

What personal trait is related with wealth accumulation?

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```
knitr::opts_chunk$set(echo = TRUE)
knitr::opts_chunk$set(tidy.opts=list(width.cutoff=60), tidy=TRUE)
```

What Personal Trait Is Related With Wealth Accumulation?

1. Introduction & literature review

The personal traits' relationship with wealth accumulation

Understanding wealth accumulation's influence factor is important. The wealth management corporations can use these knowledge to advise individuals to learn, train and make better finance decisions. The current financial planning and advising focus mainly about individual's risk-appetite, while other actions may be as well important for financial activities. (Fenton-O'Creevy & Furnham, 2022) Consequently, beside some social-economic factors, it's helpful for these advisors to understand the individual traits of people who accumulates more wealth. I will focus on two factors, financial capabilities and financial knowledge, as well as other demographical factors in its relation to personal wealth accumulation in this analysis.

Factors influencing wealth accumulation

Past studies show that there're may be many factors influencing wealth accumulation. Social/demographical factors includes income(positive); age(positive); gender(being female is negative); education(positive) (Fenton-O'Creevy & Furnham, 2022)

Personal traits also influence wealth accumulation. In a study that uses this dataset, the author analyze the dataset and find that financial capabilities of planning ahead shows the strongest positive associations, and the money attitude of seeing money as security has the strongest positive association.(Fenton-O'Creevy & Furnham, 2022) What's more, personalities of extroversion and conscientiousness is positively associated with wealth, while agreeableness is negatively associated with wealth, based on big 5 factors of personality traits.(Nabeshima & Seay, 2015)

The dataset and relevant findings

The dataset is gathered by an social survey conducted by BBC called "Big Money Test" on 2011, the data is restored at UK Data Service. (Fenton-O'Creevy,M., Furnham, A. ,2017) There're Three essays that used this dataset. They focus on following causal relationships.

One study find that the impulsive buying behavior is related with those who have not enough emotion regulation strategies.(Fenton-O'Creevy et al., 2018) Other research shows that adverse financial outcomes is associated with financial capabilities, money attitudes and socio-economic status;(Von Stumm et al.,

2013)and that there're difference by sex in money pathology(money sanity) that female exhibit more money pathology(pathological money attitudes) than males. Female score more in regarding money as love, and male score more in regarding money as power, security and freedom. (Furnham et al., 2015)

2. Methods and Sample

Method intended to be used in the essay

This analysis is intended to use several demographical variables and variables describing a person's financial knowledge and financial capabilities to predict a individual's potential in wealth accumulation.

This analysis will be about exploratory analysis of the data. The statistical methods will include descriptive data analysis, correlation analysis, simple linear regression. Further data analysis may include multivariate regression.

The graphical methods will include visualization of descriptive data analysis including scatter plot, bar plot, histogram and boxplot. Visualization of correlation includes plotting of correlation coefficients. There're also diagnostic plots for regression.

The sample and data cleaning and wrangling process

The survey data is processed according to notes of the survey to transform answers of questions to variables. The original data contains various dimensions of personal traits including Demographic variables, Money sanity, emotion regulation, vigilant and avoidant responses to threat, financial knowledge, behavioral inhibition, impulsive buying, adverse financial life events, financial capabilities, etc.

My analysis chose some of these variables. Including the demographic variables(Age, Education, Annual Household Income, Political Orientation, Religiousness, Ethnicity, Gender), the personal trait variables (Financial Knowledge, Financial Capabilities (including Making Ends Meet, Keeping Track, Planning Ahead, Choosing Products, Staying Informed)), and the dependent variables(Level of Minimum Saving transformed into Minimum Value of Savings). The answer to the questions were processed to attain these variables. There're 109472 observations in total. I filtered those with dependent variable (Minimum value of Savings) being NA. After that there're 99636 observations. I then filled NAs in other variables by using the variables' mean.

The descriptive analysis of the variables are as follows.

Cleaning Data

```
library(tidyverse)

## -- Attaching packages ----- tidyverse 1.3.1 --

## v ggplot2 3.3.6     v purrr   0.3.4
## v tibble  3.1.8     v dplyr   1.0.6
## v tidyverse 1.1.3    v stringr 1.4.0
## v readr   2.1.2     v forcats 0.5.1

## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()   masks stats::lag()
```

```
library(haven) # read and write statistical software dataset files
library(corrplot) #correlation coefficient plotting
```

```
## Warning: package 'corrplot' was built under R version 4.2.2
```

```
## corrplot 0.92 loaded
```

```
library(corrgram) #correlation coefficient plotting
```

```
## Warning: package 'corrgram' was built under R version 4.2.2
```

```
library(ppcor) # calculate parital correlation
```

```
## Warning: package 'ppcor' was built under R version 4.2.2
```

```
## Loading required package: MASS
```

```
##
```

```
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
```

```
##
```

```
##      select
```

```
library(car) # recoding data
```

```
## Loading required package: carData
```

```
##
```

```
## Attaching package: 'car'
```

```
## The following object is masked from 'package:dplyr':
```

```
##
```

```
##      recode
```

```
## The following object is masked from 'package:purrr':
```

```
##
```

```
##      some
```

```
#Disable scientific notation
```

```
options(scipen=100)
```

```
#Set system language as English
```

```
Sys.setenv(LANGUAGE="en")
```

```
#Read Data
```

```
setwd("C:/Users/starr/Desktop/HUDM 5026/Final/")
```

```
bbc<-read_dta("bbc_big_money_test_deposited_version.dta")
```

```

bbc<-as.data.frame(bbc)
bbc0 <- bbc %>% mutate(across(.cols=where(is.integer), .fns=as.numeric))

#Selecting Variables
bbc2<- bbc0[,c(237:239,220,2,6:7,242:243,8,222,226,229,232,236,195:201,241,11,19,20,208:209,210:213,216
bbctrty<- bbctrty %>% mutate(q159="wealth2", "Age", "q3", "q6", "PoliticOrient", "Religiousness", "FinancialKnowledge",
#datasets includes three parts, dependent variable, independent variable, dummy variable
##Personal wealth: the average level of three personal wealth variables, which can only be used after 195
##wealth 1/2/3: the minimum value of the person's level of certain wealth. Wealth less than 0 are regarded as 0
## We should choose wealth2, it is savings and financial investments
##Financial Capabilities: the sum of all related questions' level.

