Russia	2000	2.08 e+ 1
1111	Russia	2001	2.15 e+ 1
1112	Russia	2002	1.58 e+ 1
1113	Russia	2003	1.37 e+ 1
1114	Russia	2004	1.09 e+ 1
1115	Russia	2005	1.27 e+ 1

1116	Russia	2006	9.67 e+ 0
1117	Russia	2007	9.01 e+ 0
1118	Russia	2008	1.41 e+ 1
1119	Russia	2009	1.16 e+ 1
1120	Russia	2010	6.85 e+ 0
1121	Russia	2011	8.44 e+ 0
1122	Russia	2012	5.07 e+ 0
1123	Russia	2013	6.75 e+ 0
1124	Russia	2014	7.82 e+ 0
1125	Russia	2015	1.55 e+ 1
1126	Russia	2016	7.04 e+ 0
1127	Russia	2017	3.68 e+ 0
1128	Russia	2018	2.88 e+ 0
1129	Russia	2019	4.47 e+ 0
1130	Russia	2020	3.38 e+ 0
1131	Russia	2021	6.69 e+ 0
1132	Saudi Arabia	1993	NA
1133	Saudi Arabia	1994	NA
1134	Saudi Arabia	1995	NA
1135	Saudi Arabia	1996	1.22 e+ 0
1136	Saudi Arabia	1997	5.72 e- 2
1137	Saudi Arabia	1998	-3.71 e- 1
1138	Saudi Arabia	1999	-1.33 e+ 0
1139	Saudi Arabia	2000	-1.12 e+ 0
1140	Saudi Arabia	2001	-1.12 e+ 0
1141	Saudi Arabia	2002	2.47 e- 1
1142	Saudi Arabia	2003	6.12 e- 1
1143	Saudi Arabia	2004	5.16 e- 1
1144	Saudi Arabia	2005	4.79 e- 1
1145	Saudi Arabia	2006	2.21 e+ 0
1146	Saudi Arabia	2007	4.17 e+ 0
1147	Saudi Arabia	2008	9.87 e+ 0
1148	Saudi Arabia	2009	5.06 e+ 0
1149	Saudi Arabia	2010	5.34 e+ 0
1150	Saudi Arabia	2011	5.83 e+ 0
1151	Saudi Arabia	2012	2.87 e+ 0
1152	Saudi Arabia	2013	3.53 e+ 0
1153	Saudi Arabia	2014	2.24 e+ 0
1154	Saudi Arabia	2015	1.21 e+ 0
1155	Saudi Arabia	2016	2.07 e+ 0
1156	Saudi Arabia	2017	-8.38 e- 1
1157	Saudi Arabia	2018	2.46 e+ 0
1158	Saudi Arabia	2019	-2.09 e+ 0

1159	Saudi Arabia	2020	3.45 e+ 0
1160	Saudi Arabia	2021	3.06 e+ 0
1161	Slovenia	1993	3.18 e+ 1
1162	Slovenia	1994	2.10 e+ 1
1163	Slovenia	1995	1.35 e+ 1
1164	Slovenia	1996	9.86 e+ 0
1165	Slovenia	1997	8.36 e+ 0
1166	Slovenia	1998	7.89 e+ 0
1167	Slovenia	1999	6.16 e+ 0
1168	Slovenia	2000	8.91 e+ 0
1169	Slovenia	2001	8.38 e+ 0
1170	Slovenia	2002	7.48 e+ 0
1171	Slovenia	2003	5.54 e+ 0
1172	Slovenia	2004	3.59 e+ 0
1173	Slovenia	2005	2.45 e+ 0
1174	Slovenia	2006	2.46 e+ 0
1175	Slovenia	2007	3.66 e+ 0
1176	Slovenia	2008	5.65 e+ 0
1177	Slovenia	2009	8.39 e- 1
1178	Slovenia	2010	1.80 e+ 0
1179	Slovenia	2011	1.80 e+ 0
1180	Slovenia	2012	2.60 e+ 0
1181	Slovenia	2013	1.77 e+ 0
1182	Slovenia	2014	1.99 e- 1
1183	Slovenia	2015	-5.26 e- 1
1184	Slovenia	2016	-5.50 e- 2
1185	Slovenia	2017	1.43 e+ 0
1186	Slovenia	2018	1.74 e+ 0
1187	Slovenia	2019	1.63 e+ 0
1188	Slovenia	2020	-5.49 e- 2
1189	Slovenia	2021	1.92 e+ 0
1190	South Africa	1993	9.72 e+ 0
1191	South Africa	1994	8.94 e+ 0
1192	South Africa	1995	8.68 e+ 0
1193	South Africa	1996	7.35 e+ 0
1194	South Africa	1997	8.60 e+ 0
1195	South Africa	1998	6.88 e+ 0
1196	South Africa	1999	5.18 e+ 0
1197	South Africa	2000	5.34 e+ 0
1198	South Africa	2001	5.70 e+ 0
1199	South Africa	2002	9.49 e+ 0
1200	South Africa	2003	5.68 e+ 0
1201	South Africa	2004	-6.92 e- 1

