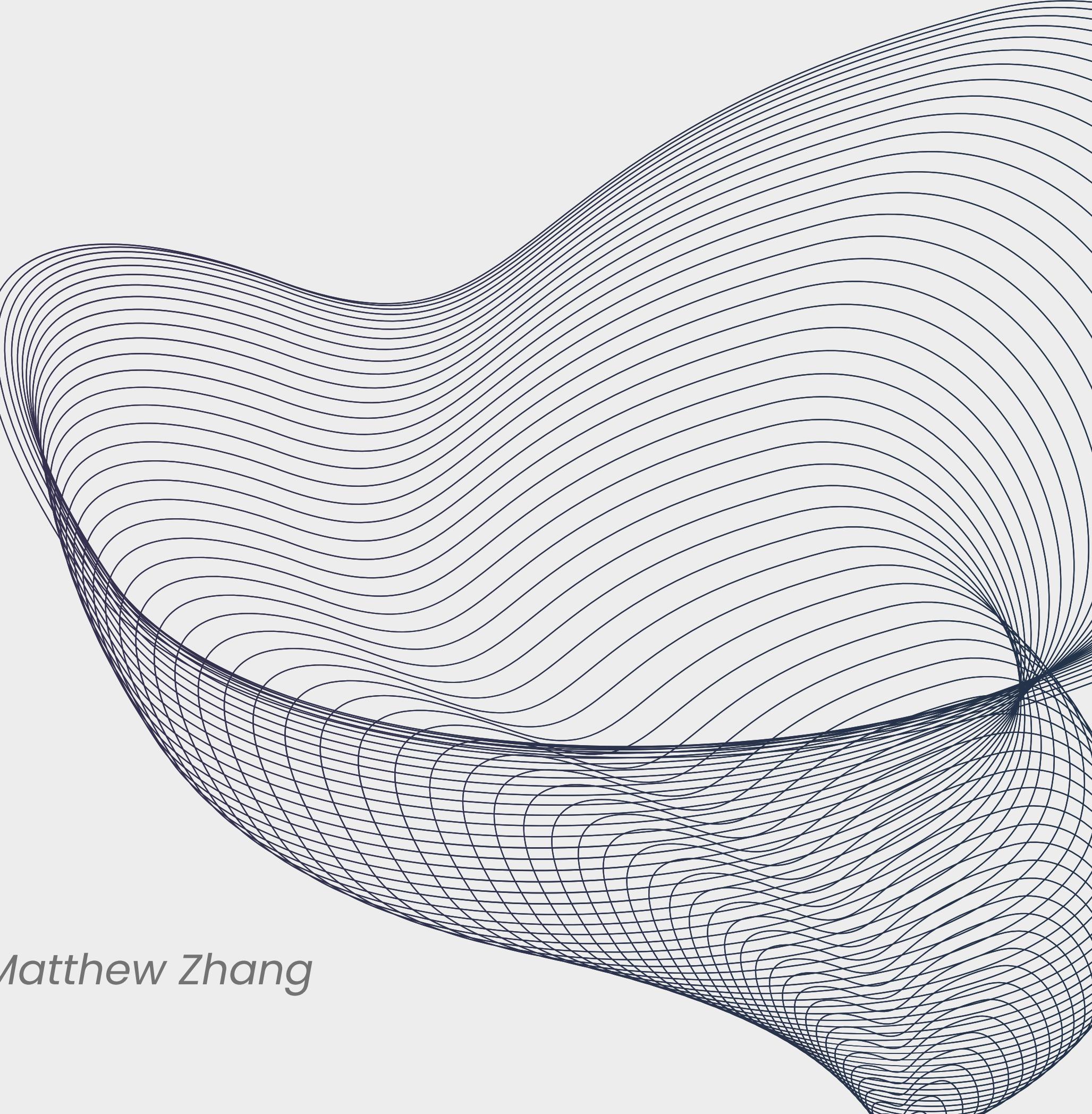


# Happiness and the S&P 500

*Hannah Grace Smith, Cameron Yenche, Matthew Zhang*



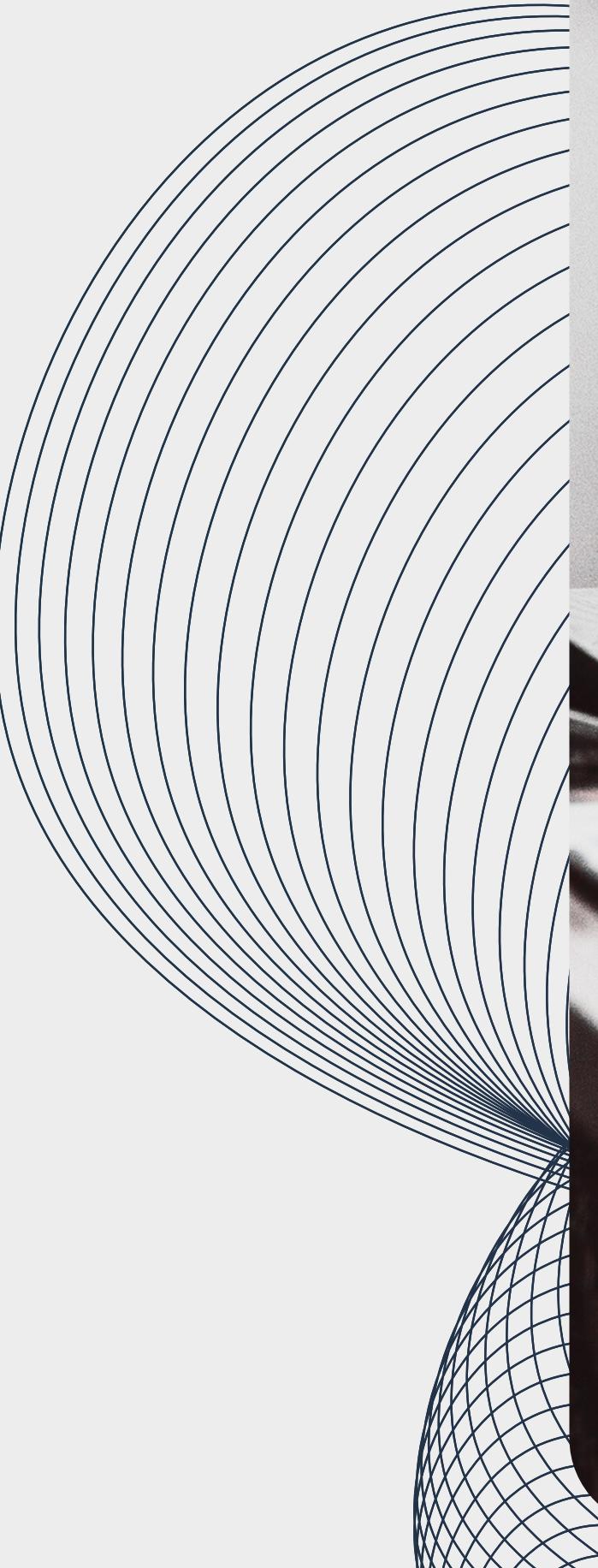
# Overview

The purpose of this project is to compile happiness data, examine major trends, and determine the relation—if any—to the trends of the S&P 500 stock market index

# Data

The report will employ data analysis techniques to explore two datasets:

