Alistair Tan


```
libname mydata "/courses/d1406ae5ba27fe300" access=readonly;
data new; set mydata.gapminder;
LABEL   INCOMEPERPERSON= "Real GDP Per Capita (US Dollar)"
                OILPERPERSON= "Oil Consumption Per Person (Tonnes per year per person)"
                CO2EMISSIONS= "Cumulative CO2 Emissions (metric tons)";
IF INCOMEPERPERSON= 0 THEN INCOMEPERSON=.;
IF OILPERPERSON= 0 THEN OILPERPERSON=.;
IF CO2EMISSIONS= 0 THEN CO2EMISSIONS=.;

/*DATA MANAGEMENT FOR INCOMEPERPERSON*/
IF INCOMEPERPERSON <= 736.27 THEN INCOMEPERPERSON= 1;
IF INCOMEPERPERSON > 736.27 AND INCOMEPERPERSON <= 2549.55 THEN INCOMEPERPERSON= 2;
IF INCOMEPERPERSON > 2549.55 AND INCOMEPERPERSON <= 9425.32 THEN INCOMEPERPERSON= 3;
IF INCOMEPERPERSON > 9425.32 THEN INCOMEPERPERSON= 4;

/*DATA MANAGEMENT FOR OILPERPERSON*/
IF OILPERPERSON <= 0.4474792661 THEN OILPERPERSON= 1;
IF OILPERPERSON > 0.4474792661 AND OILPERPERSON <= 0.8767783352 THEN OILPERPERSON= 2;
IF OILPERPERSON > 0.8767783352 AND OILPERPERSON < 1.6168591225 THEN OILPERPERSON= 3;

/* DATA MANAGEMENT FOR CO2EMISSIONS*/
IF CO2EMISSIONS <= 30800000 THEN CO2EMISSIONS= 1;
IF CO2EMISSIONS > 30800000 AND CO2EMISSIONS <= 170804333.3 THEN CO2EMISSIONS= 2;
IF CO2EMISSIONS > 170804333.3 AND CO2EMISSIONS <= 1776016000 THEN CO2EMISSIONS= 3;
IF CO2EMISSIONS > 1776016000 THEN CO2EMISSIONS= 4;
PROC SORT; BY COUNTRY;
proc freq; tables incomeperperson oilperperson co2emissions country;
run;
```

The FREQ Procedure

Real GDP Per Capita (US Dollar)				
incomeperperson	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	70	32.86	70	32.86
2	47	22.07	117	54.93
3	48	22.54	165	77.46
4	48	22.54	213	100.00

Oil Consumption Per Person (Tonnes per year per person)				
oilperperson	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1.6286148868	1	0.47	1	0.47
1.7002617508	1	0.47	2	0.94
1.9130261091	1	0.47	3	1.41
1.9386542682	1	0.47	4	1.88
2	15	7.04	19	8.92
2.006514658	1	0.47	20	9.39
2.0878480106	1	0.47	21	9.86

2.1912260442	1	0.47	22	10.33
2.2826554059	1	0.47	23	10.80
2.7385436827	1	0.47	24	11.27
2.9976546061	1	0.47	25	11.74
3	182	85.45	207	97.18
3.0073558513	1	0.47	208	97.65
4.2074308915	1	0.47	209	98.12
4.2999644554	1	0.47	210	98.59
4.5722678077	1	0.47	211	99.06
6.4675678875	1	0.47	212	99.53
12.228644991	1	0.47	213	100.00

Cumulative CO2 Emissions (metric tons)				
co2emissions	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	62	29.11	62	29.11
2	49	23.00	111	52.11
3	51	23.94	162	76.06
4	51	23.94	213	100.00

The three variables I selected had missing data with some countries not able to provide comprehensive data or Gapminder was unable to obtain the data. I managed my data to ensure that if the country did not have a response to the variable it will not be recorded. Hence, there are no missing entries that have been included in the results.

I collapsed the responses for Incomeperperson, Oilperperson and CO2Emissions and aggregated the three variables based on the quartile each country belonged to.

For Real GDP Per Capita, most countries belonged to the 1st quartile where INCOMEPERPERSON <= 736.27. This result meant that the majority of the countries in the world has a Real GDP Per Capita below $736.27.

For Cumulative CO2 Emissions, the distribution between the recorded responses was fairly even. From the results, 62 countries belonged to the lowest quartile of CO2 emitters.