#Recoding data
bbctrty$q6<-car::recode(bbctrty$q6, "1=0;2=10000;3=20000;4=30000;5=40000;6=50000;7=75000;8=150000;else=NA")
#recode q6: the minimum of gross annual household income
bbctrtryt<- bbctrty %>% mutate(FinancialCapabilities=FCMakingEndsMeet+FCKeepingTrack+FCPlanningAhead+FCStayAtHome)
bbctrtryt<- as.data.frame(bbctrtryt[,c(1:13,16,14:15)])
bbctrty<-bbctrtryt
#ethnicity and female: categorial variables

#Rename Variables
bbctrty <- bbctrty %>% rename("SavingLevel"="q159", "MinSavings"="wealth2", "Income"="q6", "Education"="q3", "Age"="q159")

#Check for null value
sum(is.na(bbctrty$wealth2))

## [1] 0

#Filter and Filling NAs for analysis
na<-colSums(is.na(bbctrty))
bbctrty1<- bbctrty %>% filter(!is.na(MinSavings)) # filter: wealth2 level of not NA;
funm <- function(x) {
  x[is.na(x)] <- mean(x, na.rm = TRUE)
  x
}
bbctrtry2<- as.data.frame(mapply(funm,bbctrty1)) # use mean to fill the NAs in Income and Age
na2<-colSums(is.na(bbctrtry2))
bbctrtry2 <- bbctrtry2 %>% mutate(across(.cols=1:ncol(bbctrtry2), .fns=as.numeric)) #mutate, turn every variable into numeric

```

Descriptive Statistics

```

# Do summary statistics for variables
Mean<-mapply(mean,bbctrty,na.rm=TRUE)
Std.Deviation<-mapply(sd,bbctrty,na.rm=TRUE)
stat<-data.frame(Mean,Std.Deviation)
stat<- stat %>% mutate(Var=Std.Deviation^2)
n<- mapply(function(x){
  sum(!is.na(x)), bbctrty)
stat<-cbind(stat,n)
Mean<-mapply(mean,bbctrtry2,na.rm=TRUE)
Std.Deviation<-mapply(sd,bbctrtry2,na.rm=TRUE)
stat2<-data.frame(Mean,Std.Deviation)

```

```

stat2<- stat2 %>% mutate(Var=Std.Deviation^2)
n<- mapply(function(x){
  sum(!is.na(x))}, bbctry2)
stat2<-cbind(stat2,n)
Mean<-mapply(mean,bbctried,na.rm=TRUE)
Std.Deviation<-mapply(sd,bbctried,na.rm=TRUE)
stat3<-data.frame(Mean,Std.Deviation)
stat3<- stat3 %>% mutate(Var=Std.Deviation^2)
n<- mapply(function(x){
  sum(!is.na(x))}, bbctried)
stat3<-cbind(stat3,n)

```

Descriptive Statistics Before Filling and filtering NAs

```
stat
```

	Mean	Std.Deviation	Var	n
## SavingLevel	5.0779688	2.7734688	7.6921292	109454
## MinSavings	13073.2817456	18133.4020752	328820270.8218482	99636
## Age	39.5820459	13.7031804	187.7771544	109390
## Education	4.1514177	1.4853749	2.2063387	109472
## Income	33539.7274263	26033.4972586	677742979.5158561	101844
## PoliticOrient	5.2815971	1.7472137	3.0527556	109472
## Religiousness	3.3972888	2.5763725	6.6376951	109472
## FinancialKnowledge	6.1415613	1.4589323	2.1284836	109472
## FCMakingEndsMeet	16.8708346	3.4535026	11.9266801	109472
## FCKeepingTrack	14.7611170	3.0597243	9.3619129	109472
## FCPlanningAhead	15.2770297	4.0540775	16.4355447	109472
## FCChoosingProducts	16.8728807	3.0154802	9.0931206	109472
## FCS stayingInformed	15.5824868	3.6462788	13.2953489	109472
## FinancialCapabilities	79.3643489	11.6289355	135.2321398	109472
## Ethnicity	1.2717316	0.8453284	0.7145801	109472
## Gender	0.5325745	0.4989400	0.2489412	109472

Descriptive Statistics After Filling and filtering NAs

```
stat3
```

	Mean	Std.Deviation	Var	n
## SavingLevel	4.6250853	2.4782814	6.1418785	99636
## MinSavings	13073.2817456	18133.4020752	328820270.8218482	99636
## Age	39.5764429	13.5114102	182.5582065	99636
## Education	4.1886366	1.4683888	2.1561657	99636
## Income	34111.5920052	25492.6024612	649872780.2430937	99636
## PoliticOrient	5.2911197	1.7526694	3.0718501	99636
## Religiousness	3.3631820	2.5645007	6.5766638	99636
## FinancialKnowledge	6.1855655	1.4452490	2.0887447	99636
## FCMakingEndsMeet	16.8924786	3.4378233	11.8186292	99636
## FCKeepingTrack	14.7681762	3.0522710	9.3163580	99636
## FCPlanningAhead	15.3449255	4.0226026	16.1813313	99636
## FCChoosingProducts	16.9198884	2.9590920	8.7562257	99636
## FCS stayingInformed	15.6507186	3.5944673	12.9201953	99636

```

## FinancialCapabilities    79.5761873    11.4557957    131.2352553 99636
## Ethnicity                 1.2526095     0.8179319     0.6690126 99636
## Gender                     0.5246497     0.4993945     0.2493949 99636

```

3. Findings

Correlation

#Correlation Between variables