- 2005 – Present World Happiness Report
- S&P 500 Index Market Trend Data

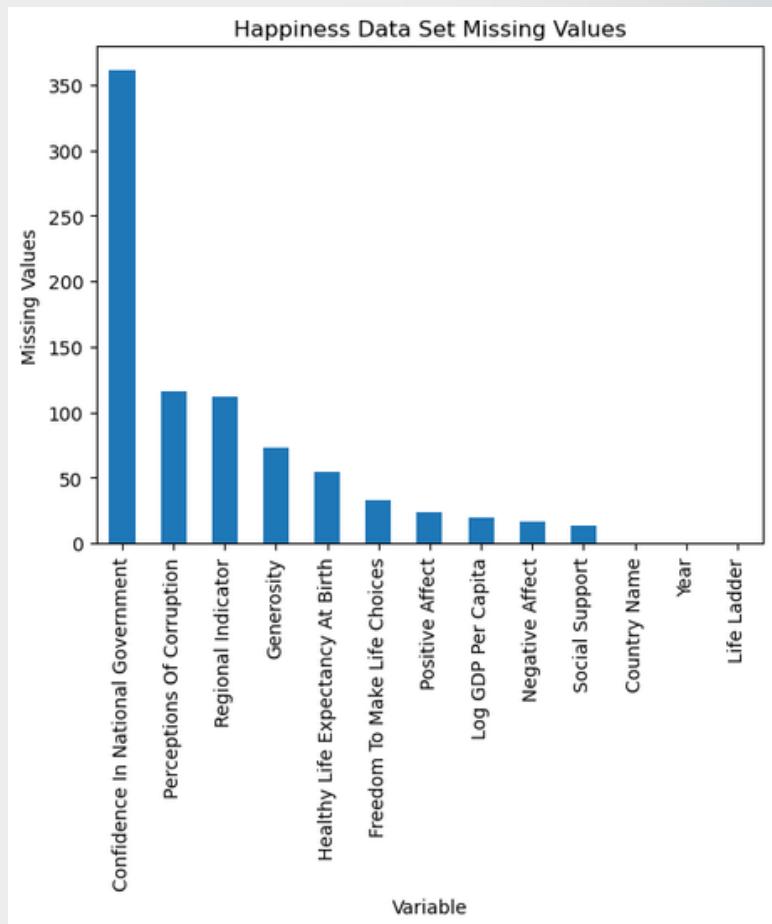


# 2005 - Present World Happiness Report

|   | Country Name | Regional Indicator | Year | Life Ladder | Log GDP Per Capita | Social Support | Healthy Life Expectancy At Birth | Freedom To Make Life Choices | Generosity | Perceptions Of Corruption | Positive Affect | Negative Affect | Confidence In National Government |
|---|--------------|--------------------|------|-------------|--------------------|----------------|----------------------------------|------------------------------|------------|---------------------------|-----------------|-----------------|-----------------------------------|
| 0 | Afghanistan  | South Asia         | 2008 | 3.723590    | 7.350416           | 0.450662       | 50.500000                        | 0.718114                     | 0.167652   | 0.881686                  | 0.414297        | 0.258195        | 0.612072                          |
| 1 | Afghanistan  | South Asia         | 2009 | 4.401778    | 7.508646           | 0.552308       | 50.799999                        | 0.678896                     | 0.190809   | 0.850035                  | 0.481421        | 0.237092        | 0.611545                          |
| 2 | Afghanistan  | South Asia         | 2010 | 4.758381    | 7.613900           | 0.539075       | 51.099998                        | 0.600127                     | 0.121316   | 0.706766                  | 0.516907        | 0.275324        | 0.299357                          |
| 3 | Afghanistan  | South Asia         | 2011 | 3.831719    | 7.581259           | 0.521104       | 51.400002                        | 0.495901                     | 0.163571   | 0.731109                  | 0.479835        | 0.267175        | 0.307386                          |
| 4 | Afghanistan  | South Asia         | 2012 | 3.782938    | 7.660506           | 0.520637       | 51.700001                        | 0.530935                     | 0.237588   | 0.775620                  | 0.613513        | 0.267919        | 0.435440                          |

# S&P 500 Index Market Trend Data

|   | Date       | Close/Last | Volume | Open    | High    | Low     |
|---|------------|------------|--------|---------|---------|---------|
| 0 | 04/14/2023 | 4137.64    | --     | 4140.11 | 4163.19 | 4113.20 |
| 1 | 04/13/2023 | 4146.22    | --     | 4100.04 | 4150.26 | 4099.40 |
| 2 | 04/12/2023 | 4091.95    | --     | 4121.72 | 4134.37 | 4086.94 |
| 3 | 04/11/2023 | 4108.94    | --     | 4110.29 | 4124.26 | 4102.61 |
| 4 | 04/10/2023 | 4109.11    | --     | 4085.20 | 4109.50 | 4072.55 |



|                                  |                        |
|----------------------------------|------------------------|
| Life Ladder                      | Min value: 1.2812711   |
|                                  | Max value: 8.01893425  |
| -----                            | -----                  |
| Log GDP Per Capita               | Min value: 5.526723385 |
|                                  | Max value: 11.66378784 |
| -----                            | -----                  |
| Social Support                   | Min value: 0.228217229 |
|                                  | Max value: 0.98734349  |
| -----                            | -----                  |
| Healthy Life Expectancy At Birth | Min value: 6.71999979  |
|                                  | Max value: 74.47499847 |
| -----                            | -----                  |
| Freedom To Make Life Choices     | Min value: 0.257533818 |
|                                  | Max value: 0.985177755 |
| -----                            | -----                  |
| Generosity                       | Min value: -0.33752656 |
|                                  | Max value: 0.702707887 |
| -----                            | -----                  |
| Perceptions Of Corruption        | Min value: 0.035197988 |
|                                  | Max value: 0.98327601  |
| -----                            | -----                  |
| Positive Affect                  | Min value: 0.178885803 |
|                                  | Max value: 0.883586407 |
| -----                            | -----                  |
| Negative Affect                  | Min value: 0.082736954 |
|                                  | Max value: 0.704589665 |
| -----                            | -----                  |

```
data columns (total 13 columns):
#   Column
--- -----
0   Country Name
1   Regional Indicator
2   Year
3   Life Ladder
4   Log GDP Per Capita
5   Social Support
6   Healthy Life Expectancy At Birth
7   Freedom To Make Life Choices
8   Generosity
9   Perceptions Of Corruption
10  Positive Affect
11  Negative Affect
12  Confidence In National Government
```

|                                   | Non-Null Count | Dtype   |
|-----------------------------------|----------------|---------|
| Country Name                      | 2199 non-null  | object  |
| Regional Indicator                | 2087 non-null  | object  |
| Year                              | 2199 non-null  | int64   |
| Life Ladder                       | 2199 non-null  | float64 |
| Log GDP Per Capita                | 2179 non-null  | float64 |
| Social Support                    | 2186 non-null  | float64 |
| Healthy Life Expectancy At Birth  | 2145 non-null  | float64 |
| Freedom To Make Life Choices      | 2166 non-null  | float64 |
| Generosity                        | 2126 non-null  | float64 |
| Perceptions Of Corruption         | 2083 non-null  | float64 |
| Positive Affect                   | 2175 non-null  | float64 |
| Negative Affect                   | 2183 non-null  | float64 |
| Confidence In National Government | 1838 non-null  | float64 |

