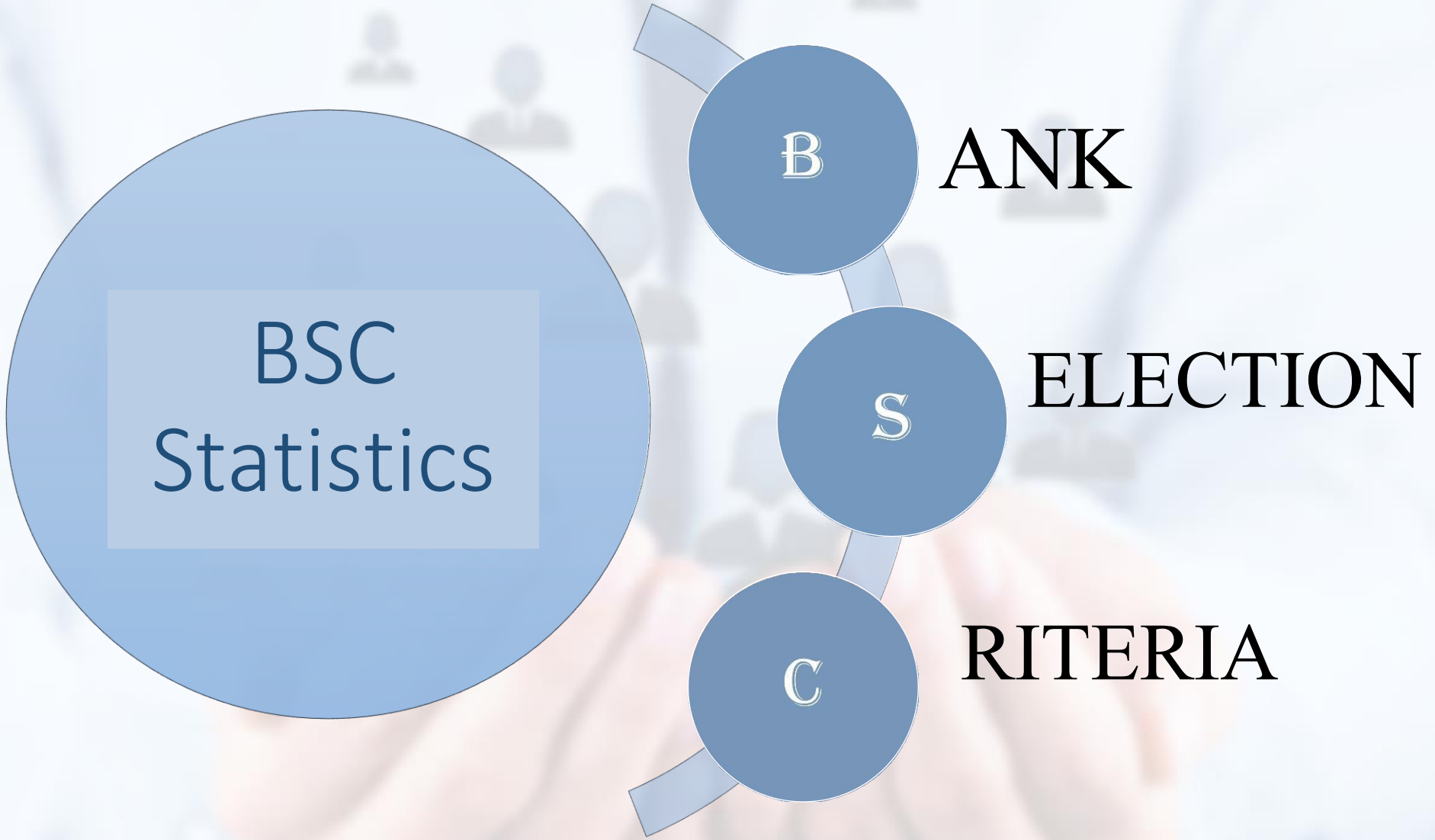

BSC.
Statistics


BSC
Statistics
B
ANK
S
ELECTION
C
RITERIA

INTRODUCTION

- The trend towards globalization has introduce many changes in the Economic and Business environment all over the world.
- With rapidly changing economic environment, more demanding and sophisticated customers grouping competitiveness in Banking Industry and similarity of services offered by Bank, it has become important for the financial institutions to determine the basis on which customers (both depositors and borrowers) choose between providers of financial services.
- In general people will choose the bank that they perceive provides the greatest reward or benefits at lowest cost, given their preference.
- The provision of products and services of high quality enhances reputation, improves customers retention, attracts new customers and increase financial performance and profitability.

OBJECTIVES

- To identify the socio-demographic factors that influence people to select Public bank.
- To identify the socio-demographic factors that influence people to select Private bank.
- To determine the criteria that customers consider important when selecting a bank.
- To identify whether there is any significant difference in bank selection criteria among the demographic (Gender , Age , Education level , Income level, Housing conditions) groups of customers.
- To rank the levels of each socio-demographic groups according to the importance they give to each factors.