```

cormatrix<- bbctried %>% cor() %>% as.data.frame()
cormatrix

```

```

##                               SavingLevel   MinSavings      Age   Education
## SavingLevel             1.000000000  0.8236555049  0.40884915  0.1358997977
## MinSavings              0.823655505  1.0000000000  0.45356433  0.0965984160
## Age                      0.408849145  0.4535643278  1.00000000 -0.1463728880
## Education                0.135899798  0.0965984160 -0.14637289  1.0000000000
## Income                   0.292229639  0.2822226882  0.02915834  0.2624275072
## PoliticOrient            -0.090433113 -0.1014083169 -0.05992064  0.1241647469
## Religiousness            0.019780414  0.0005212714  0.06251723  0.0432469527
## FinancialKnowledge       0.198169034  0.1827561842  0.11937662  0.1736973890
## FCMakingEndsMeet         0.611216889  0.4231120498  0.23252789  0.1174396417
## FCKeepingTrack           -0.058855110 -0.0322138907  0.06594841 -0.1333849506
## FCPlanningAhead          0.770796023  0.5707905715  0.33779916  0.1590215502
## FCChoosingProducts       0.284776382  0.2310599429  0.18582725  0.1422760689
## FCStayingInformed        0.290767924  0.2607395680  0.20849963  0.1105929595
## FinancialCapabilities    0.603192959  0.4603146032  0.31938759  0.1269943198
## Ethnicity                 0.002808522 -0.0135574941 -0.09450796  0.0880803207
## Gender                     -0.156502744 -0.1639040955 -0.03945637 -0.0009141658
##                               Income   PoliticOrient Religiousness
## SavingLevel               0.292229639  -0.09043311  0.0197804135
## MinSavings                0.282222688  -0.10140832  0.0005212714
## Age                       0.029158338  -0.05992064  0.0625172291
## Education                  0.262427507  0.12416475  0.0432469527
## Income                     1.000000000  -0.08194191 -0.0168241613
## PoliticOrient              -0.081941913  1.00000000 -0.0588512634
## Religiousness              -0.016824161  -0.05885126  1.0000000000
## FinancialKnowledge        0.157567166  0.00636536 -0.0295949696
## FCMakingEndsMeet          0.204917849  -0.07419032 -0.0135827269
## FCKeepingTrack             -0.127598058  -0.05238877  0.0085239058
## FCPlanningAhead            0.297791965  -0.08839261  0.0222687548
## FCChoosingProducts        0.142580103  -0.03985246  0.0131134188
## FCStayingInformed         0.176874492  -0.09031780  0.0344630089
## FinancialCapabilities     0.224391524  -0.10589380  0.0202151455
## Ethnicity                  0.006626025  0.03385634  0.1541968439
## Gender                      -0.137107526  0.10674506  0.1103430294
##                               FinancialKnowledge FCMakingEndsMeet FCKeepingTrack
## SavingLevel                  0.19816903     0.61121689  -0.058855110
## MinSavings                   0.18275618     0.42311205  -0.032213891
## Age                          0.11937662     0.23252789  0.065948413
## Education                     0.17369739     0.11743964  -0.133384951

```

```

## Income          0.15756717  0.20491785 -0.127598058
## PoliticOrient  0.00636536 -0.07419032 -0.052388772
## Religiousness -0.02959497 -0.01358273  0.008523906
## FinancialKnowledge 1.00000000  0.17958831  0.010825904
## FCMakingEndsMeet 0.17958831  1.00000000  0.073224712
## FCKeepingTrack  0.01082590  0.07322471  1.000000000
## FCPlanningAhead 0.21909181  0.71830074 -0.008329678
## FCChoosingProducts 0.21581520  0.34834357  0.162453429
## FCStayingInformed 0.18660549  0.29287360  0.231757082
## FinancialCapabilities 0.24800723  0.75370309  0.400169104
## Ethnicity       -0.05218623 -0.03063487 -0.045533712
## Gender           -0.07312110 -0.12409025  0.032378234
## FCPublicPolicy   FCPublicPolicy FCChoosingProducts FCStayingInformed
## SavingLevel     0.770796023  0.28477638  0.290767924
## MinSavings      0.570790571  0.23105994  0.260739568
## Age              0.337799161  0.18582725  0.208499628
## Education        0.159021550  0.14227607  0.110592960
## Income           0.297791965  0.14258010  0.176874492
## PoliticOrient    -0.088392611 -0.03985246 -0.090317799
## Religiousness   0.022268755  0.01311342  0.034463009
## FinancialKnowledge 0.219091811 0.21581520  0.186605491
## FCMakingEndsMeet 0.718300740  0.34834357  0.292873600
## FCKeepingTrack   -0.008329678  0.16245343  0.231757082
## FCPlanningAhead  1.000000000  0.37664719  0.354165483
## FCChoosingProducts 0.376647188  1.00000000  0.446099919
## FCStayingInformed 0.354165483  0.44609992  1.000000000
## FinancialCapabilities 0.772896038  0.67835367  0.702999453
## Ethnicity         -0.028687738 -0.03440873  0.000682973
## Gender            -0.116998486 -0.03666389 -0.145080164
## FinancialCapabilities  FinancialCapabilities Ethnicity Gender
## SavingLevel      0.60319296  0.002808522 -0.1565027437
## MinSavings       0.46031460 -0.013557494 -0.1639040955
## Age              0.31938759 -0.094507962 -0.0394563728
## Education        0.12699432  0.088080321 -0.0009141658
## Income           0.22439152  0.006626025 -0.1371075265
## PoliticOrient    -0.10589380  0.033856343  0.1067450606
## Religiousness   0.02021515  0.154196844  0.1103430294
## FinancialKnowledge 0.24800723 -0.052186229 -0.0731211043
## FCMakingEndsMeet 0.75370309 -0.030634873 -0.1240902468
## FCKeepingTrack   0.40016910 -0.045533712  0.0323782340
## FCPlanningAhead  0.77289604 -0.028687738 -0.1169984862
## FCChoosingProducts 0.67835367 -0.034408731 -0.0366638853
## FCStayingInformed 0.70299945  0.000682973 -0.1450801639
## FinancialCapabilities 1.00000000 -0.040072428 -0.1246870463
## Ethnicity         -0.04007243  1.000000000 -0.0441277164
## Gender            -0.12468705 -0.044127716  1.00000000000