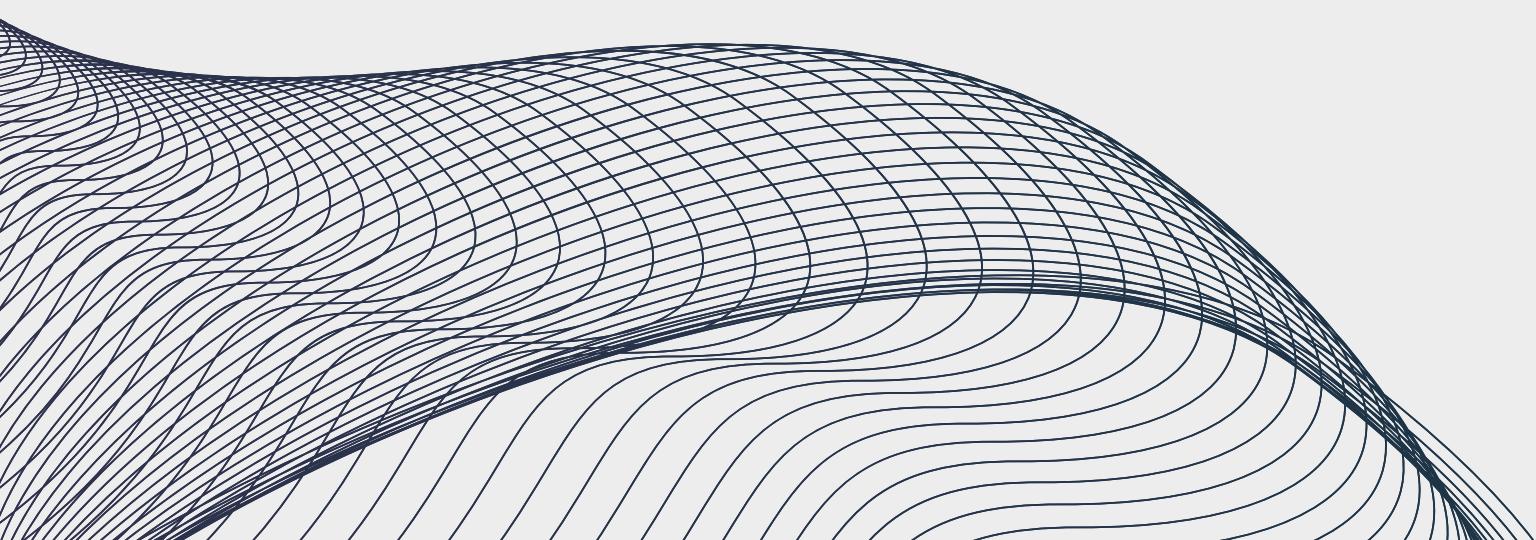
# Initial Exploration and Cleaning

- Sanity checking the data
- Reconciling dates
- Addressing missing values

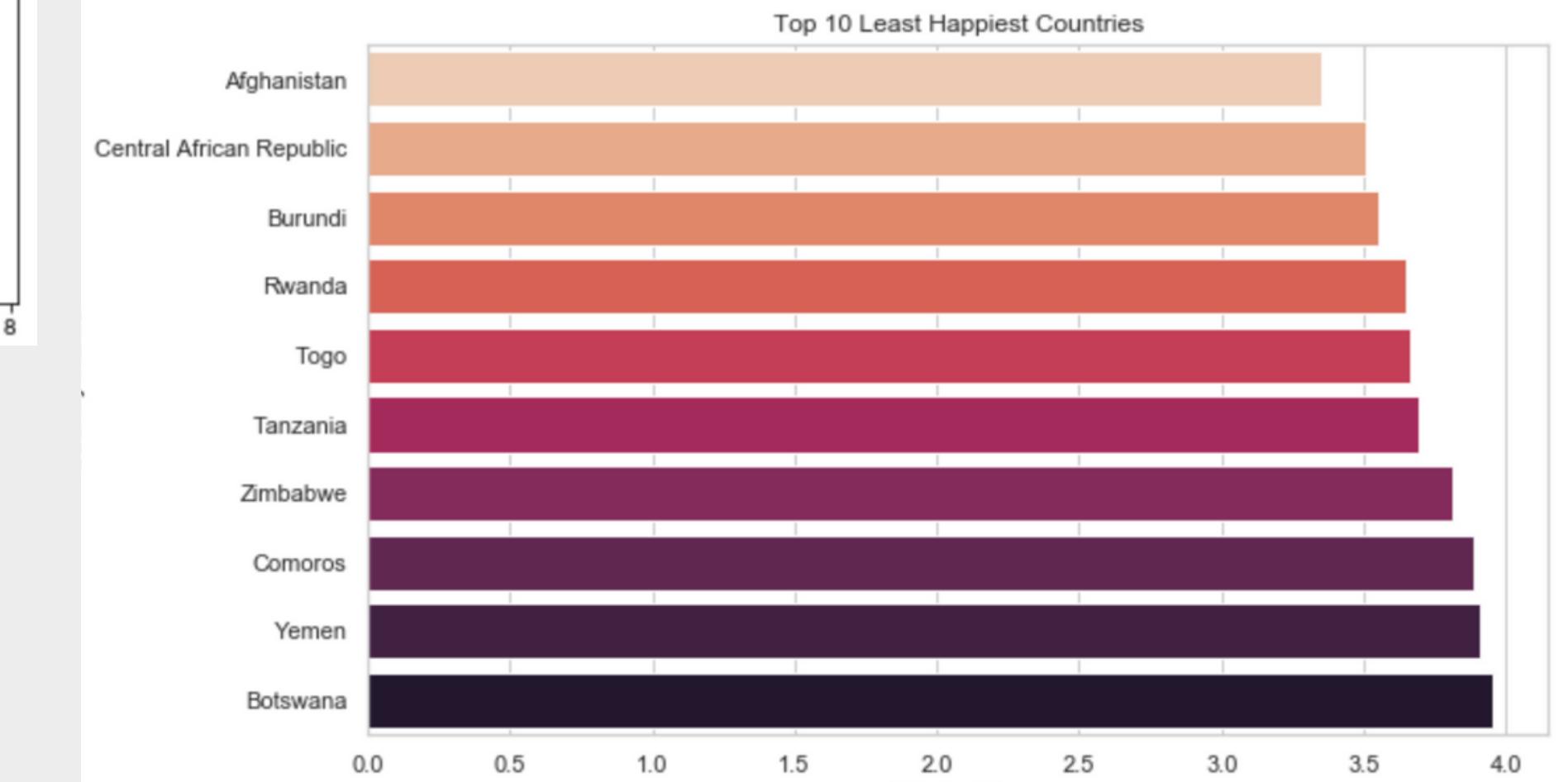
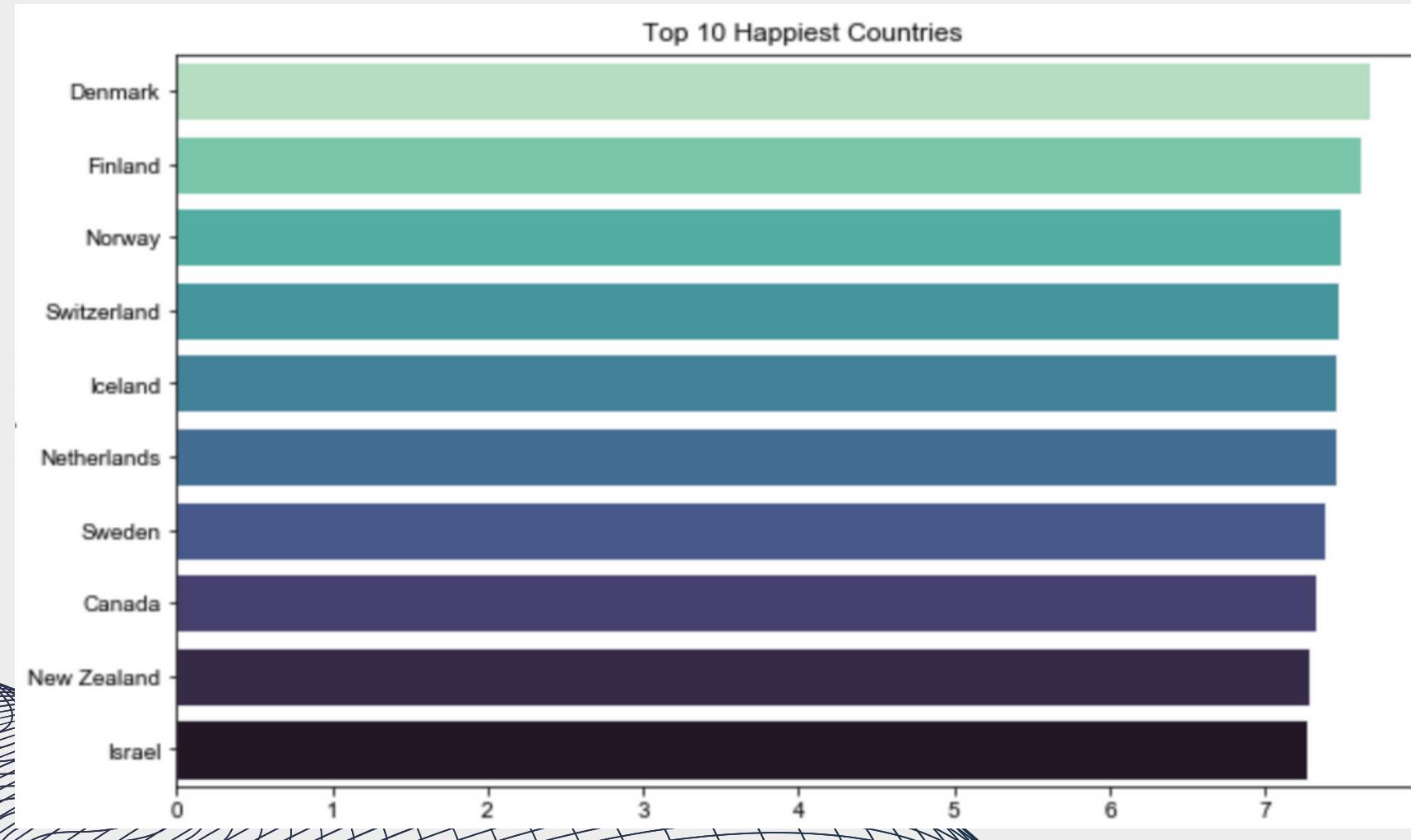
# Key Questions