METHODOLOGY

Preparatory Phase

Designing the Questionnaire

Pilot Survey

Modification of Questionnaire

Actual Survey

Data Cleaning

Coding Of Data

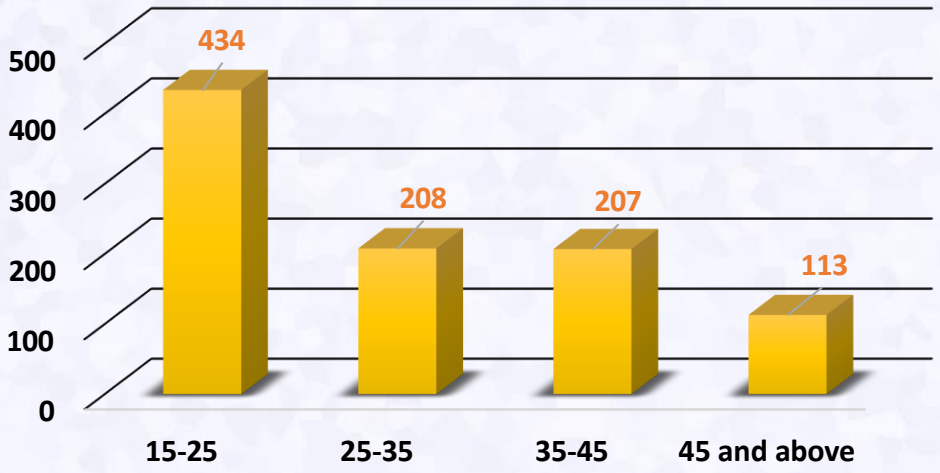
Analysis of Data

Interpretation

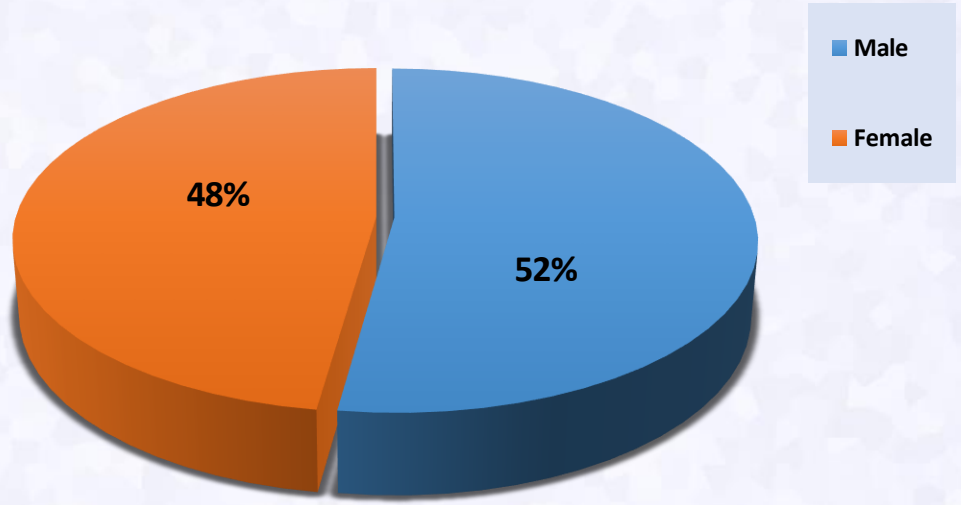
Conclusions

GRAPHICAL REPRESENTATION

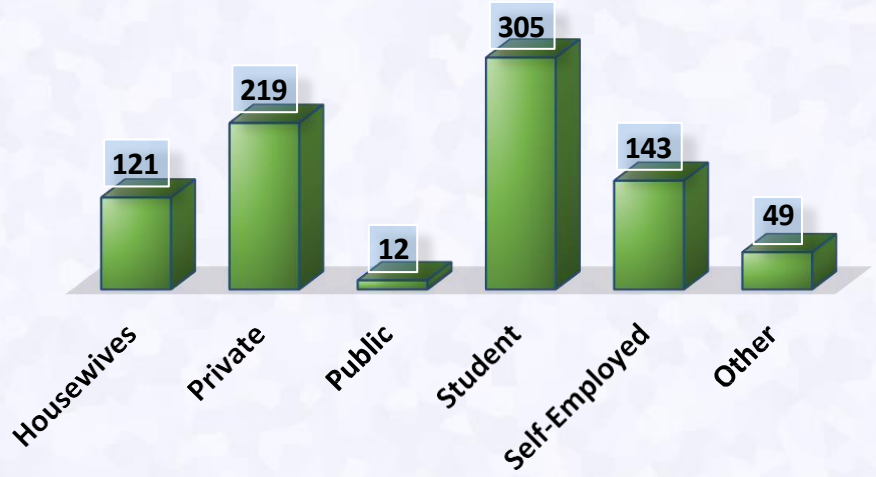
AGE



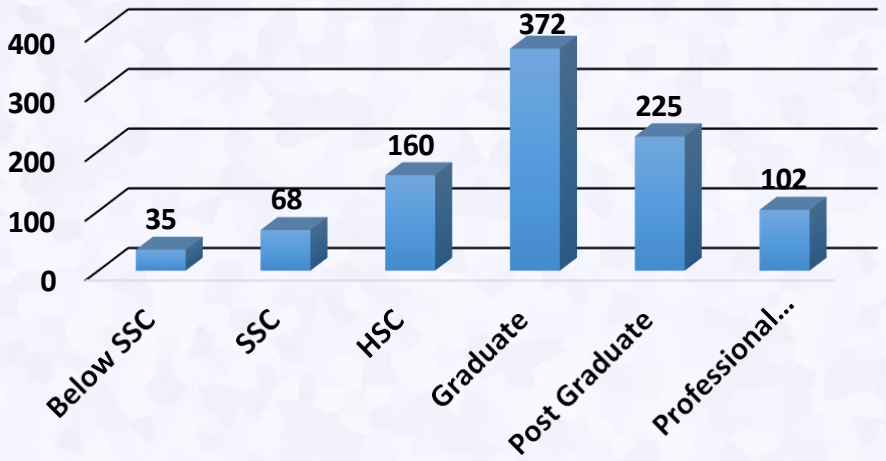
GENDER



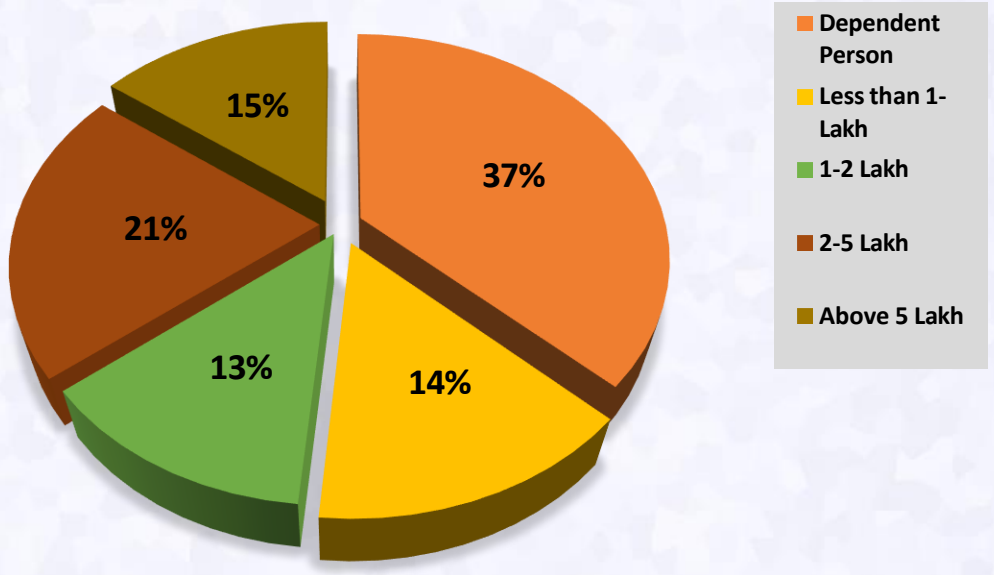
OCCUPATION



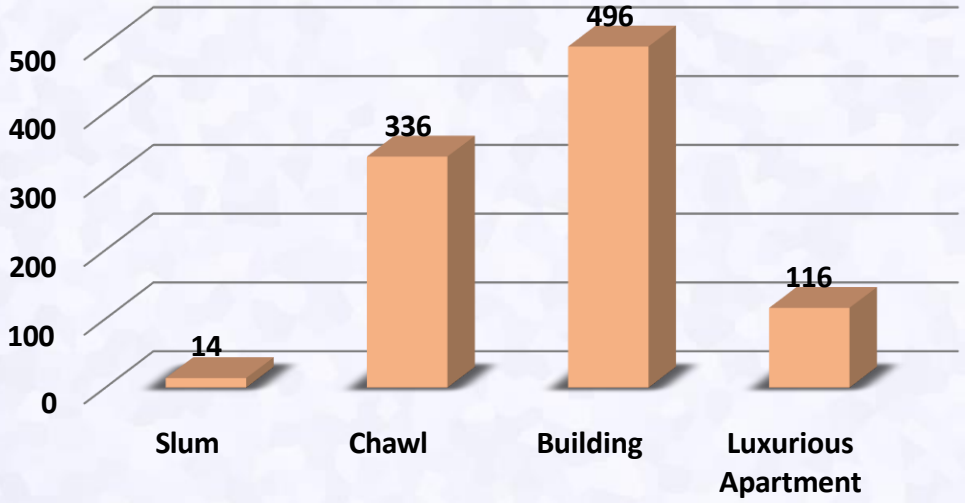
EDUCATIONAL LEVEL



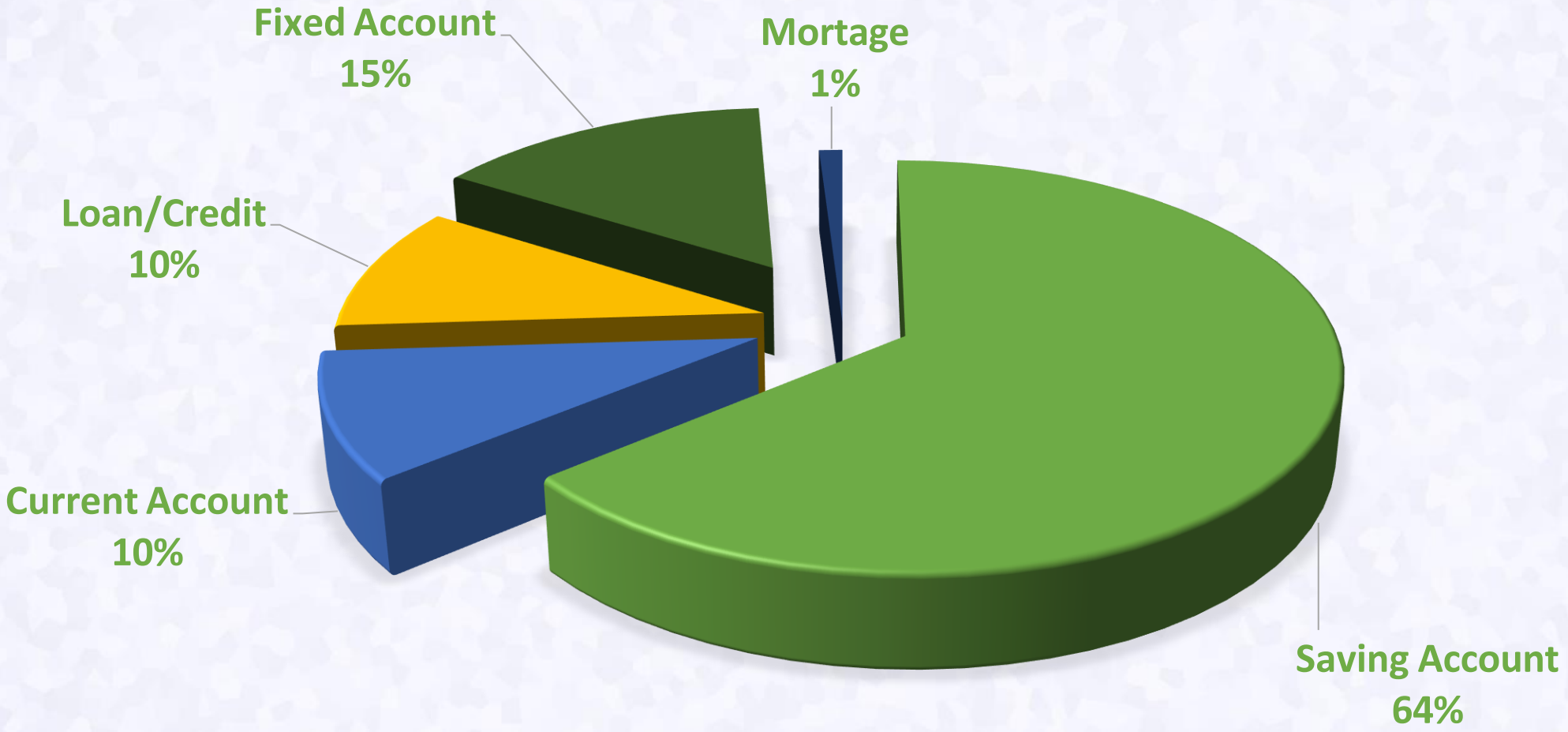
INCOME



HOUSING CONDITION



TYPES OF SERVICES



ANALYSIS

OBJECTIVE - 1

To identify the socio-demographic factors that influence people to select Public bank.