May 6th, 2016

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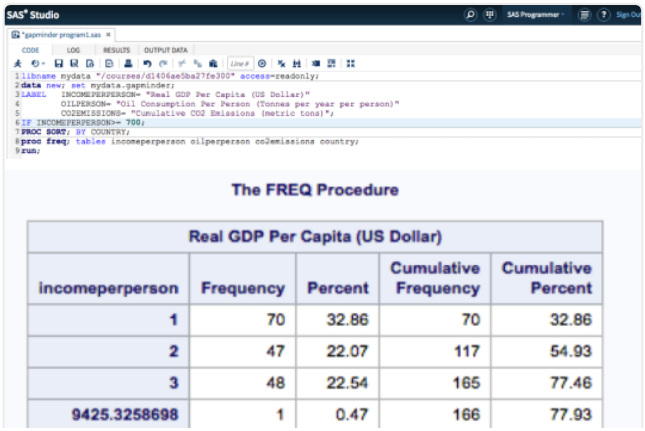

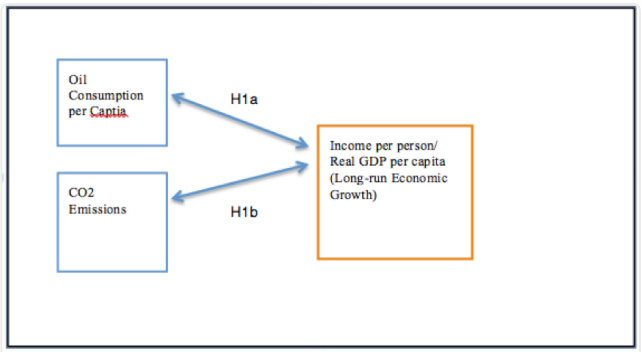

Data Management and Visualisation - Assignment 1

10480.817203	1	0.47	167	78.40
10749.419238	1	0.47	168	78.87
11066.784145	1	0.47	169	79.34
11191.811007	1	0.47	170	79.81
11744.834167	1	0.47	171	80.28
11894.464075	1	0.47	172	80.75
12505.212545	1	0.47	173	81.22
12729.4544	1	0.47	174	81.69
13577.879885	1	0.47	175	82.16
14778.163929	1	0.47	176	82.63
15313.859347	1	0.47	177	83.10
15461.758372	1	0.47	178	83.57
15822.112141	1	0.47	179	84.04
16372.499781	1	0.47	180	84.51
17092.460004	1	0.47	181	84.98
18982.269285	1	0.47	182	85.45
19630.540547	1	0.47	183	85.92
20751.893424	1	0.47	184	86.38
21087.394125	1	0.47	185	86.85
21943.339898	1	0.47	186	87.32
22275.751661	1	0.47	187	87.79
22878.466567	1	0.47	188	88.26
24496.048264	1	0.47	189	88.73
25249.986061	1	0.47	190	89.20

18982.269285	1	0.47	182	85.45
19630.540547	1	0.47	183	85.92
20751.893424	1	0.47	184	86.38
21087.394125	1	0.47	185	86.85
21943.339898	1	0.47	186	87.32
22275.751661	1	0.47	187	87.79
22878.466567	1	0.47	188	88.26
24496.048264	1	0.47	189	88.73
25249.986061	1	0.47	190	89.20
25306.187193	1	0.47	191	89.67
25575.352623	1	0.47	192	90.14
26551.844238	1	0.47	193	90.61
26692.984107	1	0.47	194	91.08
27110.731591	1	0.47	195	91.55
27595.091347	1	0.47	196	92.02
28033.489283	1	0.47	197	92.49
30532.277044	1	0.47	198	92.96
31993.200694	1	0.47	199	93.43
32292.482984	1	0.47	200	93.90
32535.832512	1	0.47	201	94.37
33923.313868	1	0.47	202	94.84
33931.832079	1	0.47	203	95.31
33945.314422	1	0.47	204	95.77

H1a: There is a positive relationship between Oil Consumption per Capita and Income per person

H1b: There is a positive relationship between CO2 emissions and Income per person

I have reviewed the various codebooks and have found the Gapminder codebook to be insightful and useful.

The global economy today is faced with major trends impacting businesses and communities, from the emergence and shift of global economic powers, disruption of technology and limited scarce resources.

I am personally interested in sustainable practices and how businesses of today need to align business strategies with sustainability. The work that Gapminder is doing to promote global sustainable development by increasing the use and understanding of statistics about economic, social and environmental development at local, national, and global levels is commendable and greatly needed.

The statistics collected can be used to help governments and businesses understand the impact of the triple bottom line factors and how to align business strategies with sustainable practices.