- What countries appear to be the happiest? The least happy?
- What variable(s) is correlated most strongly and consistently with increased subjective well-being?
- What is the relationship with the state of the economic market, as measured by the S&P 500, on worldwide and regional measures of subjective well-being?
- Are there differences in how the economic market, as measured by the S&P 500, relates to various regions' subjective well-being ratings?

# Exploratory Data Analysis

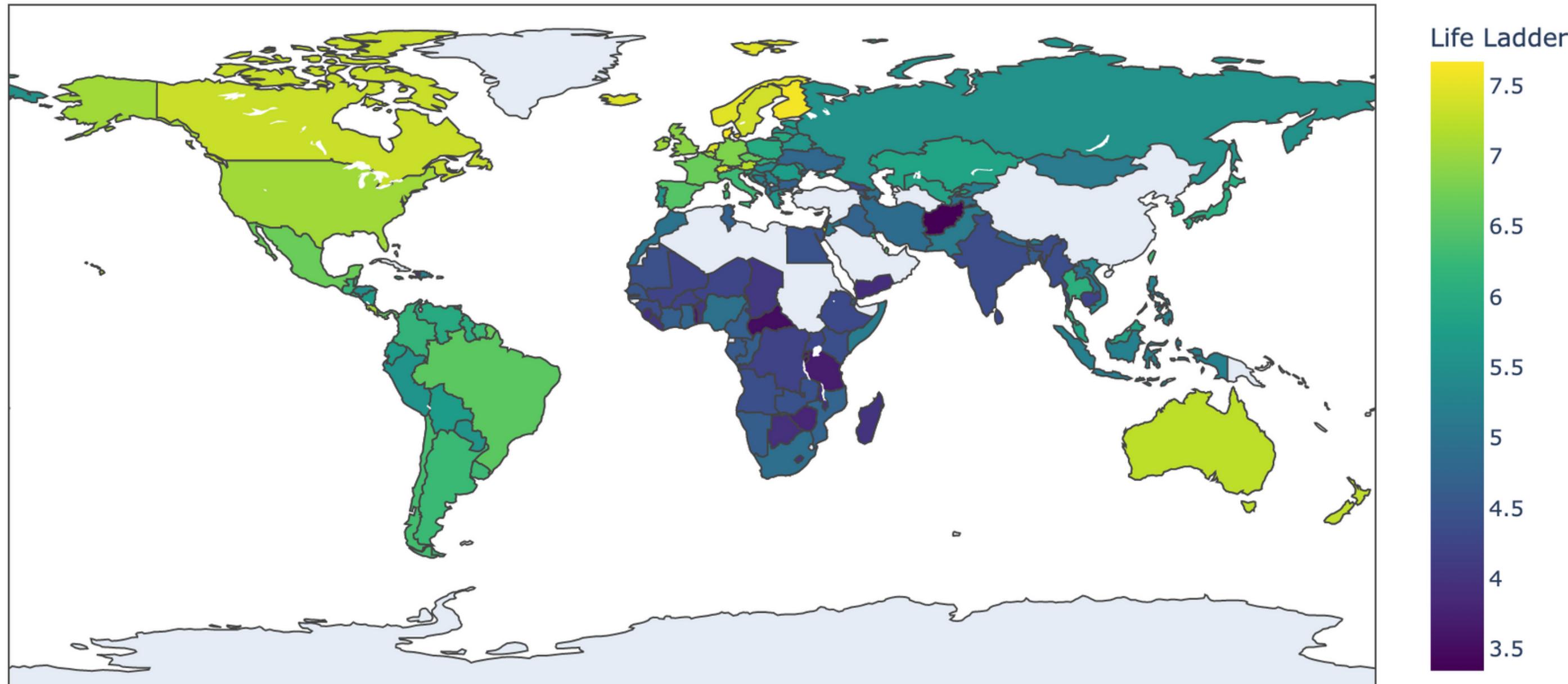


# What countries appear to be the happiest? The least happy?

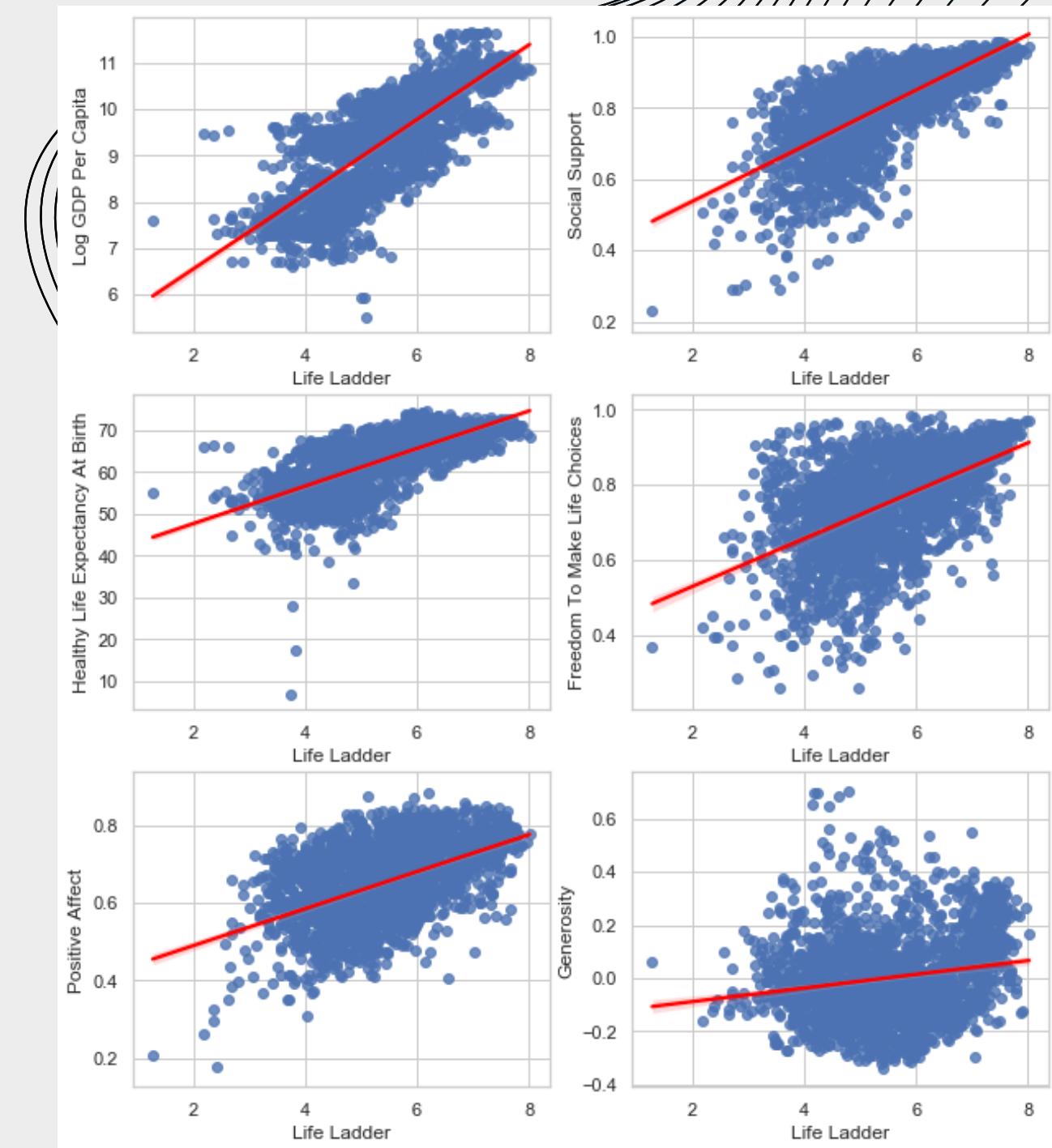
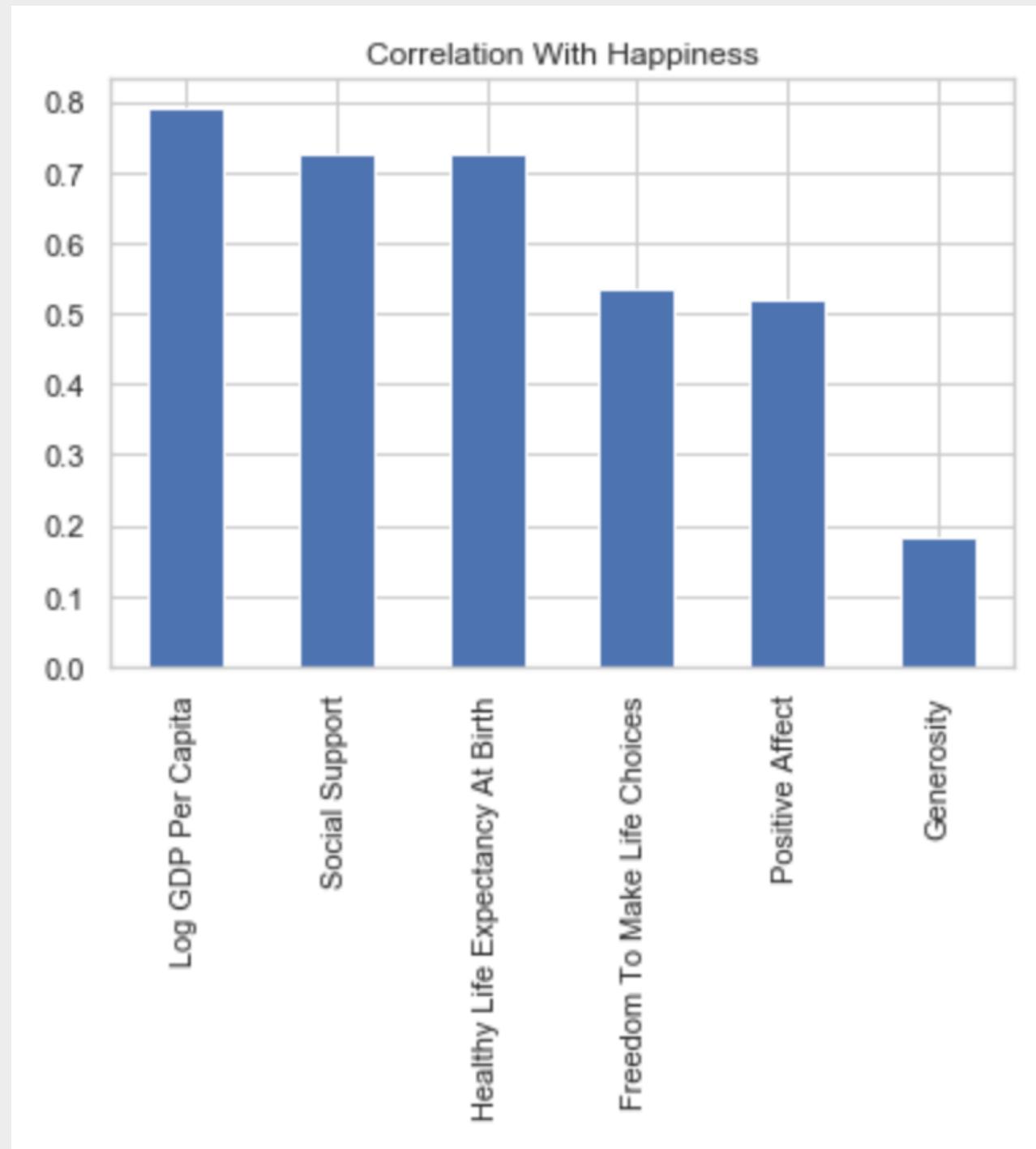