1202	South Africa	2005	2.06 e+ 0
1203	South Africa	2006	3.24 e+ 0
1204	South Africa	2007	6.18 e+ 0
1205	South Africa	2008	1.01 e+ 1
1206	South Africa	2009	7.22 e+ 0
1207	South Africa	2010	4.09 e+ 0
1208	South Africa	2011	5.00 e+ 0
1209	South Africa	2012	5.72 e+ 0
1210	South Africa	2013	5.78 e+ 0
1211	South Africa	2014	6.13 e+ 0
1212	South Africa	2015	4.54 e+ 0
1213	South Africa	2016	6.57 e+ 0
1214	South Africa	2017	5.18 e+ 0
1215	South Africa	2018	4.52 e+ 0
1216	South Africa	2019	4.12 e+ 0
1217	South Africa	2020	3.21 e+ 0
1218	South Africa	2021	4.61 e+ 0
1219	Colombia	1993	2.24 e+ 1
1220	Colombia	1994	2.28 e+ 1
1221	Colombia	1995	2.09 e+ 1
1222	Colombia	1996	2.08 e+ 1
1223	Colombia	1997	1.85 e+ 1
1224	Colombia	1998	1.87 e+ 1
1225	Colombia	1999	1.09 e+ 1
1226	Colombia	2000	9.23 e+ 0
1227	Colombia	2001	7.97 e+ 0
1228	Colombia	2002	6.35 e+ 0
1229	Colombia	2003	7.13 e+ 0
1230	Colombia	2004	5.90 e+ 0
1231	Colombia	2005	5.05 e+ 0
1232	Colombia	2006	4.29 e+ 0
1233	Colombia	2007	5.54 e+ 0
1234	Colombia	2008	7.00 e+ 0
1235	Colombia	2009	4.20 e+ 0
1236	Colombia	2010	2.27 e+ 0
1237	Colombia	2011	3.42 e+ 0
1238	Colombia	2012	3.17 e+ 0
1239	Colombia	2013	2.02 e+ 0
1240	Colombia	2014	2.90 e+ 0
1241	Colombia	2015	4.99 e+ 0
1242	Colombia	2016	7.51 e+ 0
1243	Colombia	2017	4.31 e+ 0
1244	Colombia	2018	3.24 e+ 0