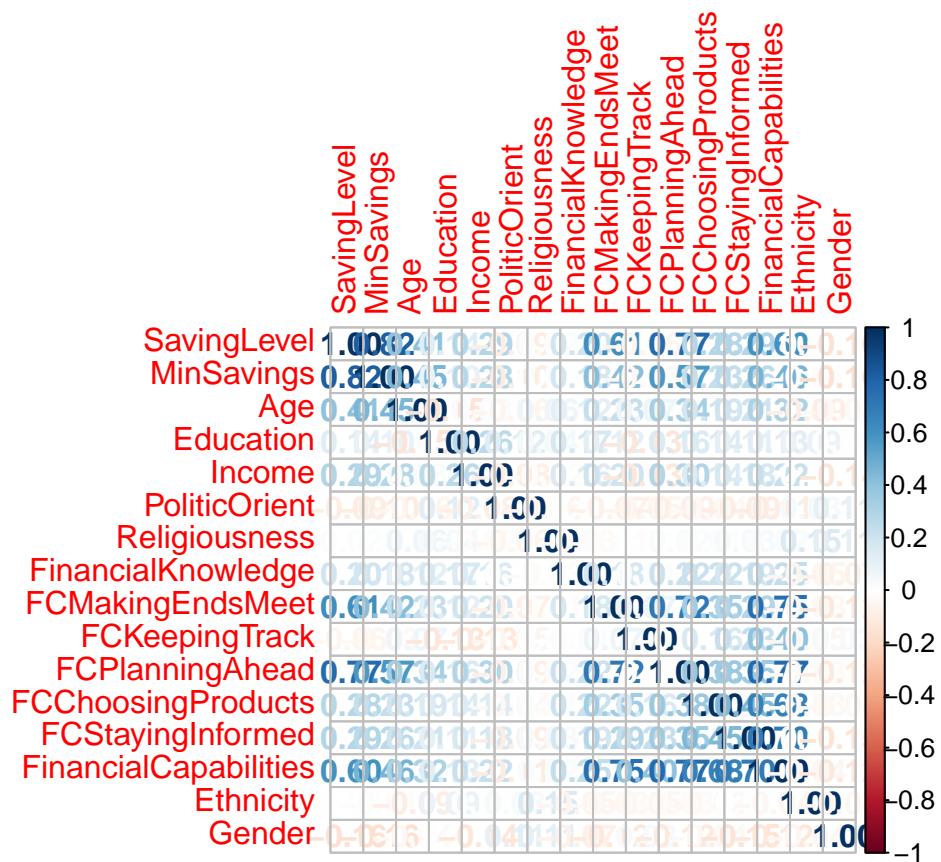
```

Visualization of Correlation

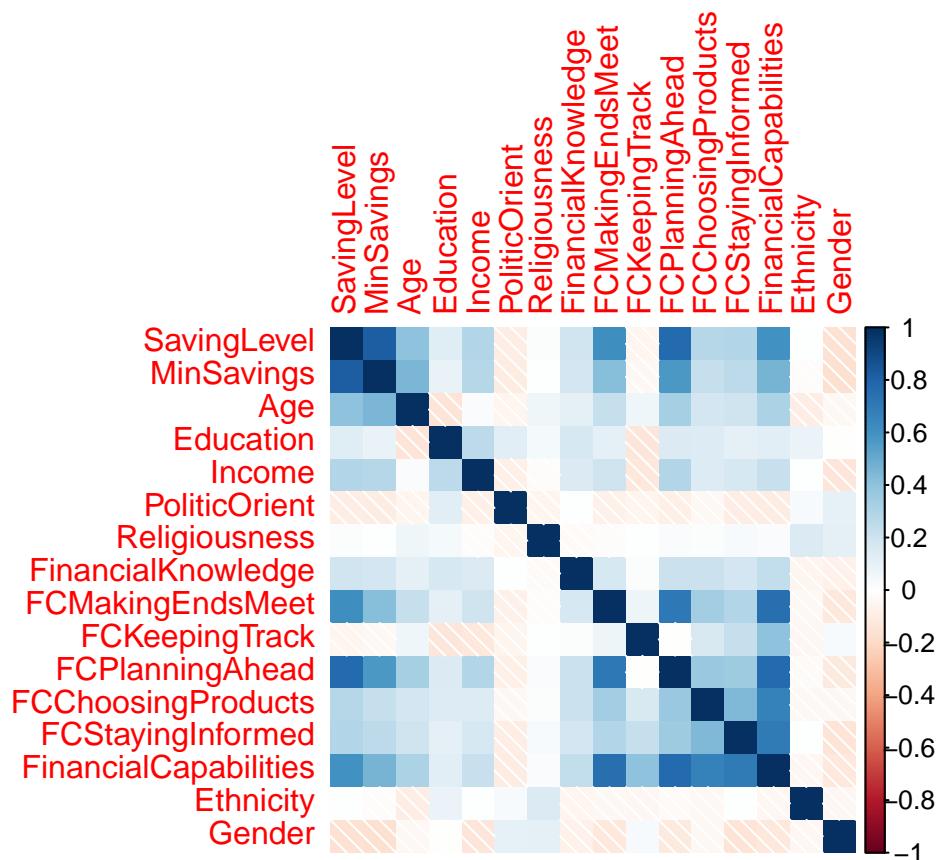
```