YES
NO

BINARY LOGISTIC REGRESSION

Public

962
People

Socio-demographic
Groups

Gender

Occupation

Male

Female

Housewives

Students

Others

Dependent Variable 1 : Public Banks

Y = 1 Public Bank Account Holders

Y = 0 Non-Public Bank Account Holders

Independent Variables:

sd1: Area
sd11 = Mumbai
sd12 = Thane
sd13 = Navi Mumbai

sd2: Age group
sd21 = 15-25
sd22 = 25-35
sd23 = 35-45
sd24 = 45+

sd3: Gender
sd31 = Male
sd32 = Female

sd4: Marital Status
sd41 = Married
sd42 = Unmarried

sd5: Religion
sd51 = Hindu
sd52 = Muslim
sd53 = Christian
sd54 = Sikh
sd55 = Buddhism
sd56 = Others

sd6: Caste
sd61 =Open
sd62 =OBC
sd63 =SC/ST
sd64 =NT/DT
sd65 =Others

sd8: Occupation
sd81 = Housewife
sd82 = Private Sector
sd83 = Public Sector
sd84 = Student
sd85 = Self-Employed
sd86 = Others

sd7: Education Level
sd71 = Below SSC
sd72 = SSC
sd73 = HSC
sd74 = Graduate
sd75 = Post Graduate
sd76 = Professional Course

sd9: Income p.a.
Sd91 = Dependent person
Sd92 = Less Than 1lakh
Sd93 = 1-2lakhs
Sd94 = 2-5lakhs
Sd95 = Above 5 lakhs

sd10: Housing condition
sd101 = Slum
sd102 = Chawl
sd103 = Building
sd104 = Luxurious apartment

sd11: Father's Education
sd11 = Below SSC
sd112 = SSC
sd113 = HSC
sd114 = Graduate
sd115 = Post Graduate
sd116 = Professional Course

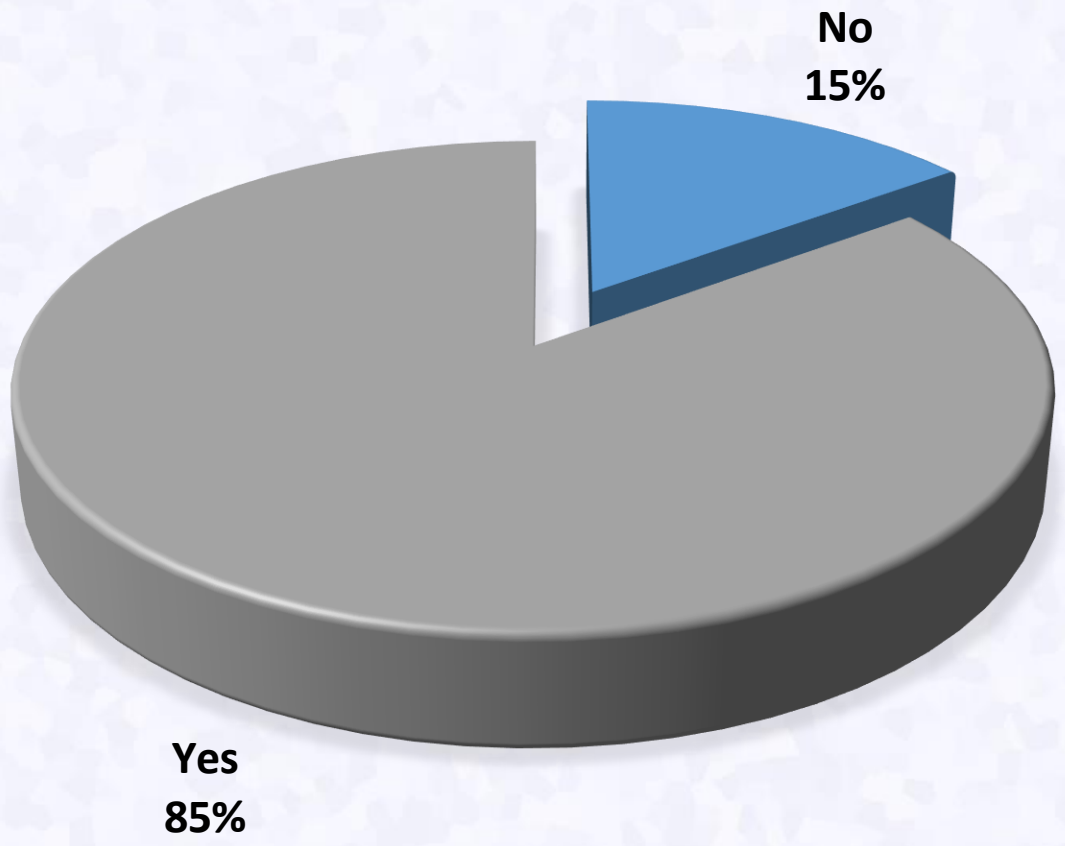
sd12: Mother's Education
sd121 = Below SSC
sd122 = SSC
sd123 = HSC
sd124 = Graduate
sd125 = Post Graduate
sd126 = Professional Course

sd13: Type of family
sd131 = Joint
sd132 = Nuclear

sd14: No. of Family Members

sd15: No. of Earning Members in Family

PUBLIC



GLOBAL TESTING

Hypothesis:

H_o: All independent variables are insignificant

i.e. $\beta_1 = \beta_2 = \ldots\ldots = \beta_{15} = 0$.

H_1: At least one of the independent variable is significant.

Test Criterion:

Reject **H_0** if p-value <0.05

SAS OUTPUT FOR GLOBAL TESTING

Testing Null Hypothesis : Beta=0			
Test	**Chi-Square**	**DF**	**Pr > Chisq**
Likelihood Ratio	**62.5974**	**8**	**<0.0001**
Score	**60.95033**	**8**	**<0.0001**
Wald	**57.6724**	**8**	**<0.0001**

Conclusion:

The p-value of the Likelihood Ratio Test **is less than 0.05** and hence **at least one of the variables is significant** at 5% level of significance

STEPWISE SELECTION

SAS OUTPUT FOR STEPWISE SELECTION

Summary of Stepwise Selection								
Step	Effect		DF	Number In	Score ChiSquare	Wald ChiSquar	Pr > ChiSq	Variable Label
	Entered	Removed						
1	sd8		5	1	48.199		< 0.0001	Occupation
2	sd10		3	2	13.1427		0.0043	Housing Condition

Applying **STEPWISE SELECTION** regression procedure, in first 2 steps the variables entered were sd8 & sd10. After step 2, no (additional) effects met the 0.05 significance level for entry into the model. Therefore, **sd8**(**Occupation**) & **sd10(Housing Condition)** are only effects which are significant and hence included in the model

RESIDUAL CHI-SQUARE

Hypothesis:

H_0: The reduced model is as good as the full model.

H_1: The reduced model is not as good as the full model.

Residual Chi-Square Test		
Chi-Square	**DF**	**Pr > Chisq**
55.0742	**57**	**0.5477**

Since the p-value > 0.05, we do not reject H_0 . Hence **the reduced model is as good as the full model** and we proceed with the 2 variables given by the stepwise procedure.

WALD STATISTICS (INDIVIDUAL TESTING)

Hypothesis:

H_0: $\beta_i = 0$; $i = 8, 10$

H_1: $\beta_i \neq 0$; for at least one

Type 3 Analysis Effect			
Effect	DF	Wald Chi-Square	Pr > ChiSq
sd8	5	32.1406	<.0001
SD10	3	12.9956	0.0046

From the table of Analysis of effects, the p-value of all the variables is less than 0.05. Thus the variables sd8 and sd10 are significant at 5% level of significance.

ODDS RATIO

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limit	
sd 8 Private Sector vs Housewife	0.359	0.209	0.615
sd 8 Public Sector vs Housewife	0.279	0.152	0.51
sd 8 Student vs Housewife	0.684	0.401	1.968
sd 8 Self Employed vs Housewife	0.327	0.181	0.591
sd 8 Other vs Housewife	0.513	0.239	1.099
sd 10 Chawl vs Slum	1.27	0.38	4.24
sd 10 Building vs Slum	0.789	0.239	2.596
sd 10 Luxurious Apartment vs Slum	0.595	0.17	2.083

People who select public banks are 0.359 times less likely to be present in private sector than in housewives.

ODDS RATIO INTERPRETATION

Significant variables for public bank:

❑ Occupation:

- People who select public banks are 0.359 times less likely to be present in private sector than in housewives.
- People who select public banks are 0.279 times less likely to be present in public sector than in housewives.
- People who select public banks are 0.684 times less likely to be present in students than in housewives.
- People who select public banks are 0.327 times less likely to be present in self-employed than in housewives.
- People who select public banks are 0.513 times less likely to be present in other occupation (apart from private, public, student and self-employed people) than in housewives.

❑ Housing Conditions:

- People who select public banks are 1.270 times more likely to be present in chawl than in slums.
- People who select public banks are 0.789 times less likely to be present in buildings than in slums.
- People who select public banks are 0.595 times less likely to be present in luxurious apartment than in slums.

HOSMER & LEMESHOW (TEST FOR GOODNESS OF FIT)

Hypothesis:

H_0:Model is a good fit.
H_1:Model is not a good fit.