# What regions appear to be the happiest? The least happy?

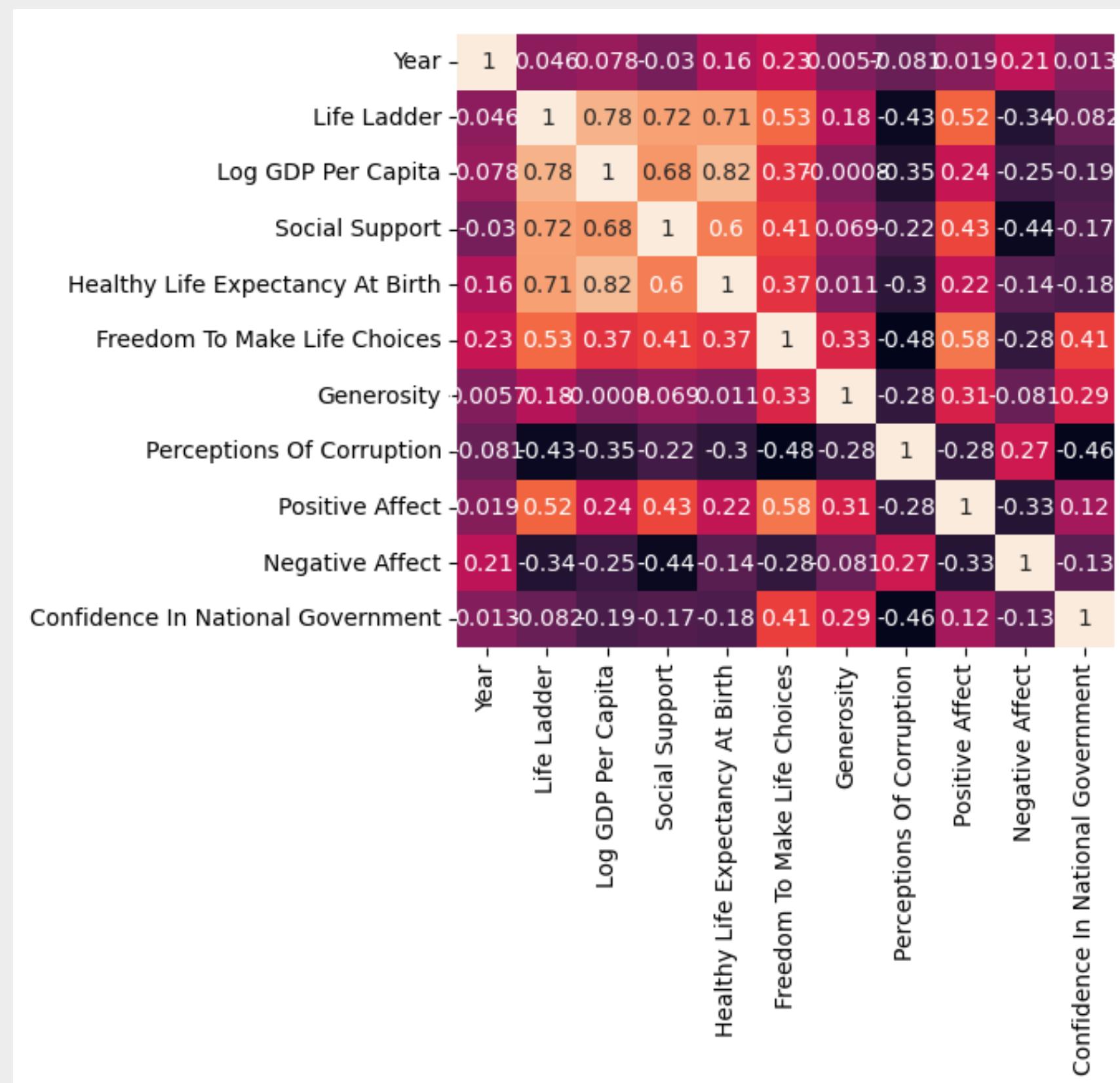
Average Life Ladder by Country



# What variables show the strongest correlations with self-identified happiness level?



# But what about their relationships with each other...



# When accounting for other variables, what variables are most correlated with happiness?

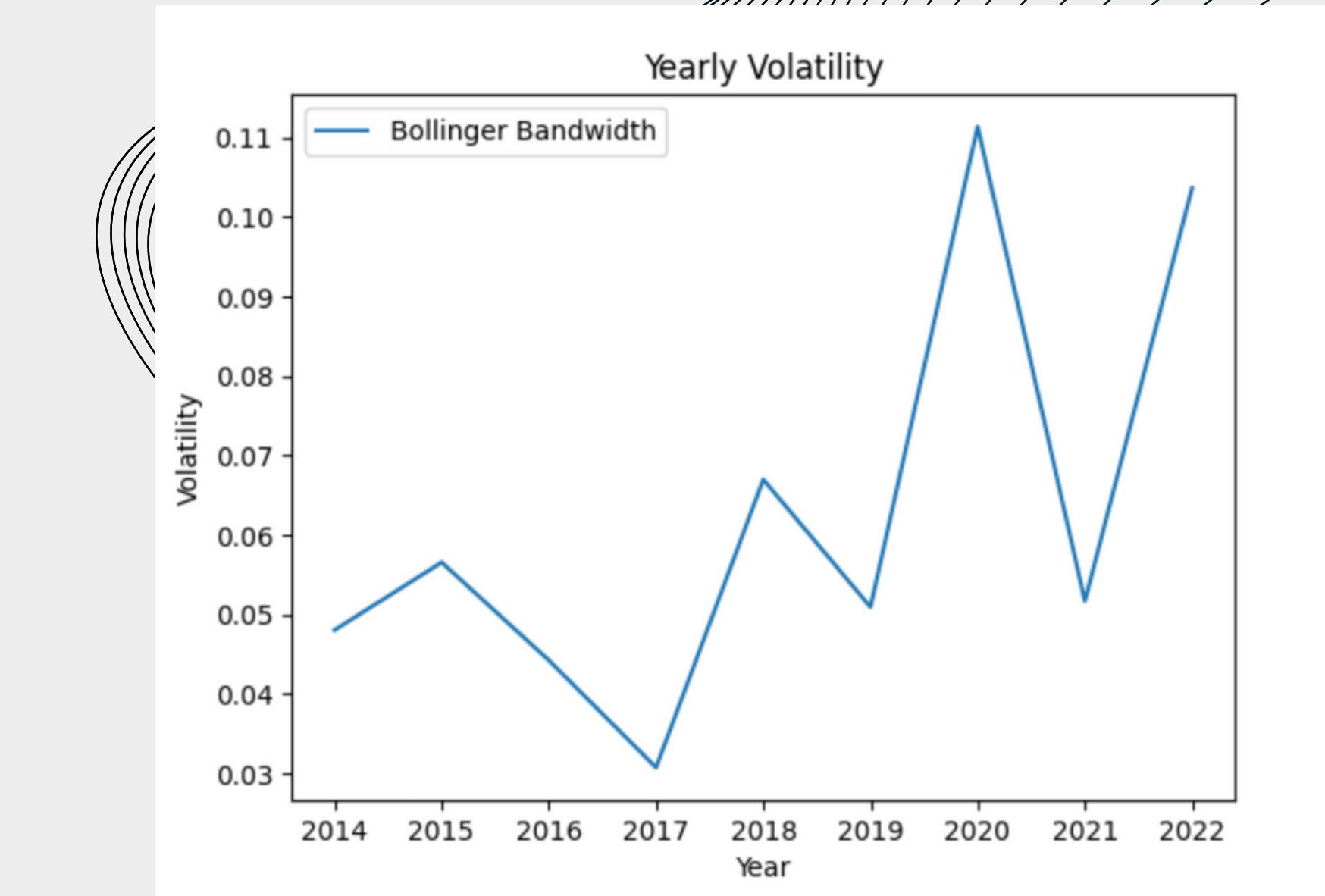
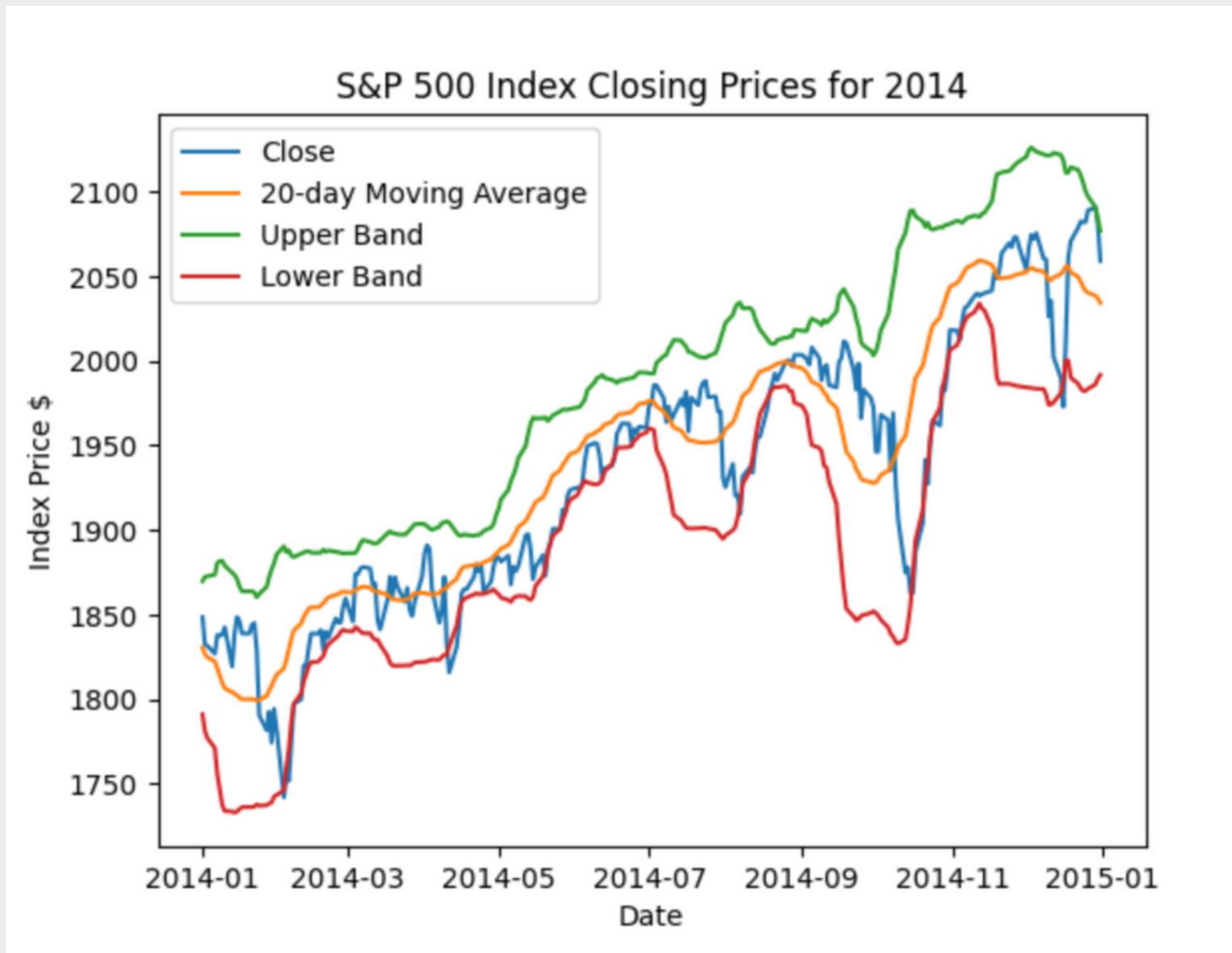
| OLS Regression Results                                |                  |                     |          |       |        |        |  |
|---|------------------|---------------------|----------|-------|--------|--------|--|
| Dep. Variable:  | Life Ladder      | R-squared:          | 0.809    |       |        |        |  |
| Model:  | OLS              | Adj. R-squared:     | 0.807    |       |        |        |  |
| Method:   | Least Squares    | F-statistic:        | 447.8    |       |        |        |  |
| Date:   | Mon, 17 Apr 2023 | Prob (F-statistic): | 0.00     |       |        |        |  |
| Time:   | 18:46:37         | Log-Likelihood:     | -1473.3  |       |        |        |  |
| No. Observations:                                     | 2032             | AIC:                | 2987.    |       |        |        |  |
| Df Residuals:   | 2012             | BIC:                | 3099.    |       |        |        |  |
| Df Model:   | 19               |                     |          |       |        |        |  |
| Covariance Type:                                      | nonrobust        |                     |          |       |        |        |  |
|   | coef             | std err             | t        | P> t  | [0.025 | 0.975] |  |
| const   | 7.5416           | 5.355               | 1.408    | 0.159 | -2.961 | 18.044 |  |
| Year  | -0.0041          | 0.003               | -1.528   | 0.127 | -0.009 | 0.001  |  |
| Log GDP Per Capita                                    | 0.3396           | 0.022               | 15.399   | 0.000 | 0.296  | 0.383  |  |
| Social Support  | 1.4351           | 0.157               | 9.164    | 0.000 | 1.128  | 1.742  |  |
| Healthy Life Expectancy At Birth                      | 0.0130           | 0.004               | 3.681    | 0.000 | 0.006  | 0.020  |  |
| Freedom To Make Life Choices                          | 0.9104           | 0.132               | 6.918    | 0.000 | 0.652  | 1.168  |  |