1245	Colombia	2019	3.52 e+ 0
1246	Colombia	2020	2.53 e+ 0
1247	Colombia	2021	3.50 e+ 0
1248	Costa Rica	1993	9.78 e+ 0
1249	Costa Rica	1994	1.35 e+ 1
1250	Costa Rica	1995	2.32 e+ 1
1251	Costa Rica	1996	1.75 e+ 1
1252	Costa Rica	1997	1.32 e+ 1
1253	Costa Rica	1998	1.17 e+ 1
1254	Costa Rica	1999	1.00 e+ 1
1255	Costa Rica	2000	1.10 e+ 1
1256	Costa Rica	2001	1.13 e+ 1
1257	Costa Rica	2002	9.17 e+ 0
1258	Costa Rica	2003	9.45 e+ 0
1259	Costa Rica	2004	1.23 e+ 1
1260	Costa Rica	2005	1.38 e+ 1
1261	Costa Rica	2006	1.15 e+ 1
1262	Costa Rica	2007	9.36 e+ 0
1263	Costa Rica	2008	1.34 e+ 1
1264	Costa Rica	2009	7.84 e+ 0
1265	Costa Rica	2010	5.66 e+ 0
1266	Costa Rica	2011	4.88 e+ 0
1267	Costa Rica	2012	4.50 e+ 0
1268	Costa Rica	2013	5.23 e+ 0
1269	Costa Rica	2014	4.52 e+ 0
1270	Costa Rica	2015	8.02 e- 1
1271	Costa Rica	2016	-1.75 e- 2
1272	Costa Rica	2017	1.63 e+ 0
1273	Costa Rica	2018	2.22 e+ 0
1274	Costa Rica	2019	2.10 e+ 0
1275	Costa Rica	2020	7.25 e- 1
1276	Costa Rica	2021	1.73 e+ 0

This data frame has 3 columns and 1276 rows.

Question 5

- What is the highest inflation rate observed between 1993 and 2021? In addition to code and output, your response should include a single sentence stating the country and year.

```
inf_long%>%
  filter(annual_inflation==max(annual_inflation, na.rm = TRUE))
```

```
# A tibble: 1 x 3
  country year annual_inflation
  <chr>   <dbl>         <dbl>
1 Brazil  1994         2076.
```

The highest inflation rate between 1993 and 2021 is observed in Brazil in 1994 at approximately 2075.888.

- b. What is the lowest inflation rate observed between 1993 and 2021? In addition to code and output, your response should include a single sentence stating the country and year.

```
inf_long%>%
  filter(annual_inflation==min(annual_inflation, na.rm = TRUE))
```

```
# A tibble: 1 x 3
  country year annual_inflation
  <chr>   <dbl>         <dbl>
1 Ireland 2009         -4.48
```

The lowest inflation rate between 1993 and 2021 is observed in Ireland in 2009 at approximately -4.478.

- c. Putting (a) and (b) together: What are the highest and the lowest inflation rates observed between 1993 and 2021? The output of the pipeline should be a data frame with two rows and three columns.

```
inf_long %>%
  filter(annual_inflation %in% c(max(annual_inflation, na.rm = TRUE),
                                min(annual_inflation, na.rm = TRUE)))
```

```
# A tibble: 2 x 3
  country year annual_inflation
  <chr>   <dbl>         <dbl>
1 Ireland 2009         -4.48
2 Brazil  1994         2076.
```

Question 6

a. Create a vector called `countries_of_interest` which contains the names of up to five countries you want to visualize the inflation rates for over the years. For example, if these countries are Türkiye and United States, you can express this as follows:

```
countries_of_interest <- c("Sweden", "Norway", "Denmark", "Finland", "Iceland")
```

Then, in 1-2 sentences, state why you chose these countries.

Picked because they are all nordic countries and interesting to compare

b. In a single pipeline, filter your reshaped dataset to include only the `countries_of_interest` from part (a), and save the resulting data frame with a new name so you (1) can refer to this data frame later in your analysis and (2) do not overwrite the data frame you're starting with. Use a short but informative name. Then, in a new pipeline, find the `distinct()` countries in the data frame you created.

```
nordic_inf <- inf_long %>%  
  filter(country %in% countries_of_interest)  
  
nordic_inf %>%  
  distinct(country)
```

```
# A tibble: 5 x 1  
  country  
  <chr>  
1 Denmark  
2 Finland  
3 Iceland  
4 Norway  
5 Sweden
```