Decision Criteria:

Reject H_0 for large values of Chi-square i.e. if p-value < 0.05

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	DF	Pr > ChiSq
7.4671	7	0.3891

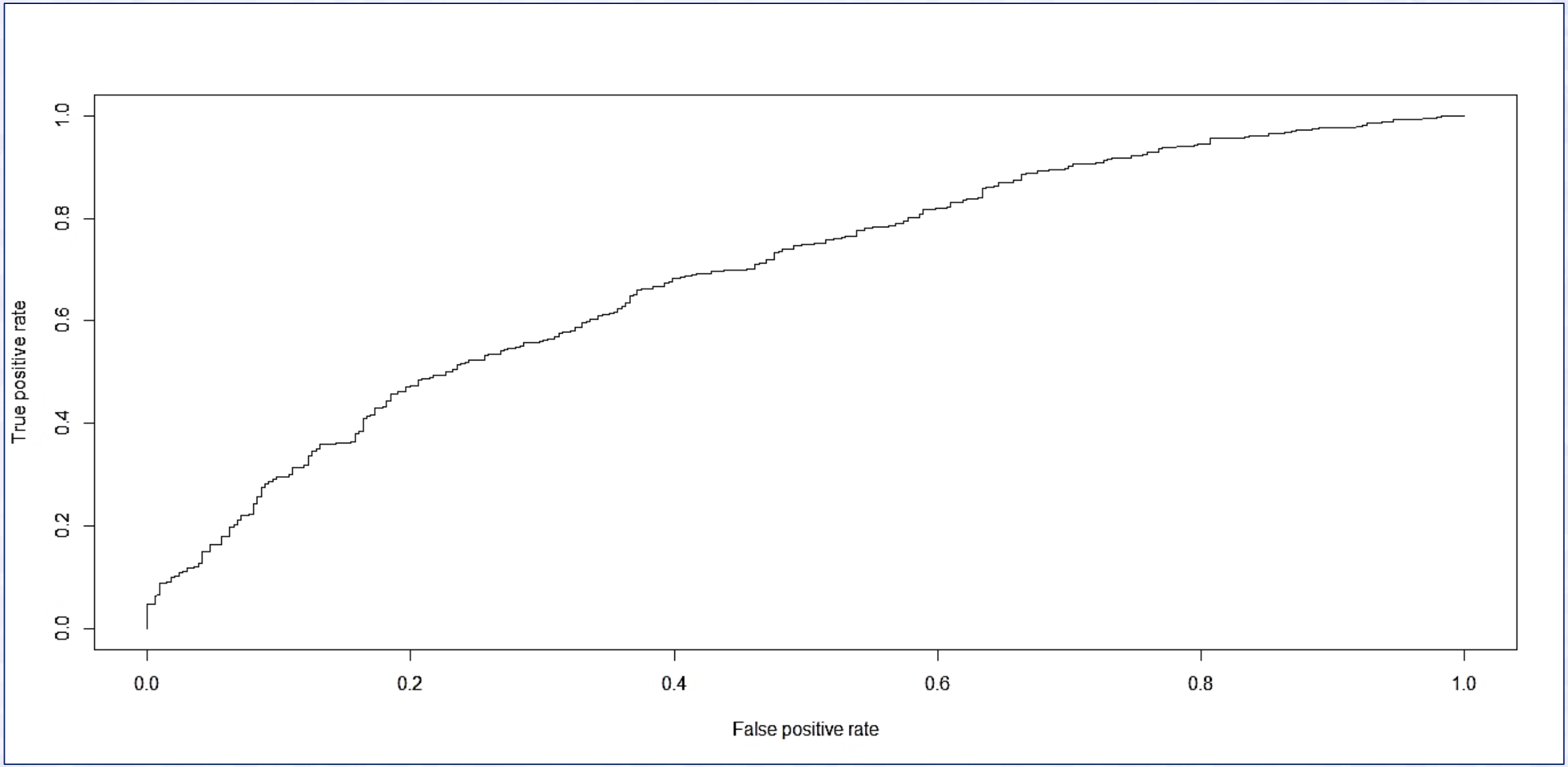
Conclusion :

Since the p-value > 0.05, we do not reject H_0 . Hence **the reduced model is good fit.**

SAS OUTPUT FOR ESTIMATES AND INDIVIDUAL TESTING

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	1.4907	0.6509	5.2443	0.022
sd8	Private Sector	1	-1.025	0.2753	13.8652	0.0002
sd8	Public Sector	1	-1.2776	0.3083	17.1696	<0.0001
sd8	Student	1	-0.3796	0.2727	1.9372	0.164
sd8	Self Employed	1	-1.1167	0.3013	13.73374	0.0002
sd8	Other	1	-0.668	0.3891	2.9482	0.86
sd10	Chawl	1	0.2388	0.6152	0.1506	0.6979
sd10	Building	1	-0.2376	0.6081	0.1527	0.696
sd10	Luxurious Apartment	1	-0.5196	0.6396	0.66	0.4166

ROC CURVE


True positive rate
0.0
0.2
0.4
0.6
0.8
1.0
False positive rate
0.0
0.2
0.4
0.6
0.8
1.0

SAS OUTPUT

Association of Predicted Probabilities and Observed Responses			
Percent Concordant	60.2	Somers' D	0.292
Percent Discordant	31	Gamma	0.32
Percent Tied	8.8	Tau-a	0.133
Pairs	210336	C	0.646

Conclusion:

Area under the ROC curve is estimated by the statistic c in the "Association of Predicted Probabilities and Observed Responses" table. Hence, the area under the ROC curve is 0.646 Since, our ROC curve rises quickly i.e. both sensitivity and specificity are high (thus 1-specificity is low). Hence our model has high predictive accuracy.

OBJECTIVE - 2

To identify the socio-demographic factors that influence people to select Private bank.

BINARY LOGISTIC REGRESSION

Private

962
People

Socio-demographic
Groups

Gender

Occupation

Male

Female

Housewives

Students

Others

Dependent Variable 1 : Private Banks

Y = 1 Private Bank Account Holders

Y = 0 Non-Private Bank Account Holders

Independent Variables:

sd1: Area
sd11 = Mumbai
sd12 = Thane
sd13 = Navi Mumbai

sd2: Age group
sd21 = 15-25
sd22 = 25-35
sd23 = 35-45
sd24 = 45+

sd3: Gender
sd31 = Male
sd32 = Female

sd4: Marital Status
sd41 = Married
sd42 = Unmarried

sd5: Religion
sd51 = Hindu
sd52 = Muslim
sd53 = Christian
sd54 = Sikh
sd55 = Buddhism
sd56 = Others

sd6: Caste
sd61 =Open
sd62 =OBC
sd63 =SC/ST
sd64 =NT/DT
sd65 =Others

sd8: Occupation
sd81 = Housewife
sd82 = Private Sector
sd83 = Public Sector
sd84 = Student
sd85 = Self-Employed
sd86 = Others

sd7: Education Level
sd71 = Below SSC
sd72 = SSC
sd73 = HSC
sd74 = Graduate
sd75 = Post Graduate
sd76 = Professional Course

sd9: Income p.a.
Sd91 = Dependent person
Sd92 = Less Than 1lakh
Sd93 = 1-2lakhs
Sd94 = 2-5lakhs
Sd95 = Above 5 lakhs

sd10: Housing condition
sd101 = Slum
sd102 = Chawl
sd103 = Building
sd104 = Luxurious apartment

sd11: Father's Education
sd11 = Below SSC
sd112 = SSC
sd113 = HSC
sd114 = Graduate
sd115 = Post Graduate
sd116 = Professional Course

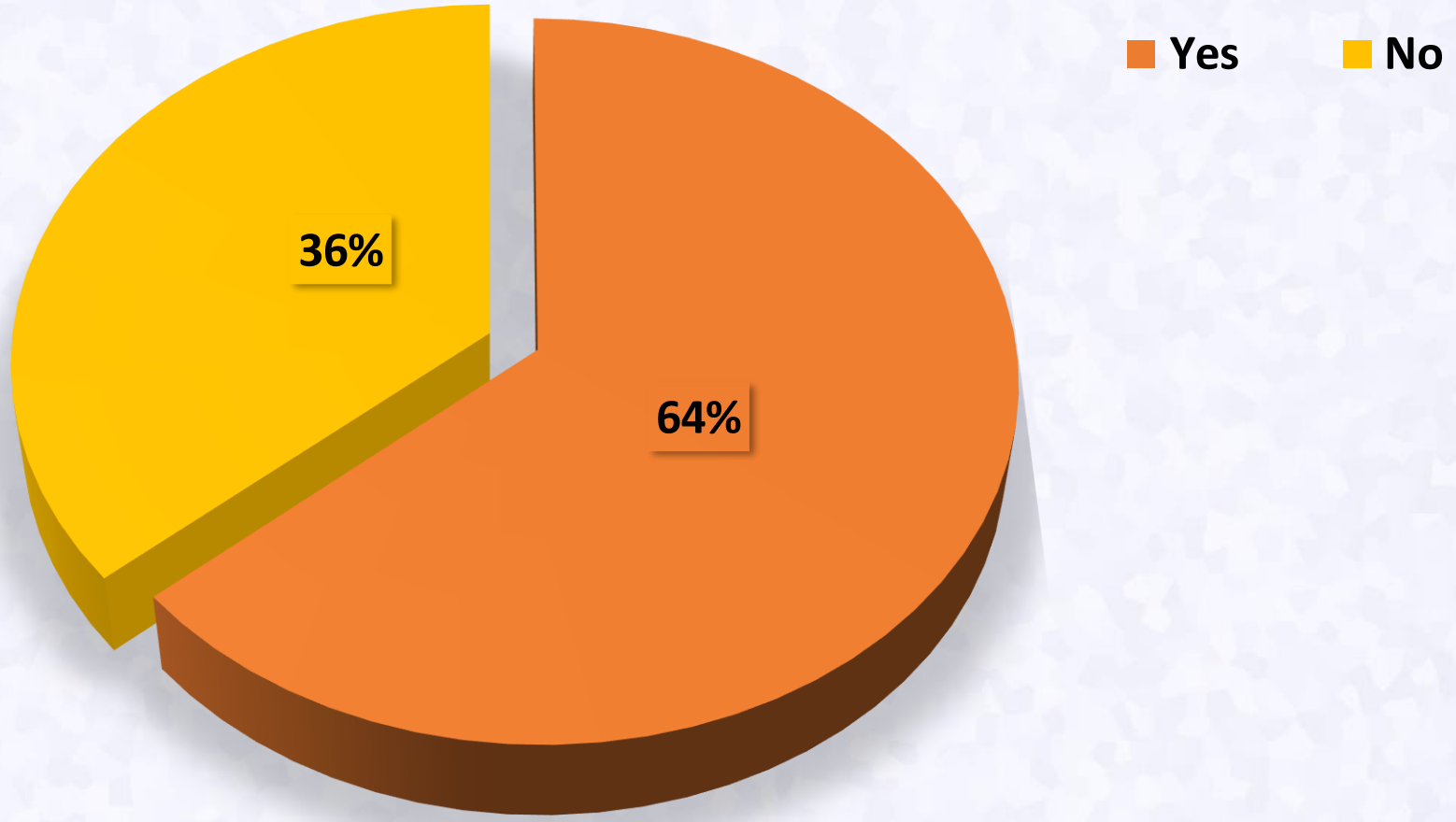
sd12: Mother's Education
sd121 = Below SSC
sd122 = SSC
sd123 = HSC
sd124 = Graduate
sd125 = Post Graduate
sd126 = Professional Course