#Plotting Correlations
corrplot(cor(bbctrried),method="number")

```



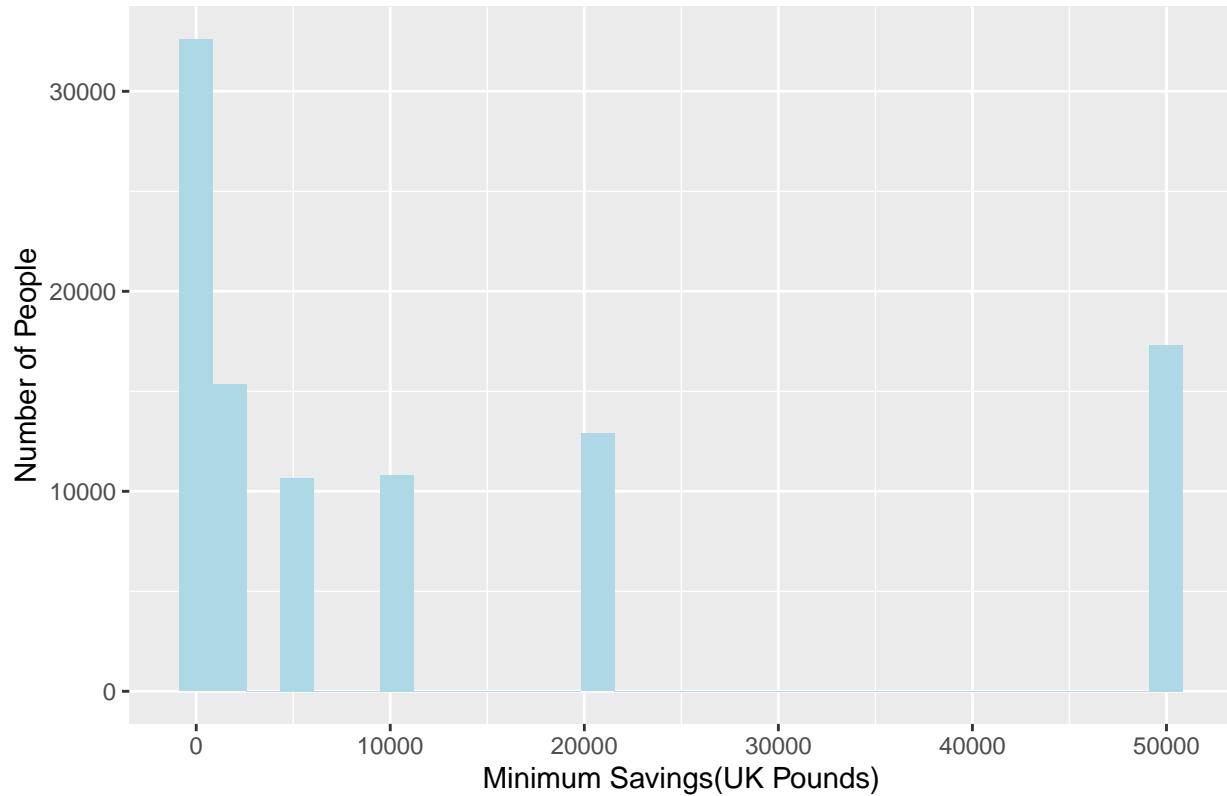
```
corrplot(cor(bbctried), method="shade")
```



Visualization of Variables and its Relations

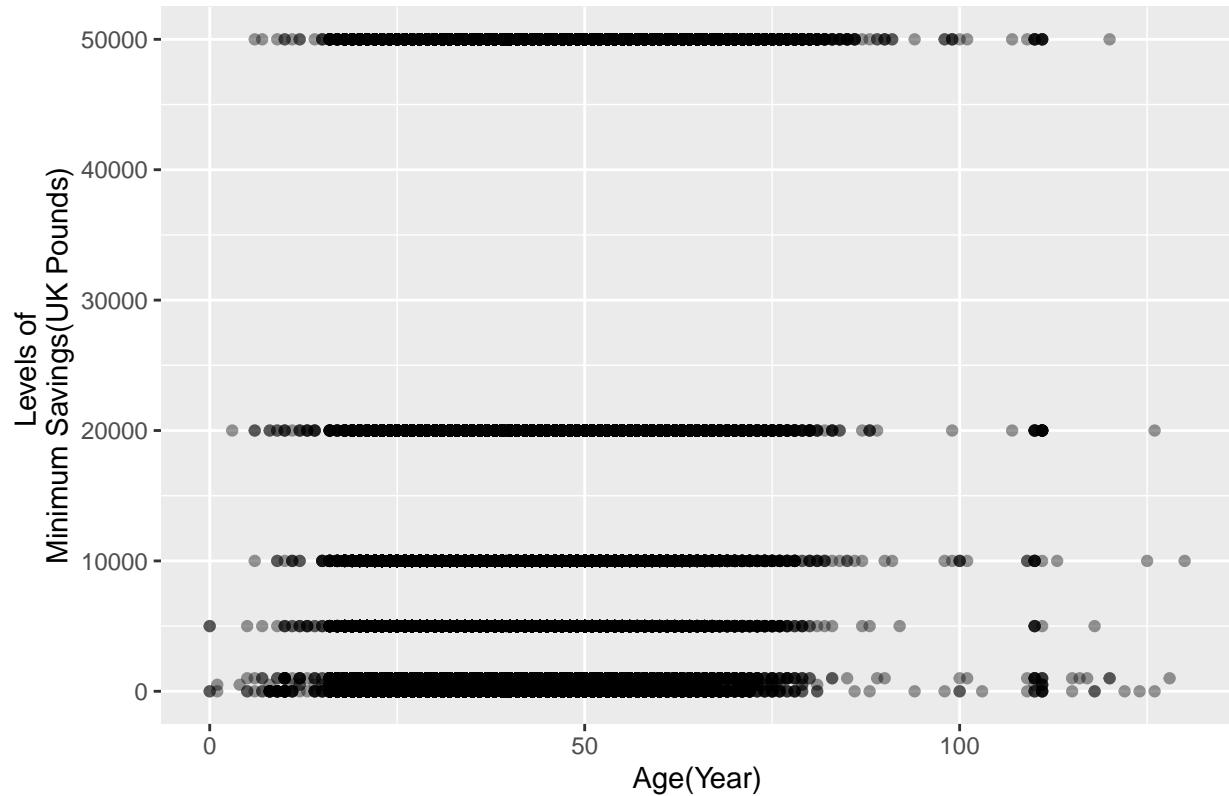
```
#build a histogram of MinSavings to show distribution of wealth in the sample
ggplot(data = bbctried) +
  geom_histogram(aes(x = c(MinSavings)), fill="lightblue") + xlab("Minimum Savings(UK Pounds)") + ylab("Number of Observations")
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

Levels of Minimum Savings(UK Pounds)