| Generosity  | 0.4681           | 0.089               | 5.277    | 0.000 | 0.294  | 0.642  |  |
| Perceptions Of Corruption                             | -0.6402          | 0.094               | -6.794   | 0.000 | -0.825 | -0.455 |  |
| Positive Affect                                       | 1.7555           | 0.197               | 8.919    | 0.000 | 1.369  | 2.142  |  |
| Negative Affect                                       | -0.5233          | 0.180               | -2.912   | 0.004 | -0.876 | -0.171 |  |
| Confidence In National Government                     | -0.3465          | 0.094               | -3.698   | 0.000 | -0.530 | -0.163 |  |
| Regional Indicator_Commonwealth of Independent States | -0.0003          | 0.055               | -0.006   | 0.995 | -0.108 | 0.108  |  |
| Regional Indicator_East Asia                          | -0.0853          | 0.073               | -1.174   | 0.240 | -0.228 | 0.057  |  |
| Regional Indicator_Latin America and Caribbean        | 0.2541           | 0.057               | 4.439    | 0.000 | 0.142  | 0.366  |  |
| Regional Indicator_Middle East and North Africa       | 0.0185           | 0.057               | 0.326    | 0.745 | -0.093 | 0.130  |  |
| Regional Indicator_North America and ANZ              | 0.3835           | 0.083               | 4.616    | 0.000 | 0.221  | 0.546  |  |
| Regional Indicator_South Asia                         | -0.0693          | 0.073               | -0.947   | 0.344 | -0.213 | 0.074  |  |
| Regional Indicator_Southeast Asia                     | -0.3098          | 0.070               | -4.423   | 0.000 | -0.447 | -0.172 |  |
| Regional Indicator_Sub-Saharan Africa                 | -0.2978          | 0.068               | -4.404   | 0.000 | -0.430 | -0.165 |  |
| Regional Indicator_Western Europe                     | 0.3018           | 0.053               | 5.666    | 0.000 | 0.197  | 0.406  |  |
| Omnibus:  | 44.594           | Durbin-Watson:      | 0.648    |       |        |        |  |
| Prob(Omnibus):  | 0.000            | Jarque-Bera (JB):   | 74.915   |       |        |        |  |
| Skew:   | -0.181           | Prob(JB):           | 5.40e-17 |       |        |        |  |
| Kurtosis:   | 3.868            | Cond. No.           | 9.69e+05 |       |        |        |  |