sd13: Type of family
sd131 = Joint
sd132 = Nuclear

sd14: No. of Family Members

sd15: No. of Earning Members in Family

PRIVATE



GLOBAL TESTING

Hypothesis:

H_o: All independent variables are insignificant

i.e. $\beta_1 = \beta_2 = \ldots\ldots = \beta_{15} = 0$.

H_1: At least one of the independent variable is significant.

Test Criterion:

Reject **H_0** if p-value <0.05

SAS Output For GLOBAL TESTING

Testing Null Hypothesis : Beta=0			
Test	Chi-Square	DF	Pr > Chisq
Likelihood Ratio	59.6314	9	<0.0001
Score	56.165	9	<0.0001
Wald	52.4789	9	<0.0001

Conclusion:

The p-value of the Likelihood Ratio Test **is less than 0.05** and hence **at least one of the variables is significant** at 5% level of significance

STEPWISE SELECTION

SAS OUTPUT FOR STEPWISE SELECTION

Summary of Stepwise Selection								
Step	Effect		DF	Number In	Score ChiSquar	Wald ChiSquar	Pr > ChiSq	Variable Label
	Entered	Removed						
1	sd9		4	1	38.8425		< 0.0001	Income
2	sd11		5	2	18.3414		0.0025	Father's Education

Applying STEPWISE SELECTION regression procedure, in first 2 steps the variables entered were sd9 & sd11. After step 2, no (additional) effects met the 0.05 significance level for entry into the model. Therefore, **sd9 (Income) and sd11 (Father's Education**) are only effects which are significant and hence included in the model.

RESIDUAL CHI-SQUARE

Hypothesis:

H_0: The reduced model is as good as the full model.

H_1: The reduced model is not as good as the full model.

Residual Chi-Square Test		
Chi-Square	**DF**	**Pr > Chisq**
63.056	**56**	**0.241**

Since the p-value > 0.05, we do not reject H_0 . Hence **the reduced model is as good as the full model** and we proceed with the 2 variables given by the stepwise procedure.

WALD STATISTICS (INDIVIDUAL TESTING)

Hypothesis:

H_0: $\beta_i = 0$; i = 9,11

H_1: $\beta_i \neq 0$; for at least one

Type 3 Analysis Effect			
Effect	DF	Wald Chi-Square	Pr > ChiSq
sd 9	4	25.4003	<.0001
sd11	5	17.9433339	0.003

From the table of Analysis of effects , the p-value of all the variables is less than 0.05 . Thus the variables sd9 and sd11 are significant at 5% level of significance.

ODDS RATIO

Odds Ratio Estimates			
Effect	Point Estimate	95% Wald Confidence Limit	
sd9 Less than 1 Lakh vs Dependent Person	0.883	0.589	1.323
sd 9 1-2 Lakh vs Dependent Person	1.664	1.072	2.583
sd 9 2-5 Lakh vs Dependent Person	1.681	1.163	2.431
sd 9 5 Lakh Above vs Dependent Person	2.745	1.664	4.528
sd 11 SSC vs Below SSC	0.979	0.0681	1.407
sd 11 HSC vs Below SSC	1.14	0.753	1.726
sd11 Graduate vs Below SSC	2.041	1.318	3.161
sd11 Post Graduate vs Below SSC	1.58	0.792	3.152
sd 11 Professional Course vs Below SSC	2.45	1.212	4.95

People who select private banks are 0.883 times less likely to be present in Less than 1 Lakh than in Dependent persons.

ODDS RATIO INTERPRETATION

Significant variables for private bank:

❑ Father's Education:

- People who select private banks are 0.979 times less likely to be present in SSC than in Below SSC.
- People who select private banks are 1.14 times less likely to be present in HSC than in Below SSC.
- People who select private banks are 2.041 times less likely to be present in Graduate than in Below SSC.
- People who select private banks are 1.58 times less likely to be present in Post Graduate than in Below SSC.
- People who select private banks are 2.45 times less likely to be present in Professional course than in Below SSC.

❑ Income:

- People who select private banks are 0.883 times less likely to be present in Less than 1 Lakh than in Dependent persons.
- People who select private banks are 1.664 times less likely to be present in 1-2 Lakh than in Dependent persons.
- People who select private banks are 1.681 times less likely to be present in 2-5 Lakhs than in Dependent persons.
- People who select private banks are 2.745 times less likely to be present in Above 5 Lakh than in Dependent persons.

HOSMER & LEMESHOW (TEST FOR GOODNESS OF FIT)

Hypothesis:

H_0: Model is a good fit.
H_1: Model is not a good fit.

Decision Criteria:

Reject H_0 for large values of Chi-square i.e. if p-value < 0.05

Hosmer and Lemeshow Goodness-of-Fit Test		
Chi-Square	DF	Pr > ChiSq
7.0276	8	0.5337

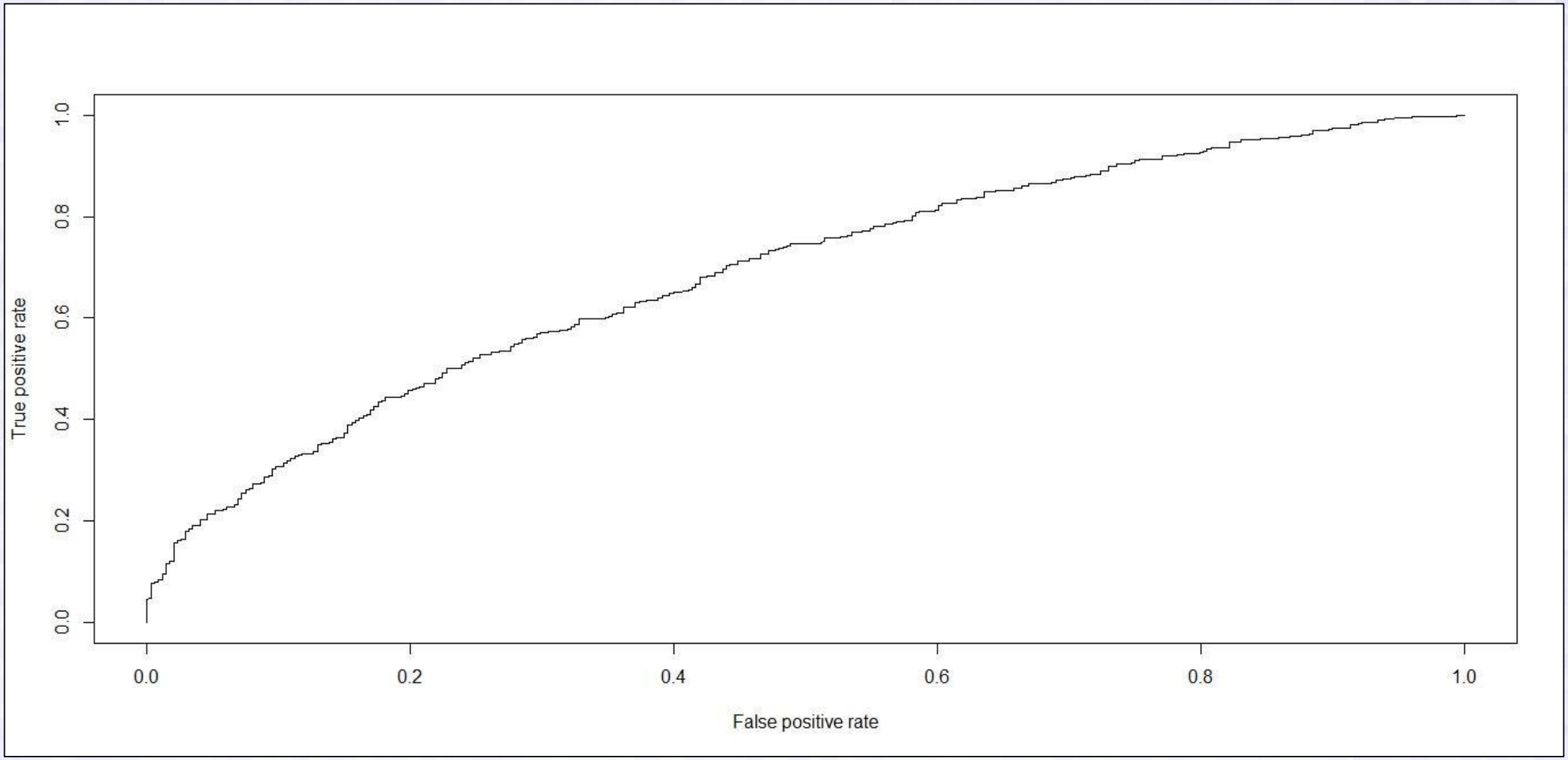
Conclusion:

Since the p-value > 0.05, we do not reject H_0 . Hence **the reduced model is good fit.**

SAS OUTPUT FOR ESTIMATES AND INDIVIDUAL TESTING

Analysis of Maximum Likelihood Estimates						
Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	0.0724	0.1613	0.2013	0.6537
sd 9	Less than 1 Lakh	1	-0.1246	0.2062	0.365	0.5457
sd 9	1-2 Lakh	1	0.509	0.2244	5.1467	0.0233
sd 9	2-5 Lakh	1	0.5197	0.188	7.6384	0.0057
sd 9	5 Lakh Above	1	1.0098	0.2554	15.6364	<0.0001
sd 11	SSC	1	-0.0214	0.1852	0.0133	0.9082
sd 11	HSC	1	0.1308	0.2116	0.3818	0.5366
sd 11	Graduate	1	0.7136	0.223	10.2371	0.0014
sd 11	Post Graduate	1	0.4574	0.3523	1.6861	0.1941
sd 11	Professional Course	1	0.8959	0.3592	6.2206	0.0126

ROC CURVE


True positive rate
0.0
0.2
0.4
0.6
0.8
1.0
False positive rate
0.0
0.2
0.4
0.6
0.8
1.0

SAS OUTPUT

Association of Predicted Probabilities and Observed Responses			
Percent Concordant	61.3	Somers' D	0.282
Percent Discordant	33.1	Gamma	0.298
Percent Tied	5.5	Tau-a	0.13
Pairs	213672	C	0.641

Conclusion:

Area under the ROC curve is estimated by the statistic c in the "Association of Predicted Probabilities and Observed Responses" table. Hence, the area under the ROC curve is 0.641.

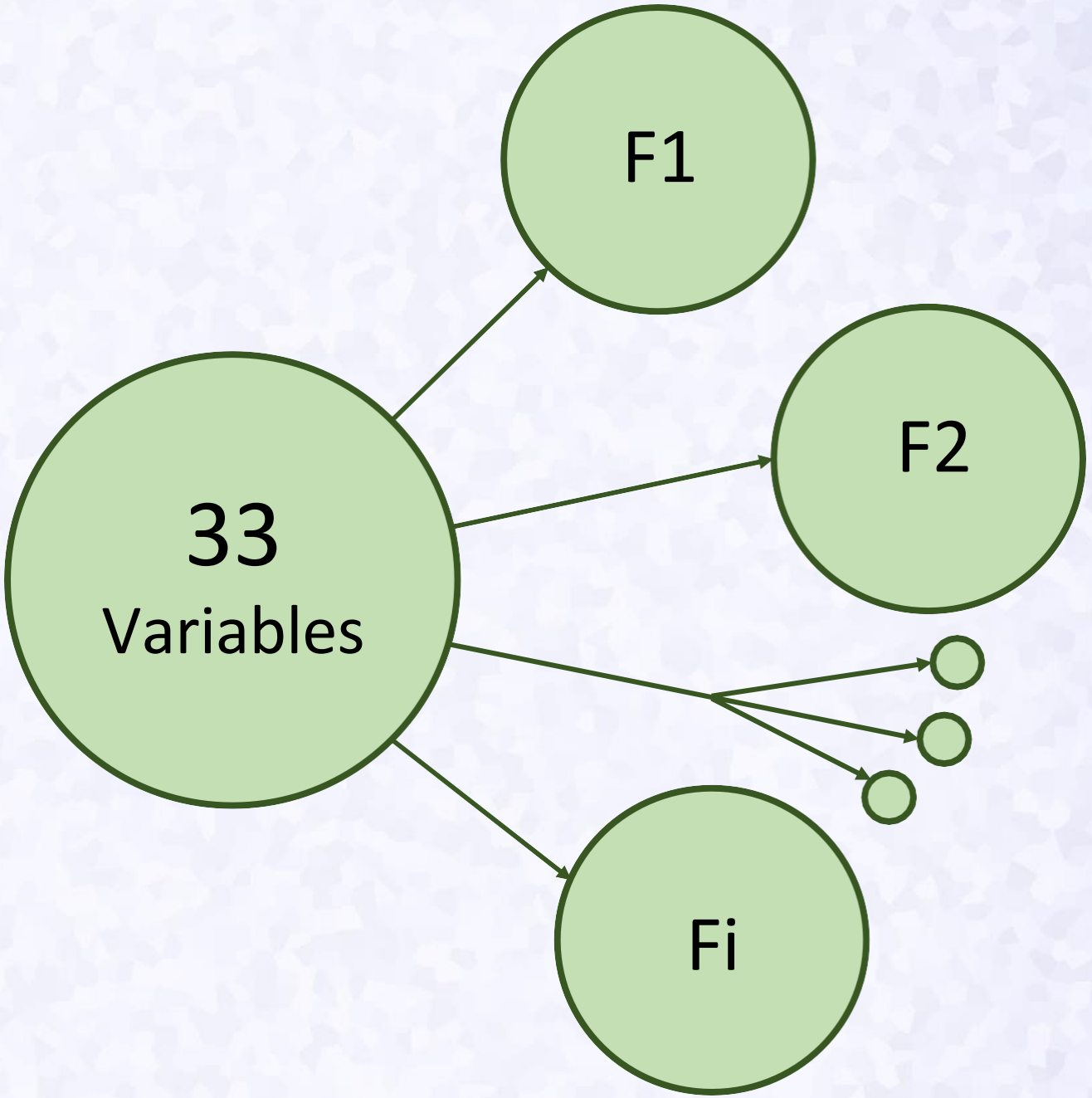
Since, our ROC curve rises quickly i.e. both sensitivity and specificity are high (thus 1-specificity is low). Hence our model has high predictive accuracy.

OBJECTIVE - 3

To determine the criteria that customers consider important when selecting a bank.

FACTOR ANALYSIS


BANK


33
Variables
F1
F2
Fi

What is Factor Analysis ?

- Factor analysis is a useful method of reducing data complexity by reducing the number of variables under study
- It is a set of techniques which analyses correlations between variables, and reduces their number into fewer uncorrelated and unobservable “factors” which explain much of the original data, more economically

Basic Steps In Factor Analysis

- Calculate a correlation matrix of all variables to be used in the analysis
- Extract the factors. (Method used: **Principal Component Analysis**)
- Rotate to create a more understandable factor structure (Method used is **Varimax**)
- Interpret the results

VARIABLES

F1 : Convenient location of bank and its main branches.
F2 : Extended operation hours (i.e. Saturday's, evening, etc).
F3 : Recommendation from family/relatives.
F4 : Recommendation from friends/colleagues.
F5 : Availability of ATM in several locations.
F6 : Convenient ATM locations.
F7 : Low interest rate on loans.
F8 : High interest rate on savings.
F9 : Low service charge on products/services.
F10: Internet/Online banking facility.
F11: Parking facility.
F12: Phone banking facility.
F13: Friendly/pleasing manners of staff.
F14: Transactions Alert and regular communication with customers.
F15: Ease of opening an account.
F16: Low account fees.
F17: Fast and efficiency services.
F18: Reputation and image of bank.
F19: External appearance of bank.
F20: Knowledge, skill and expertise of staff.
F21: Seating arrangement.
F22: Appearance and attire of staff.
F23: Interior designs of bank.
F24: Type of bank (Public/Private).
F25: Pleasant bank atmosphere and sufficient facilities.
F26: Reliability of staff.
F27: Security management.
F28: Financial stability of bank.
F29: Connectivity to others bank's ATMs.
F30: More number of branches.
F31: Minimum account balance.
F32: Latest Technology and Services.
F33: Availability of different banking cards. (Debit , Credit card , etc)

KMO TEST

Hypothesis:
H0: Population correlation matrix is identity matrix
H1: Population correlation matrix is not identity matrix