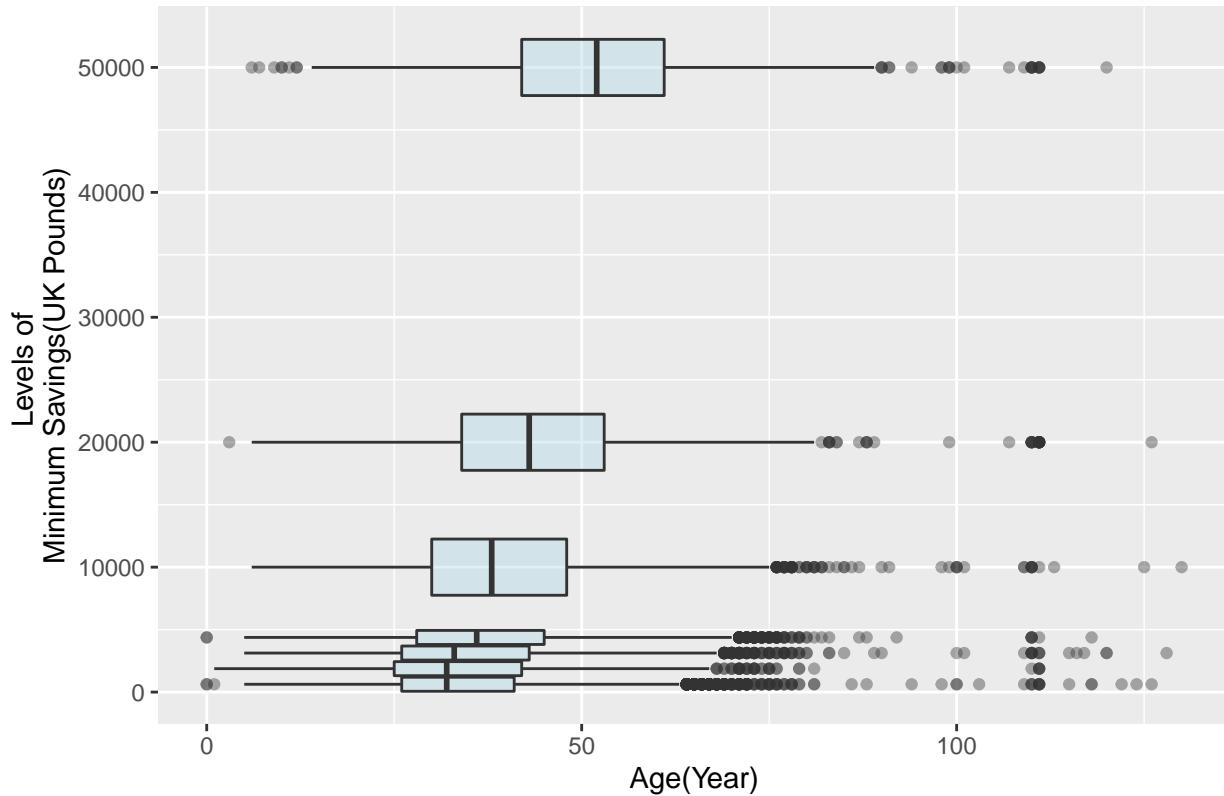
```
#build a scatterplot of Minsavings and age to see their correleations
# attach(bbctrried)
# detach(bbctrried)
ggplot(data = bbctrried, mapping = aes(x=Age, y =MinSavings)) +
  geom_point(alpha=0.4) +ylab("Levels of \nMinimum Savings(UK Pounds)")+xlab("Age(Year)") +ggtitle("Age
```

Age's Relation with Wealth Accumulation



```
#build a boxplot of Minsavings and age to show each groups in wealth and the average age and dispersion
ggplot(data = bbctried, mapping = aes(group = MinSavings, x=Age, y = MinSavings)) +
  geom_boxplot(width=5000,alpha=0.4,fill="lightblue") +ylab("Levels of \nMinimum Savings(UK Pounds)")+x
```

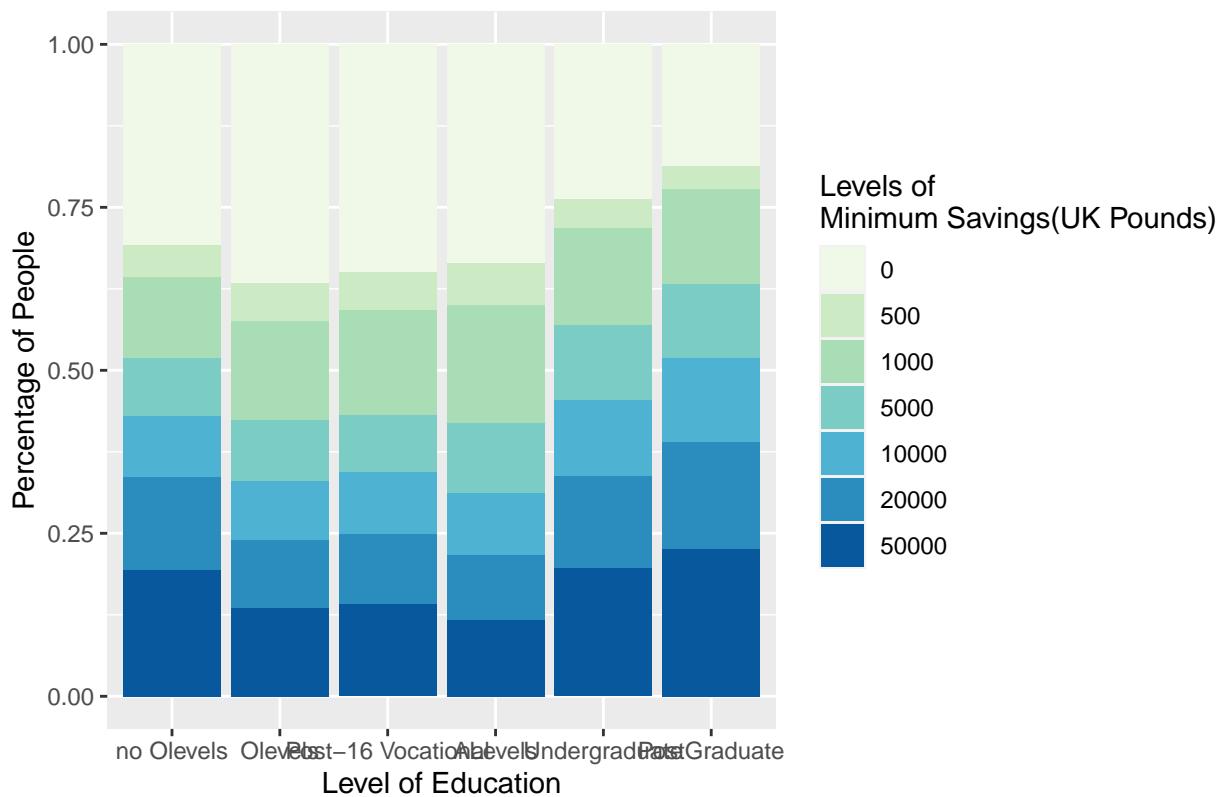
Age's Relation with Wealth Accumulation



```
#Draw a Barplot to show Education's Relation with Wealth Accumulation
```