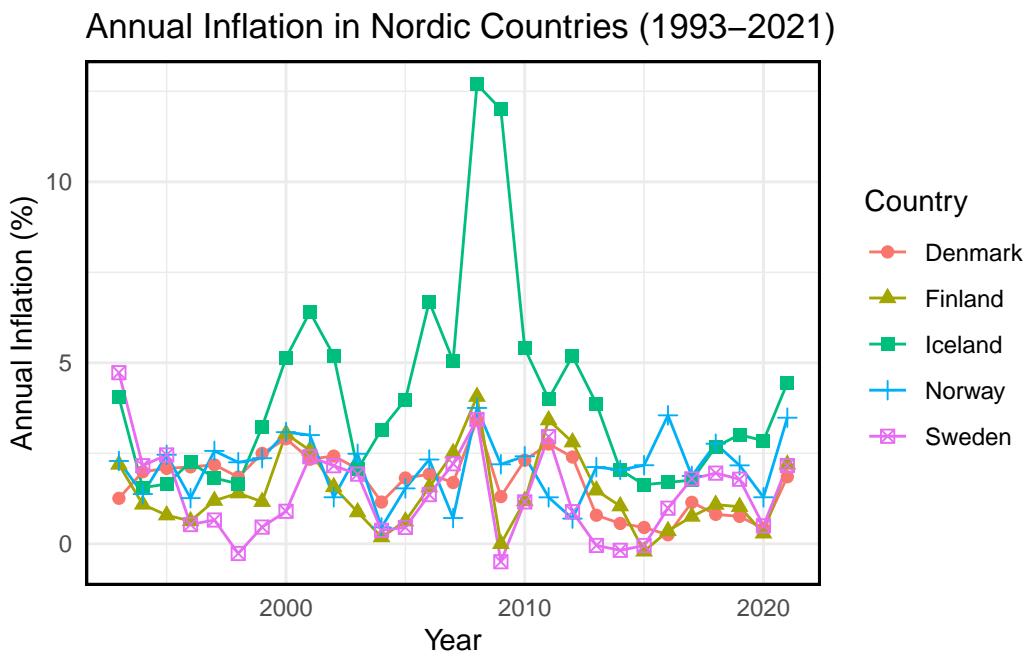
Question 7

Using your data frame from the previous question, create a plot of annual inflation vs. year for these countries. Then, in a few sentences, describe the patterns you observe in the plot, particularly focusing on anything you find surprising or not surprising, based on your knowledge (or lack thereof) of these countries' economies.

Requirements for the plot:

- Data should be represented with points as well as lines connecting the points for each country.
- Each country should be represented by a different color line and different color and shape points.
- Axes and legend should be properly labeled.
- The plot should have an appropriate title (and optionally a subtitle).
- Plot should be customized in at least one way – you could use a different than default color scale, or different than default theme, or some other customization.

```
ggplot(nordic_inf, aes(x = year, y = annual_inflation,
                      color = country, shape = country)) +
  geom_line() +
  geom_point(size = 2) +
  labs(
    title = "Annual Inflation in Nordic Countries (1993-2021)",
    x = "Year",
    y = "Annual Inflation (%)",
    color = "Country",
    shape = "Country"
  ) +
  theme_minimal() +
  theme(panel.border = element_rect(color = "black", fill = NA, size = 1))
```



If you haven't yet done so, now is a good time to render, commit, and push. Make sure that you commit and push all changed documents and your Git pane is completely empty before proceeding.

Part 2

Inflation in the US

The OECD defines inflation as follows:

Inflation is a rise in the general level of prices of goods and services that households acquire for the purpose of consumption in an economy over a period of time.

The main measure of inflation is the annual inflation rate which is the movement of the Consumer Price Index (CPI) from one month/period to the same month/period of the previous year expressed as percentage over time.

Source: [OECD CPI FAQ](#)

CPI is broken down into 12 divisions such as food, housing, health, etc. Your goal in this part is to create another time series plot of annual inflation, this time for US only.

The data you will need to create this visualization is spread across two files:

- `us-inflation.csv`: Annual inflation rate for the US for 12 CPI divisions. Each division is identified by an ID number.
- `cpi-divisions.csv`: A “lookup table” of CPI division ID numbers and their descriptions.