## Notes:

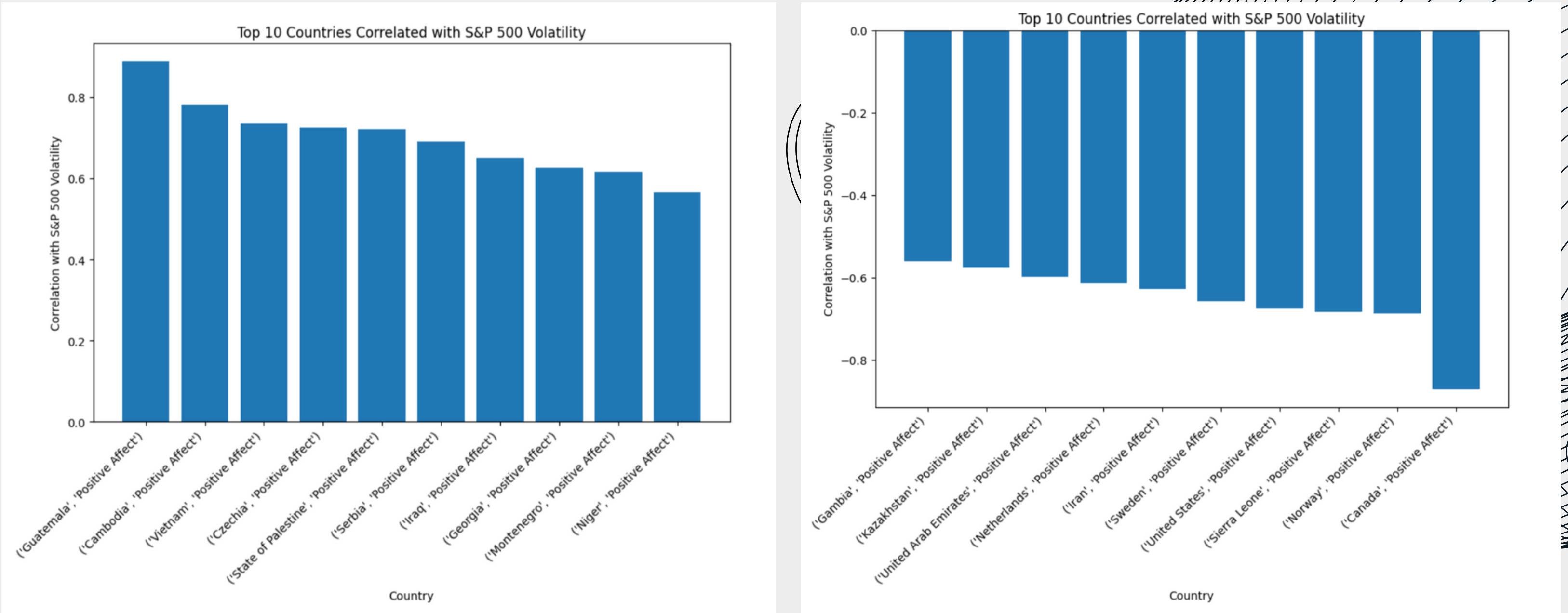
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

[2] The condition number is large, 9.69e+05. This might indicate that there are strong multicollinearity or other numerical problems.

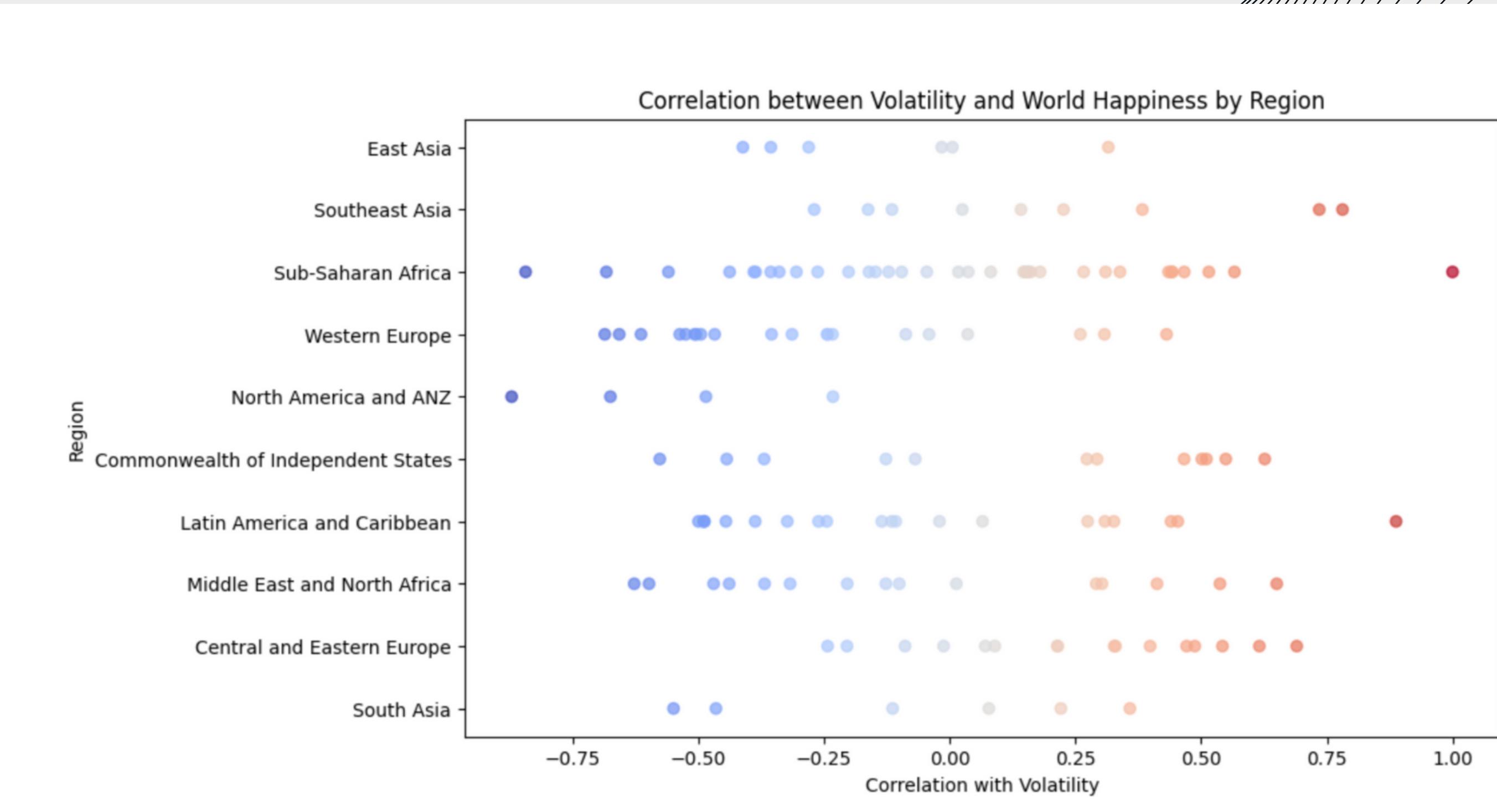
# What happens when we bring in the S&P 500 data?



# Happy or Sad when S&P 500 is Volatile



# Regional Relationship with Affect & the S&P 500?



# Conclusions

- North America and Western Europe have higher happiness scores compared to other regions.
- Denmark, Finland and Norway tend to have higher happiness scores than other countries.
- Log GDP per capita, Social support and Healthy life expectancy are strongly correlated with happiness score.
- Generosity and perceptions of corruption are weakly correlated with happiness score.
- There are explainable economic ties with specific countries' affect and the S&P 500, but no regional trends

# Thank You