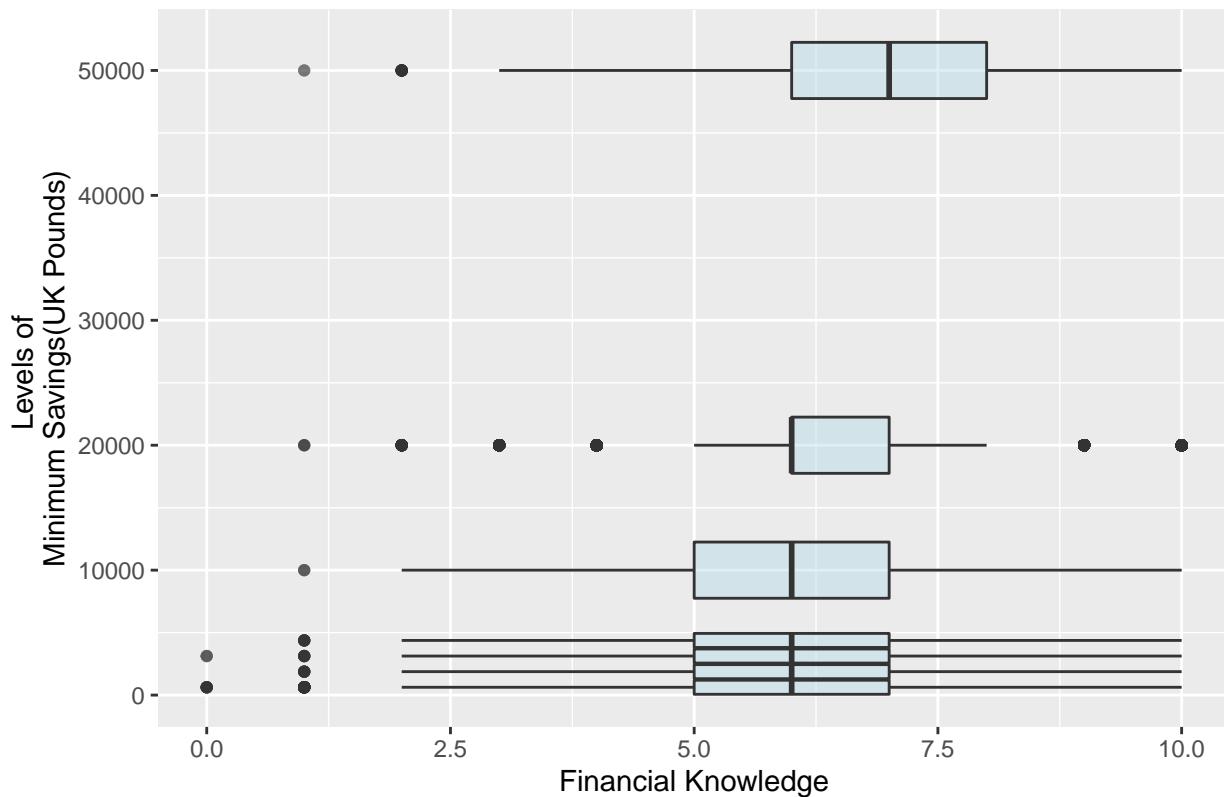
```
ggplot(data = bbctried, mapping = aes(x = Education %>%as_factor(), group=MinSavings %>%as_factor(), fill=
```

Education's Relation with Wealth Accumulation



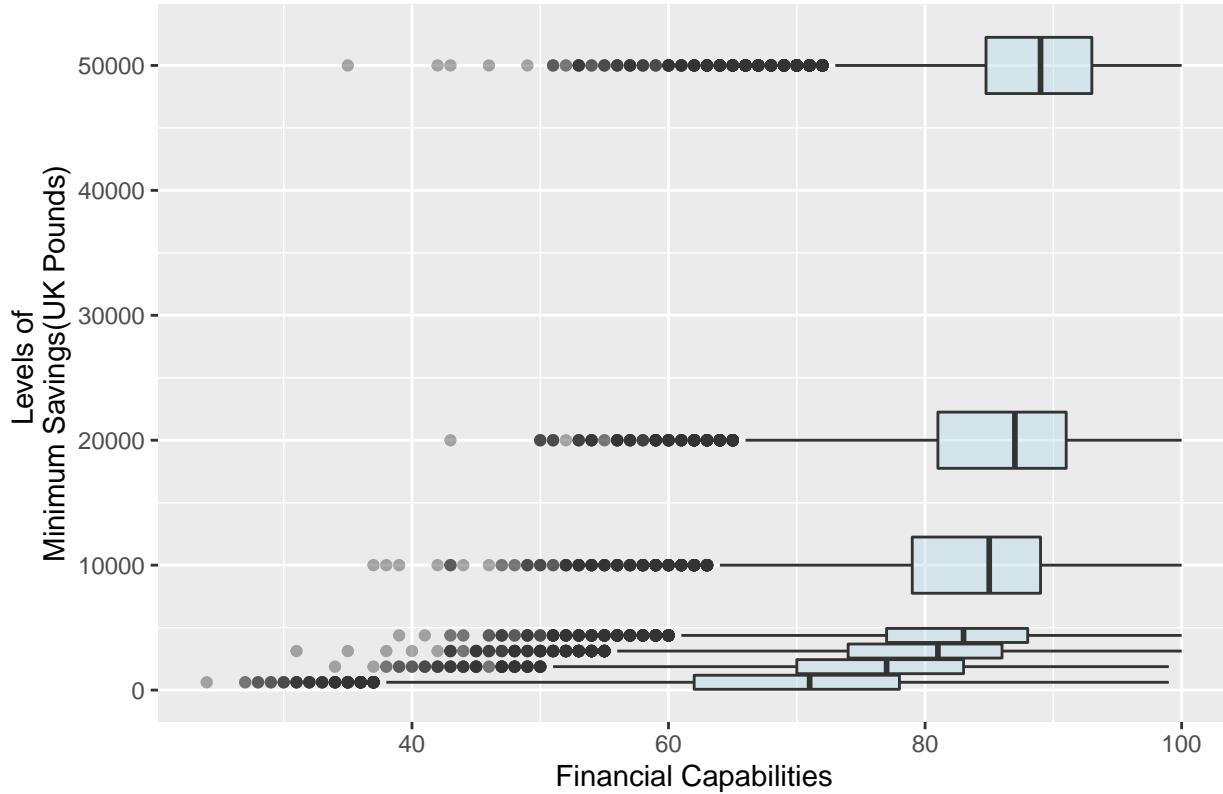
```
#boxplot of Minsavings and Financial Knowledge
ggplot(data = bbctried, mapping = aes(group = MinSavings, x=FinancialKnowledge, y = MinSavings)) +
  geom_boxplot(width=5000,alpha=0.4,fill="lightblue") + ylab("Levels of \nMinimum Savings(UK Pounds)") + xla
```