Let's load both of these files.

```
us_inflation <- read_csv("data/us-inflation.csv")
cpi_divisions <- read_csv("data/cpi-divisions.csv")
```

Question 8

a. How many columns and how many rows does the `us_inflation` dataset have? What are the variables in it? Add a brief (1-2 sentences) narrative summarizing this information.

```
glimpse(us_inflation)
```

```

Rows: 132
Columns: 4
$ country      <chr> "United States", "United States", "United States", "U~
$ cpi_division_id <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, ~
$ year         <dbl> 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, ~
$ annual_inflation <dbl> 4.8039240, 2.4539620, 0.9083796, 2.6398010, 1.1677110~

```

ANSWER

b. How many columns and how many rows does the `cpi_divisions` dataset have? What are the variables in it? Add a brief (1-2 sentences) narrative summarizing this information.

```
glimpse(cpi_divisions)
```

```

Rows: 12
Columns: 2
$ id          <dbl> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
$ description <chr> "Food and non-Alcoholic beverages", "Alcoholic beverages, ~

```

ANSWER

c. Create a new dataset by joining the `us_inflation` dataset with the `cpi_division_id` dataset.

```

us_inflation_full <- us_inflation %>%
  left_join(cpi_divisions, by=c("cpi_division_id"="id"))

```

- Determine which type of join is the most appropriate one and use that.
- Note that the two datasets don't have a common variable. Review the help for the join functions to determine how to use the `by` argument when the names of the variables that the datasets should be joined by are different.
- Use a short but informative name for the joined dataset, and do not overwrite either of the datasets that go into creating it.

Then, find the number of rows and columns of the resulting dataset and report the names of its columns. Add a brief (1-2 sentences) narrative summarizing this information.

ANSWER

Question 9

a. Create a vector called `divisions_of_interest` which contains the descriptions or IDs of CPI divisions you want to visualize. Your `divisions_of_interest` should consist of no more than five divisions. If you're using descriptions, make sure that the spelling of your divisions matches how they appear in the dataset. Then, in 1-2 sentences, state why you chose these divisions.

```
divisions_of_interest <- c(2,4,6)
```

b. In a single pipeline, filter your reshaped dataset to include only the `divisions_of_interest` from part (a), and save the resulting data frame with a new name so you (1) can refer to this data frame later in your analysis and (2) do not overwrite the data frame you're starting with. Use a short but informative name. Then, in a new pipeline, find the `distinct()` divisions in the data frame you created.

```
cpi_of_interest <- us_inflation_full %>%  
  filter(cpi_division_id %in% divisions_of_interest)  
  
cpi_of_interest %>%  
  distinct(description)
```

```
# A tibble: 3 x 1  
  description  
  <chr>  
1 Alcoholic beverages, tobacco and narcotics  
2 Housing, water, electricity, gas and other fuels  
3 Health
```