Decision criteria:
Null hypothesis is rejected by Bartlett's test of sphericity

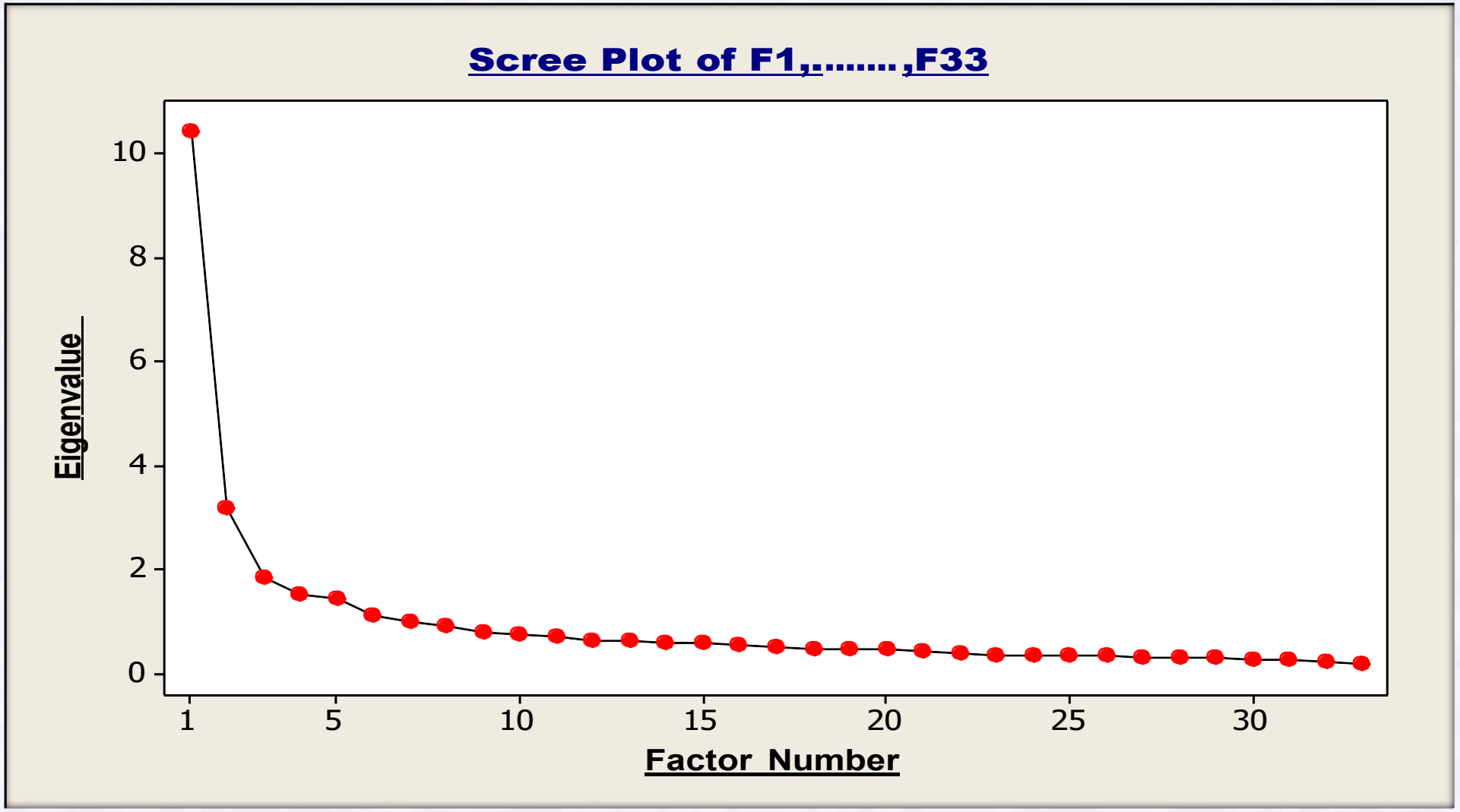
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.927
Bartlett's Test of Sphericity	Approx. Chi-Square	15181.27
	df	528
	Sig.	0

Conclusion:
The value of KMO statistics is **0.927** is large **(>0.5).** Hence, we proceed with **Factor Analysis** as an appropriate technique of data reduction. Note that the correlation matrix used is **Polychoric Correlation Matrix** since our data is **ordinal.**

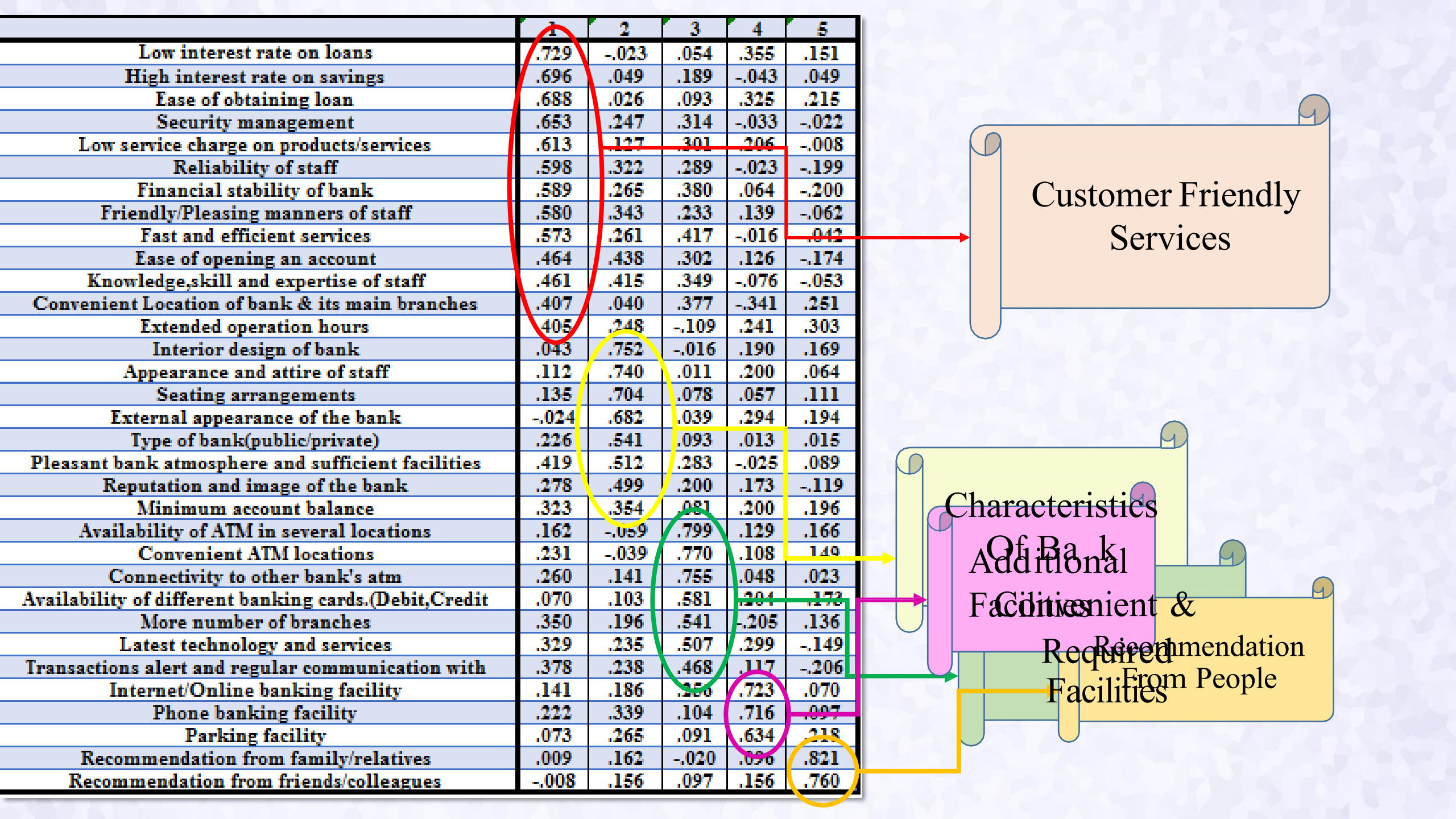
Polychoric Correlation Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20	F21	F22	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33
F1	1.000	.223	.086	.078	.346	.375	.208	.320	.286	.018	-.019	.012	.295	.285	.249	.165	.217	.337	.153	-.027	.311	.115	.048	-.002	.196	.301	.274	.318	.277	.312	.357	.142	.176
F2	.223	1.000	.247	.250	.087	.100	.301	.192	.247	.277	.240	.343	.322	.180	.267	.072	.308	.256	.263	.260	.184	.237	.259	.272	.246	.206	.193	.220	.237	.050	.110	.274	.193
F3	.086	.247	1.000	.657	.045	.024	.111	.032	.003	.198	.216	.199	.053	-.028	-.001	-.045	.167	.051	.085	.266	.047	.144	.140	.224	.066	.129	-.068	.074	-.065	.018	.065	.182	-.015
F4	.078	.250	.657	1.000	.117	.070	.103	.020	.100	.203	.258	.217	.057	.074	.034	.066	.180	.059	.098	.246	.042	.150	.161	.223	.082	.113	.025	.071	.022	.084	.104	.196	.089
F5	.346	.087	.045	.117	1.000	.760	.259	.293	.377	.262	.163	.212	.278	.338	.289	.340	.296	.394	.146	.101	.302	.115	.075	.045	.120	.274	.263	.311	.312	.583	.383	.152	.397
F6	.375	.100	.024	.070	.760	1.000	.331	.332	.372	.277	.173	.205	.321	.300	.319	.346	.321	.408	.189	.098	.324	.118	.100	.060	.156	.319	.300	.344	.362	.589	.433	.200	.360
F7	.208	.301	.111	.103	.259	.331	1.000	.483	.530	.316	.261	.362	.375	.256	.331	.153	.696	.345	.227	.166	.282	.199	.190	.195	.217	.335	.362	.420	.401	.307	.257	.299	.342
F8	.320	.192	.032	.020	.293	.332	.483	1.000	.488	.142	.093	.177	.450	.303	.370	.180	.407	.477	.246	.102	.415	.190	.119	.110	.172	.365	.405	.433	.404	.327	.362	.209	.287
F9	.286	.247	.003	.100	.377	.372	.530	.488	1.000	.293	.244	.294	.446	.451	.471	.277	.441	.449	.291	.178	.404	.232	.272	.167	.245	.372	.483	.434	.436	.409	.362	.305	.403
F10	.018	.277	.198	.203	.262	.277	.316	.142	.293	1.000	.445	.632	.303	.281	.276	.243	.287	.233	.316	.300	.233	.208	.271	.260	.196	.258	.200	.236	.267	.255	.128	.265	.402
F11	-.019	.240	.216	.258	.163	.173	.261	.093	.244	.445	1.000	.545	.228	.166	.162	.130	.291	.132	.181	.349	.174	.323	.338	.329	.133	.282	.120	.161	.135	.160	.066	.254	.212
F12	.012	.343	.199	.217	.212	.205	.362	.177	.294	.632	.545	1.000	.388	.243	.358	.175	.364	.268	.315	.409	.253	.324	.397	.376	.289	.310	.232	.265	.282	.214	.108	.342	.358
F13	.295	.322	.053	.057	.278	.321	.375	.450	.446	.303	.228	.388	1.000	.466	.565	.263	.401	.538	.364	.239	.454	.343	.299	.290	.272	.454	.463	.491	.496	.349	.325	.318	.385
F14	.285	.180	-.028	.074	.338	.300	.256	.303	.451	.281	.166	.243	.466	1.000	.493	.398	.279	.474	.423	.137	.427	.257	.134	.160	.207	.336	.467	.417	.499	.419	.328	.133	.466
F15	.249	.267	-.001	.034	.289	.319	.331	.370	.471	.276	.162	.358	.565	.493	1.000	.347	.342	.534	.409	.306	.447	.336	.353	.314	.365	.402	.512	.428	.477	.383	.305	.336	.411
F16	.165	.072	-.045	.066	.340	.346	.153	.180	.277	.243	.130	.175	.263	.398	.347	1.000	.166	.270	.248	.069	.217	.116	.117	.119	.078	.220	.311	.219	.348	.385	.266	.112	.358
F17	.217	.308	.167	.180	.296	.321	.696	.407	.441	.287	.291	.364	.401	.279	.342	.166	1.000	.386	.271	.199	.338	.218	.219	.205	.174	.357	.366	.444	.394	.308	.282	.289	.344
F18	.337	.256	.051	.059	.394	.408	.345	.477	.449	.233	.132	.268	.538	.474	.534	.270	.386	1.000	.381	.172	.554	.256	.239	.149	.275	.449	.509	.537	.509	.481	.405	.313	.490
F19	.153	.263	.085	.098	.146	.189	.227	.246	.291	.316	.181	.315	.364	.423	.409	.248	.271	.381	1.000	.366	.411	.281	.371	.306	.339	.352	.350	.326	.420	.273	.207	.252	.382
F20	-.027	.260	.266	.246	.101	.098	.166	.102	.178	.300	.349	.409	.239	.137	.306	.069	.199	.172	.366	1.000	.227	.472	.528	.570	.313	.285	.169	.113	.166	.160	.110	.266	.230
F21	.311	.184	.047	.042	.302	.324	.282	.415	.404	.233	.174	.253	.454	.427	.447	.217	.338	.554	.411	.227	1.000	.411	.337	.227	.237	.510	.464	.521	.448	.425	.373	.193	.394
F22	.115	.237	.144	.150	.115	.118	.199	.190	.232	.208	.323	.324	.343	.257	.336	.116	.218	.256	.281	.472	.411	1.000	.500	.562	.252	.449	.241	.283	.226	.175	.239	.221	.219
F23	.048	.259	.140	.161	.075	.100	.190	.119	.272	.271	.338	.397	.299	.134	.353	.117	.219	.239	.371	.528	.337	.500	1.000	.534	.394	.402	.287	.252	.234	.171	.142	.382	.251
F24	-.002	.272	.224	.223	.045	.060	.195	.110	.167	.260	.329	.376	.290	.160	.314	.119	.205	.149	.306	.570	.227	.562	.534	1.000	.376	.395	.219	.188	.207	.127	.169	.322	.193
F25	.196	.246	.066	.082	.120	.156	.217	.172	.245	.196	.133	.289	.272	.207	.365	.078	.174	.275	.339	.313	.237	.252	.394	.376	1.000	.352	.303	.259	.290	.228	.235	.329	.287
F26	.301	.206	.129	.113	.274	.319	.335	.365	.372	.258	.282	.310	.454	.336	.402	.220	.357	.449	.352	.285	.510	.449	.402	.395	.352	1.000	.481	.508	.420	.400	.371	.303	.340
F27	.274	.193	-.068	.025	.263	.300	.362	.405	.483	.200	.120	.232	.463	.467	.512	.311	.366	.509	.350	.169	.464	.241	.287	.219	.303	.481	1.000	.593	.639	.397	.377	.315	.408
F28	.318	.220	.074	.071	.311	.344	.420	.433	.434	.236	.161	.265	.491	.417	.428	.219	.444	.537	.326	.113	.521	.283	.252	.188	.259	.508	.593	1.000	.659	.445	.455	.260	.457
F29	.277	.237	-.065	.022	.312	.362	.401	.404	.436	.267	.135	.282	.496	.499	.477	.348	.394	.509	.420	.166	.448	.226	.234	.207	.290	.420	.639	.659	1.000	.465	.464	.309	.529
F30	.312	.050	.018	.084	.583	.589	.307	.327	.409	.255	.160	.214	.349	.419	.383	.385	.308	.481	.273	.160	.425	.175	.171	.127	.228	.400	.397	.445	.465	1.000	.507	.274	.509
F31	.357	.110	.065	.104	.383	.433	.257	.362	.362	.128	.066	.108	.325	.328	.305	.266	.282	.405	.207	.110	.373	.239	.142	.169	.235	.371	.377	.455	.464	.507	1.000	.241	.377
F32	.142	.274	.182	.196	.152	.200	.299	.209	.305	.265	.254	.342	.318	.133	.336	.112	.289	.313	.252	.266	.193	.221	.382	.322	.329	.303	.315	.260	.309	.274	.241	1.000	.266
F33	.176	.193	-.015	.089	.397	.360	.342	.287	.403	.402	.212	.358	.385	.466	.411	.358	.344	.490	.382	.230	.394	.219	.251	.193	.287	.340	.408	.457	.529	.509	.377	.266	1.000

