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CIS 607
Unit 4 Assignment

Software Used

Minitab is the software used for analysis.

Description of Dataset and Variables

The dataset used for analysis is titled "Financial well-being survey". It is prepared and presented by the consumer financial protection bureau. It contains individuals' scores on attributes that influence their personal financial well-being. The primary dataset covers variables that detail individuals' income, employment, savings, past financial experiences, and financial skills and behaviors ("Consumer," 2020).

For a brief analysis, the primary dataset is scaled down to 24 variables from more than 45 variables. These variables are detailed below. The goal of the analysis is to explore the relationships between potential dependent variables. A factor is defined and assigned to variables by reducing the dimensionality of the dataset.

Variable	Variable Label	Response Values	Variable	Variable Label	Response Values
FWB1_1	I could handle a major unexpected expense	-4 Response not written to database -1 Refused 1 Not at all 2 Very little 3 Somewhat 4 Very well 5 Completely	FS1_3	I know how to make complex financial decisions.	-1 Refused 1 Not at all 2 Very little 3 Somewhat 4 Very well 5 Completely
FWB1_2	I am securing my financial future		FS1_4	I am able to make good financial decisions that are new to me	
FWB1_3	I am securing my financial future never have the things I want in life		FS1_5	I am able to recognize a good financial investment	
FWB1_4	I can enjoy life because of the way		FS1_6	I know how to keep myself from	

	I'm managing my money			spending too much	
FWB1_5	I am just getting by financially		FS1_7	I know how to make myself save	
FWB1_6	I am concerned that the money I have or will save won't last		FS2_1	I know when I do not have enough info to make a good decision involving my money	
FWB2_1	Giving a gift...would put a strain on my finances for the month		FS2_3	I know when I need advice about my money	
FWB2_2	I have money left over at the end of the month		FS2_3	I struggle to understand financial information	
FWB2_3	I am behind with my finances		PROPPLAN_1	I consult my budget to see how much money I have left	
FWB2_4	My finances control my life		PROPPLAN_2	I actively consider the steps I need to take to stick to my budget	-1 Refused 1 Strongly disagree 2 Disagree 3 Neither agree nor disagree 4 Agree 5 Strongly agree
FS1_1	I know how to get myself to follow through on my financial intentions		PROPPLAN_3	I set financial goals for what I want to achieve with my money	

FS1_2	I know where to find the advice I need to make decisions involving money	-1 Refused 1 Not at all 2 Very little 3 Somewhat 4 Very well 5 Completely	PROPPLAN_4	I prepare a clear plan of action w/ detailed steps to achieve my financial goals	