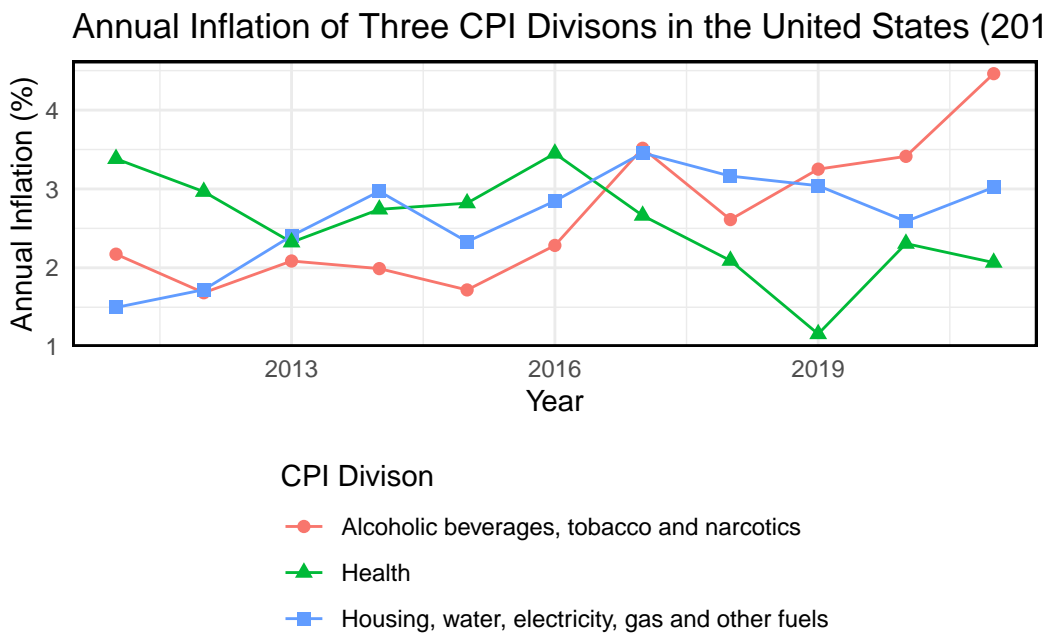
Question 10

Using your data frame from the previous question, create a plot of annual inflation vs. year for these divisions. Then, in a few sentences, describe the patterns you observe in the plot, particularly focusing on anything you find surprising or not surprising, based on your knowledge (or lack thereof) of inflation rates in the US over the last decade.

- Data should be represented with points as well as lines connecting the points for each division.
- Each division should be represented by a different color line and different color and shape points.
- Axes and legend should be properly labeled.

- The plot should have an appropriate title (and optionally a subtitle).
- Plot should be customized in at least one way – you could use a different than default color scale, or different than default theme, or some other customization.
- If your legend has labels that are too long, you can try moving the legend to the bottom and stack the labels vertically. *Hint:* The `legend.position` and `legend.direction` arguments of the `theme()` functions will be useful.

```
ggplot(cpi_of_interest, aes(x = year, y = annual_inflation,
                           color = description, shape = description)) +
  geom_line() +
  geom_point(size = 2) +
  labs(
    title = "Annual Inflation of Three CPI Divisions in the United States (2011-2021)",
    x = "Year",
    y = "Annual Inflation (%)",
    color = "CPI Divison",
    shape = "CPI Divison"
  ) +
  theme_minimal() +
  theme(panel.border = element_rect(color = "black", fill = NA, size = 1),
        legend.position = "bottom",
        legend.direction = "vertical")
```



If you haven't yet done so since Part 1, now is a good time to render, commit, and push. Make

sure that you commit and push all changed documents and your Git pane is completely empty before proceeding.

Wrap-up

Submission

Once you are finished with the lab, you will submit your final PDF document to Canvas.

Warning

Before you wrap up the assignment, make sure all of your documents are updated on your GitHub repo. We will be checking these to make sure you have been practicing how to commit and push changes.

You must turn in a PDF file to the Canvas page by the submission deadline to be considered “on time”.

To submit your assignment:

- Go to <http://www.Canvas.com> and click *Log in* in the top right corner.
- Click *School Credentials* → *Duke NetID* and log in using your NetID credentials.
- Click on your *REN R 213* course.
- Click on the assignment, and you’ll be prompted to submit it.
- Mark all the pages associated with question. All the pages of your lab should be associated with at least one question (i.e., should be “checked”).

Checklist

Make sure you have:

- attempted all questions
- rendered your Quarto document
- committed and pushed everything to your GitHub repository such that the Git pane in RStudio is empty
- uploaded your PDF to Canvas
- selected pages associated with each question on Canvas

Grading

The lab is graded out of a total of 36 points.

You can earn up to 4 points on each question:

- 4: Response shows excellent understanding and addresses all or almost all of the rubric items.
- 3: Response shows good understanding and addresses most of the rubric items.
- 2: Response shows understanding and addresses a majority of the rubric items.
- 1: Response shows effort and misses many of the rubric items.
- 0: Response does not show sufficient effort or understanding and/or is largely incomplete.