35536.072471	1	0.47	205	96.24
37491.179523	1	0.47	206	96.71
37662.75125	1	0.47	207	97.18
39309.478859	1	0.47	208	97.65
39972.352768	1	0.47	209	98.12
52301.587179	1	0.47	210	98.59
62682.147006	1	0.47	211	99.06
81647.100031	1	0.47	212	99.53
105147.4377	1	0.47	213	100.00

Oil Consumption Per Person (Tonnes per year per person)

oilperperson	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0.0322814662	1	1.59	1	1.59
0.1180920595	1	1.59	2	3.17
0.1269787524	1	1.59	3	4.76
0.1404663083	1	1.59	4	6.35
0.1821845251	1	1.59	5	7.94
0.237607469	1	1.59	6	9.52
0.2484669506	1	1.59	7	11.11
0.2552349064	1	1.59	8	12.70
0.2888929731	1	1.59	9	14.29
0.319532369	1	1.59	10	15.87
0.35917261	1	1.59	11	17.46
0.3944891108	1	1.59	12	19.05
0.4200945252	1	1.59	13	20.63
0.423524289	1	1.59	14	22.22
0.4474792661	1	1.59	15	23.81
0.5046594529	1	1.59	16	25.40
0.5604235307	1	1.59	17	26.98
0.5996517885	1	1.59	18	28.57
0.635943801	1	1.59	19	30.16
0.6710975801	1	1.59	20	31.75
0.6773927847	1	1.59	21	33.33
0.6871027932	1	1.59	22	34.92
0.6878280797	1	1.59	23	36.51
0.7262496753	1	1.59	24	38.10
0.732816541	1	1.59	25	39.68
0.7705665037	1	1.59	26	41.27
0.779964667	1	1.59	27	42.86
0.8123694379	1	1.59	28	44.44
0.8589615517	1	1.59	29	46.03

Search Terms:

a) Sustainable business practices

b) Oil Consumption per Capita

c) The impact of economic growth on energy consumption

d) CO2 emissions

Research Question: Is the Income per person (Real GDP per capita) associated with the level of Oil consumption per person?

1st Topic: Relationship between income per person and the oil consumption per person

Variable Name:

1. Income per person

2. Oil per person

2nd Topic: Relationship between economic growth (Real GDP) and the consumption of oil and CO2 emissions

1.1106714703	1	1.59	33	52.38
1.1625764479	1	1.59	34	53.97
1.1802646266	1	1.59	35	55.56
1.1880280942	1	1.59	36	57.14
1.2072498142	1	1.59	37	58.73
1.2146367734	1	1.59	38	60.32
1.328291411	1	1.59	39	61.90
1.3985000328	1	1.59	40	63.49
1.4874121872	1	1.59	41	65.08
1.5458938022	1	1.59	42	66.67
1.5487909661	1	1.59	43	68.25
1.5675274615	1	1.59	44	69.84
1.5796211473	1	1.59	45	71.43
1.5932234894	1	1.59	46	73.02
1.6168591225	1	1.59	47	74.60
1.6286148868	1	1.59	48	76.19
1.7002617508	1	1.59	49	77.78
1.9130261091	1	1.59	50	79.37
1.9386542682	1	1.59	51	80.95
2.006514658	1	1.59	52	82.54
2.0878480106	1	1.59	53	84.13
2.1912260442	1	1.59	54	85.71
2.2826554059	1	1.59	55	87.30
2.7385436827	1	1.59	56	88.89
2.9976546061	1	1.59	57	90.48
3.0073558513	1	1.59	58	92.06
4.2074308915	1	1.59	59	93.65
4.2999644554	1	1.59	60	95.24
4.5722678077	1	1.59	61	96.83
6.4675678875	1	1.59	62	98.41
12.228644991	1	1.59	63	100.00
Frequency Missing = 150				

Cumulative CO2 Emissions (metric tons)				
co2emissions	Frequency	Percent	Cumulative Frequency	Cumulative Percent
132000	1	0.50	1	0.50
850666.66667	1	0.50	2	1.00
1045000	1	0.50	3	1.50
1111000	1	0.50	4	2.00
1206333.3333	1	0.50	5	2.50
1723333.3333	1	0.50	6	3.00
2251333.3333	1	0.50	7	3.50

3rd Topic: Relationship between urbanisation and depletion of resources

Questions:

1. Is the rate of economic growth a major factor causing the increase in the consumption of oil and CO2 emissions?

2. Is urbanisation of countries driving our global resources to an unsustainable level?

3. Has economic globalization and rapid development of emering countries such as BRICS been a major contributor to CO2 emissions?