Scree Plot and Number of Factors

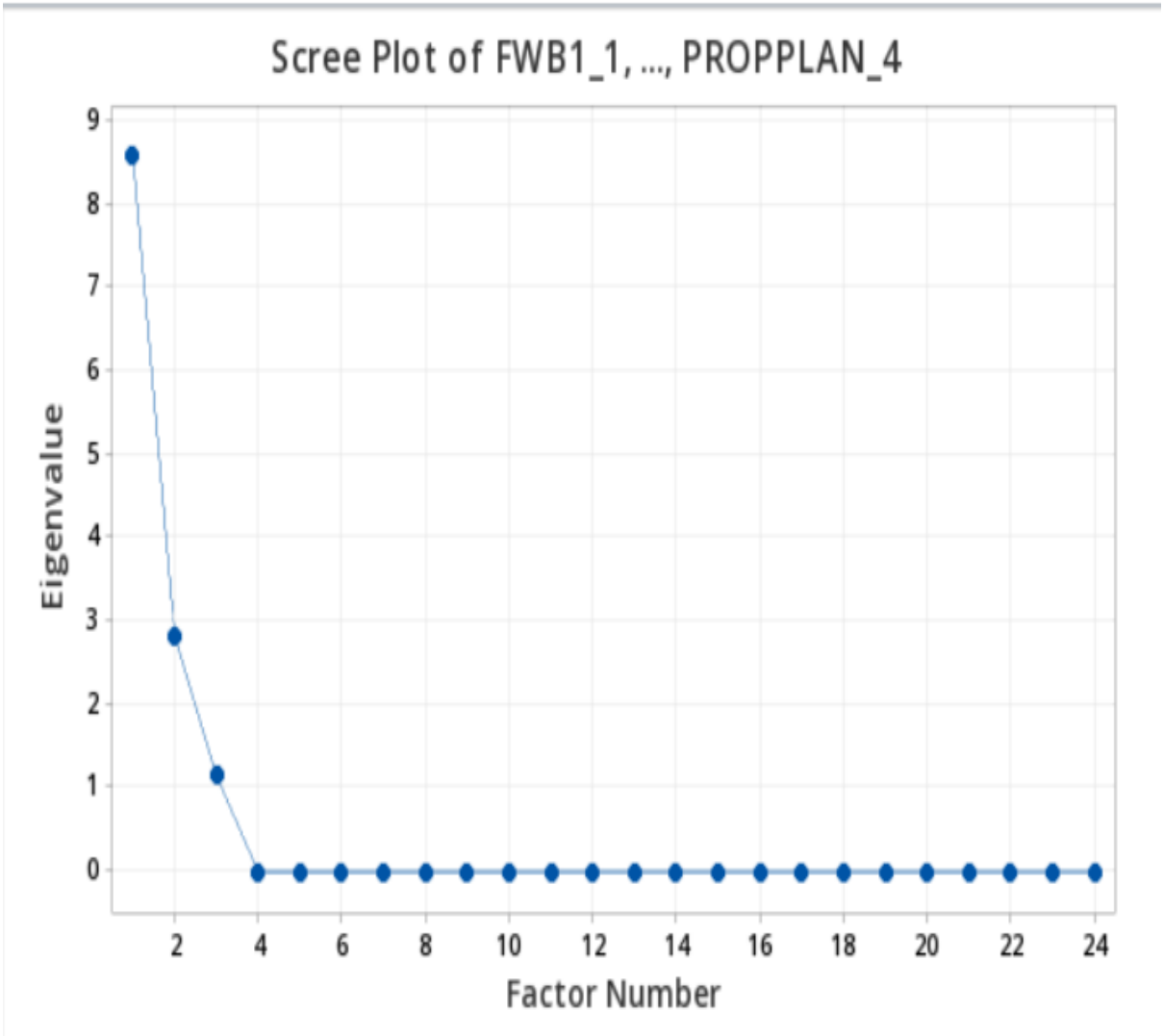

Fig. 1: Scree Plot

Fig. 1 shows the scree plot for the 24 variables. The bend of scree plot takes place at the factor of 3. Besides, based on the rule proposed by Kaiser (1964), only up to 3 factors can be rotated since

the eigenvalues are greater than one (1). This strongly suggests the inclusion of 3 factors in the solution and interpretation of the analysis.

Model to Predict Factor Scores

Factor Score Coefficients

Variable	Factor1	Factor2	Factor3
FWB1_1	0.125	-0.014	0.025
FWB1_2	0.098	-0.024	0.009
FWB1_3	-0.161	-0.064	0.008
FWB1_4	0.102	-0.030	0.010
FWB1_5	-0.102	-0.042	-0.005
FWB1_6	-0.120	-0.049	0.005
FWB2_1	-0.225	-0.086	0.001
FWB2_2	0.140	0.015	0.004
FWB2_3	-0.140	-0.058	0.022
FWB2_4	-0.139	-0.056	-0.003
FS1_1	-0.021	-0.172	0.008
FS1_2	-0.018	-0.130	0.046
FS1_3	-0.097	-0.260	0.085
FS1_4	-0.085	-0.283	0.089
FS1_5	-0.059	-0.196	0.070
FS1_6	-0.002	-0.085	-0.014
FS1_7	0.017	-0.101	-0.014
FS2_1	-0.022	-0.051	-0.004
FS2_2	-0.018	-0.046	-0.006
FS2_3	-0.007	0.036	-0.023
PROPPLAN_1	-0.019	0.069	-0.248
PROPPLAN_2	-0.017	0.101	-0.438
PROPPLAN_3	0.002	0.027	-0.229
PROPPLAN_4	-0.004	0.035	-0.252