Financial Knowledge's Relation with Wealth Accumulation



```
#boxplot of Minsavings and Financial Capabilities
ggplot(data = bbctrried, mapping = aes(group = MinSavings, x=FinancialCapabilities, y = MinSavings)) +
  geom_boxplot(width=5000,alpha=0.4,fill="lightblue") + ylab("Levels of \nMinimum Savings(UK Pounds)") + xla
```

Financial Capabilities' Relation and Wealth Accumulation



Regression Analysis

#Conduct Regression Analysis

```
lm1<-lm(data=bbctried, formula=MinSavings~FinancialKnowledge+log(FinancialCapabilities)+Age+Education+Income)
summary(lm1)
```

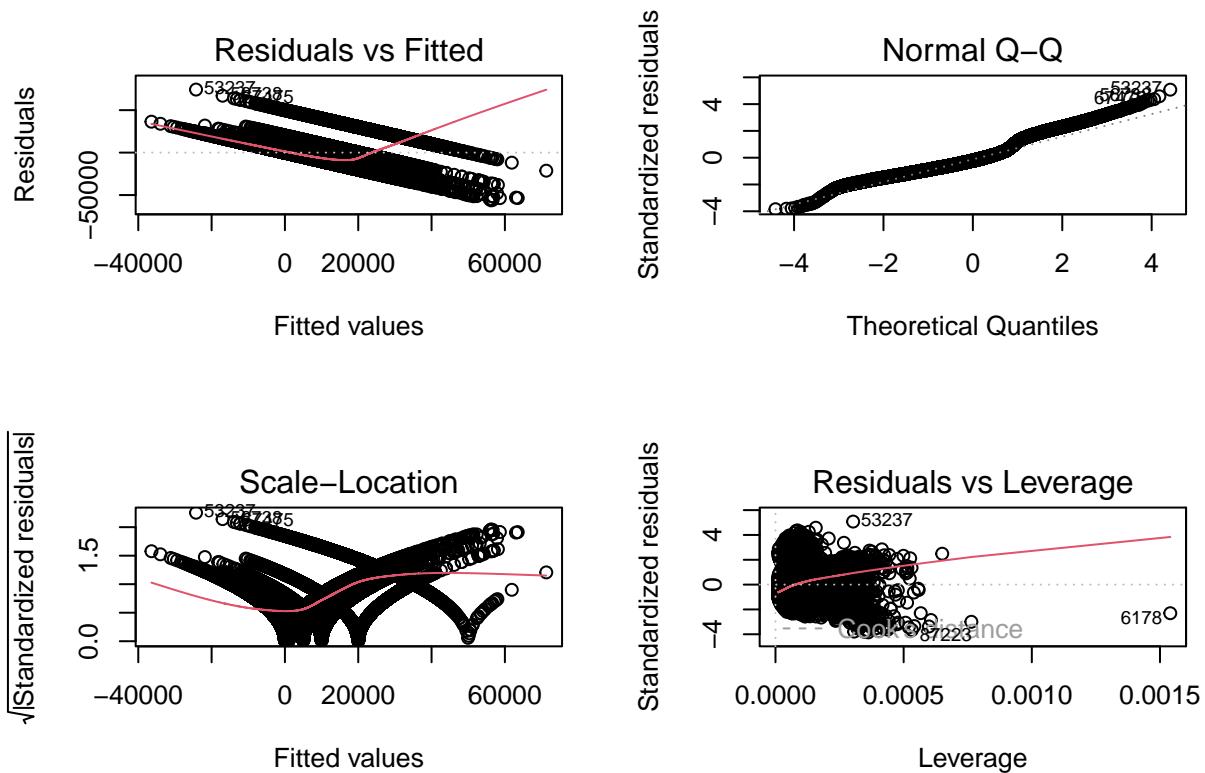
```
##
## Call:
## lm(formula = MinSavings ~ FinancialKnowledge + log(FinancialCapabilities) +
##     Age + Education + Income, data = bbctried)
##
## Residuals:
##    Min     1Q Median     3Q    Max 
## -56246 -10120 -3219   6544  74249 
##
## Coefficients:
##                               Estimate Std. Error t value
## (Intercept)             -148573.784439  1328.355987 -111.85
## FinancialKnowledge       419.925315   33.622536  12.49
## log(FinancialCapabilities) 30123.322982  322.760441  93.33
## Age                      500.816520    3.681800 136.03
## Education                737.706499   33.761106  21.85
## Income                   0.136339    0.001926  70.77
## 
## Pr(>|t|) 
## (Intercept) <0.0000000000000002 ***
##
```

```

## FinancialKnowledge      <0.0000000000000002 ***
## log(FinancialCapabilities) <0.0000000000000002 ***
## Age                      <0.0000000000000002 ***
## Education                <0.0000000000000002 ***
## Income                   <0.0000000000000002 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 14620 on 99630 degrees of freedom
## Multiple R-squared:  0.3497, Adjusted R-squared:  0.3497
## F-statistic: 1.072e+04 on 5 and 99630 DF,  p-value: < 0.0000000000000022

par(mfrow=c(2,2))
plot(lm1)

```



4. Discussion

Findings related to research questions

I first describe levels of minimum savings in histogram and find that people with small amount of money and large amount of money seems to be not small in the sample while the middle class is smaller.

The findings show that by correlation analysis at first hand, Minimum Savings is more strongly correlated with age, education, income, financial capabilities and also financial knowledge. This finding seems to prove the former findings by other studies that age, education and income are related with wealth accumulation. The financial knowledge is correlated with the minimum savings but has small correlation. The financial capabilities is more correlated with minimum savings.

Boxplots and scatterplots show that financial capabilities' relation with wealth accumulation may be not linear but more logistic, while financial knowledge show small correlation with wealth accumulation. The age and education seem linearly related with financial accumulation.

The analysis also made simple regression analysis for the data.

Weaknesses

The analysis seems to touch the basics of variables but didn't include more other personal traits into analysis, and it may compromise the final model's explanation ability, with R-squared at 0.35. What's more, detailed investigation about the regression model should be made.

The analysis visually described the variables well, but didn't make very big contributions to existing academic literatures with exceptional conclusions.

Citation

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