Literature Review:

Major global trends are impacting the global economy and the sustainability of our business practices. These trends include the demographic and social change, the shift in economic global powers, rapid urbanisation, climate change and resource scarcity and the advent of technological breakthroughs (PricewaterhouseCoopers, 2015). These trends relate closely to

2335666.6667	1	0.50	8	4.00
2368666.6667	1	0.50	9	4.50
2401666.6667	1	0.50	10	5.00
2907666.6667	1	0.50	11	5.50
2977333.3333	1	0.50	12	6.00
3659333.3333	1	0.50	13	6.50
4352333.3333	1	0.50	14	7.00
4774000	1	0.50	15	7.50
4814333.3333	1	0.50	16	8.00
5210333.3333	1	0.50	17	8.50
5214000	1	0.50	18	9.00
6024333.3333	1	0.50	19	9.50
7315000	1	0.50	20	10.00
7355333.3333	1	0.50	21	10.50
7388333.3333	1	0.50	22	11.00
7601000	1	0.50	23	11.50
7608333.3333	1	0.50	24	12.00
7813666.6667	1	0.50	25	12.50
8092333.3333	1	0.50	26	13.00
8231666.6667	1	0.50	27	13.50
8338000	1	0.50	28	14.00
8968666.6667	1	0.50	29	14.50
9155666.6667	1	0.50	30	15.00
4286590000	1	0.50	170	85.00
4466084333.3	1	0.50	171	85.50
5248815000	1	0.50	172	86.00
5418886000	1	0.50	173	86.50
5584766000	1	0.50	174	87.00
5675629666.7	1	0.50	175	87.50
5872119000	1	0.50	176	88.00
5896388666.7	1	0.50	177	88.50
6710201666.7	1	0.50	178	89.00
7104137333.3	1	0.50	179	89.50
7861553333.3	1	0.50	180	90.00
9183548000	1	0.50	181	90.50
9483023000	1	0.50	182	91.00
9580226333.3	1	0.50	183	91.50
9666891666.7	1	0.50	184	92.00
10822529667	1	0.50	185	92.50
10897025333	1	0.50	186	93.00
12970092667	1	0.50	187	93.50
13304503667	1	0.50	188	94.00

economic growth and globalization. When we refer to economic growth of a country, we are looking at the income per person or the Real GDP per capita. The rate of change in Real GDP is reflected in the long-run economic growth of a country (Hubbard, Garnett, & Lewis, 2013).

Lean & Smith (2009) examined the causal relationship between energy consumption and CO2 emissions for five ASEAN countries over a 26-year period. The findings revealed the positive relationship between the two variables. Alam & Paramati (2015) identified that economic growth had led to the increased consumption of energy with particular reference to CO2 emissions and the increased consumption of oil. There is further discussion that Greenhouse gases (GHG) such as CO2 emissions have increased significantly in tandem with a country's Real GDP (Lim, Lim, & Yoo, 2014). A study done in China using a neoclassical aggregate production model found a bidirectional relationship

14609848000	1	0.50	189	94.50
19000454000	1	0.50	190	95.00
23053598333	1	0.50	191	95.50
23404568000	1	0.50	192	96.00
24979045667	1	0.50	193	96.50
30391317000	1	0.50	194	97.00
33341634333	1	0.50	195	97.50
41229554667	1	0.50	196	98.00
46092214667	1	0.50	197	98.50
72524250333	1	0.50	198	99.00
101386215333	1	0.50	199	99.50
334220872333	1	0.50	200	100.00
Frequency Missing = 13				

I have decided to narrow down my study of countries
to emerging/developing nations such as the BRIC group of countries. BRIC consists of Brazil, Russia, India and China.

Based on the Gapminder data codebook, among the BRIC countries, India had the lowest Real GDP per capita of US$786.7 dollars. I chose to streamline the sample size to include countries that fall within the 1st quartile and 3rd quartile..

A random sample of 213 countries were analysed to understand if a relationship among the following variables, income per person, oil consumption and CO2 emissions existed.

existing between oil consumption and Real GDP (Yuan, Kang, Zhao, & Hu, 2008).

Al-Mulali (2011) explained the effect of oil consumption on CO2 emissions while considering economic growth in Middle Eastern and North African (MENA) countries. Al-Mulali (2011) identified a bi-directional causality among the three variables, however the findings cannot be generalised as the study focused on a particular region and is not a representation of the global population.

Regardless of economic growth and development phase, countries will need to consider the feasibility of pursuing sustainable economic growth while moderating the increasing levels of CO2 emissions and oil consumption.

The results revealed that out of the 213 countries in the gapminder data,

a) The countries that fall within the 1st quartile and 3rd quartile for Income per person is quite equal each making up approximately 32% individually.

b) 150 countries had no data collected with regards to oil consumption per person

c) 13 countries had no data collected with regards to CO2 emissions.

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