Fig. 2: Factor Scores

The factor scores in Fig. 2 explain how much each variable can assist one to predict the variable score. These scores can be used for future analysis to scale each factor to an individual. The equation (extract) can be acceptably (quality) adopted to predict the factor score for factor 1 is shown below.

$$Factor1_{score} = 0.125x_1 + 0.098x_2 - 0.161x_3 + 0.102x_4 - 0.102x_5 - 0.120x_6 + \ldots\ldots\ldots\ldots$$

Explanation and Meaning of Factors and Factor Loadings.

Rotated Factor Loadings and Communalities

Varimax Rotation

Variable	Factor1	Factor2	Factor3	Communality
FWB1_1	0.669	-0.368	-0.063	0.587
FWB1_2	0.612	-0.410	-0.122	0.557
FWB1_3	-0.728	0.139	0.039	0.551
FWB1_4	0.617	-0.427	-0.127	0.580
FWB1_5	-0.613	0.078	-0.017	0.382
FWB1_6	-0.659	0.117	0.030	0.448
FWB2_1	-0.792	0.150	0.023	0.651
FWB2_2	0.693	-0.306	-0.085	0.581
FWB2_3	-0.693	0.152	0.088	0.511
FWB2_4	-0.694	0.107	0.000	0.494
FS1_1	0.303	-0.698	-0.271	0.653
FS1_2	0.270	-0.644	-0.133	0.505
FS1_3	0.122	-0.781	-0.163	0.652
FS1_4	0.195	-0.791	-0.176	0.694
FS1_5	0.177	-0.730	-0.138	0.583
FS1_6	0.292	-0.578	-0.276	0.496
FS1_7	0.381	-0.607	-0.277	0.591
FS2_1	0.056	-0.413	-0.197	0.212
FS2_2	0.078	-0.399	-0.196	0.204
FS2_3	-0.237	0.329	0.020	0.165
PROPPLAN_1	-0.071	-0.128	-0.720	0.540
PROPPLAN_2	0.023	-0.243	-0.813	0.721
PROPPLAN_3	0.142	-0.347	-0.677	0.598
PROPPLAN_4	0.104	-0.323	-0.704	0.610
Variance	5.1938	4.7865	2.5835	12.5638
% Var	0.216	0.199	0.108	0.523

Fig. 3: Rotated Factor Loadings

Fig. 3 illustrates the rotated factor loadings. It displays how much a factor explains each variable. The larger the loadings, the stronger the factor influences the variable. For example, variables, FWB1_1, FWB1_2, FWB1_3, and FWB2_1, among other variables, have significant positive and negative loadings on Factor 1. Based on questions that dispense the response values data for the latter variable, one may conclude Factor 1 describes individuals' financial well-being.

Factor	What the factor describes (Conclusion)
Factor 1	Individual's Financial Welfare
Factor 2	Individual's Financial Skills
Factor 3	Individual's Financial Planning

References

Consumer Financial Protection Bureau. (2020). Financial well-being survey data. *Consumerfinance.gov*. Retrieved from https://www.consumerfinance.gov/data-research/financial-well-being-survey-data/

Kaiser, H. F. (1964). A method for determining eigenvalues. Society for Industrial and Applied Mathematics. *Journal of the Society of Industrial and Applied Mathematics*, 12(1), 238-11. DOI:http://dx.doi.org/10.1137/0112023