SCREE PLOT


Scree Plot of F1,.....,F33
Eigenvalue
0
2
4
6
8
10
1
5
10
15
20
25
30
Factor Number

	1	2	3	4	5
Low interest rate on loans	.729	-.023	.054	.355	.151
High interest rate on savings	.696	.049	.189	-.043	.049
Ease of obtaining loan	.688	.026	.093	.325	.215
Security management	.653	.247	.314	-.033	-.022
Low service charge on products/services	.613	.127	.301	.206	-.008
Reliability of staff	.598	.322	.289	-.023	-.199
Financial stability of bank	.589	.265	.380	.064	-.200
Friendly/Pleasing manners of staff	.580	.343	.233	.139	-.062
Fast and efficient services	.573	.261	.417	-.016	.042
Ease of opening an account	.464	.438	.302	.126	-.174
Knowledge,skill and expertise of staff	.461	.415	.349	-.076	-.053
Convenient Location of bank & its main branches	.407	.040	.377	-.341	.251
Extended operation hours	.405	.248	-.109	.241	.303
Interior design of bank	.043	.752	-.016	.190	.169
Appearance and attire of staff	.112	.740	.011	.200	.064
Seating arrangements	.135	.704	.078	.057	.111
External appearance of the bank	-.024	.682	.039	.294	.194
Type of bank(public/private)	.226	.541	.093	.013	.015
Pleasant bank atmosphere and sufficient facilities	.419	.512	.283	-.025	.089
Reputation and image of the bank	.278	.499	.200	.173	-.119
Minimum account balance	.323	.354	.081	.200	.196
Availability of ATM in several locations	.162	-.059	.799	.129	.166
Convenient ATM locations	.231	-.039	.770	.108	.149
Connectivity to other bank's atm	.260	.141	.755	.048	.023
Availability of different banking cards.(Debit,Credit	.070	.103	.581	.204	.173
More number of branches	.350	.196	.541	-.205	.136
Latest technology and services	.329	.235	.507	.299	-.149
Transactions alert and regular communication with	.378	.238	.468	.117	-.206
Internet/Online banking facility	.141	.186	.256	.723	.070
Phone banking facility	.222	.339	.104	.716	.097
Parking facility	.073	.265	.091	.634	.218
Recommendation from family/relatives	.009	.162	-.020	.096	.821
Recommendation from friends/colleagues	-.008	.156	.097	.156	.760



FACTOR 1
(Customer friendly Services)

- Low interest rate on loans
- High interest rate on saving
- Ease of obtaining loan
- Security management
- Low service charge on product/service
- Reliability of staff
- Financial stability of Bank
- Friendly/pleasing manners of staff
- Fast and Efficiency services
- Knowledge/skill and expertise of staff
- Extended operation hours
- Convenient location of bank and its main branches
- Ease of opening an account

FACTOR 2
(Characteristics of Bank)

- Interior design of Bank
- Appearance and attire of staff
- Seating arrangement
- External appearance of Bank
- Types of Bank (Public/Private).
- Pleasant bank atmosphere and sufficient facilities
- Reputation and image of Bank
- Minimum account balance

FACTOR 3
(Convenient and Required Facilities)

- Avail Convenient ATM location
- Ability of ATM in several location
- Connectivity to other banks ATM
- More no. of branches
- Availability of different banking cards
- Latest technology and services
- Transaction alert & regular interaction with customers.

FACTOR 4
(Additional Facilities)

- Internet/Online banking facility
- Phone banking facility
- Parking facility

FACTOR 5
(Recommendation From People)

- Recommendation from family/ relatives
- Recommendation from friends/ colleagues

OBJECTIVE - 4

To identify whether there is any significant difference in bank selection criteria among the demographic (Gender, Age, Education level, Income level, Housing conditions) groups of customers.

962
People

33
Variables

F1

F2

Fi

Socio-demographic
Groups

Gender

Occupation

Male

Female

Housewives

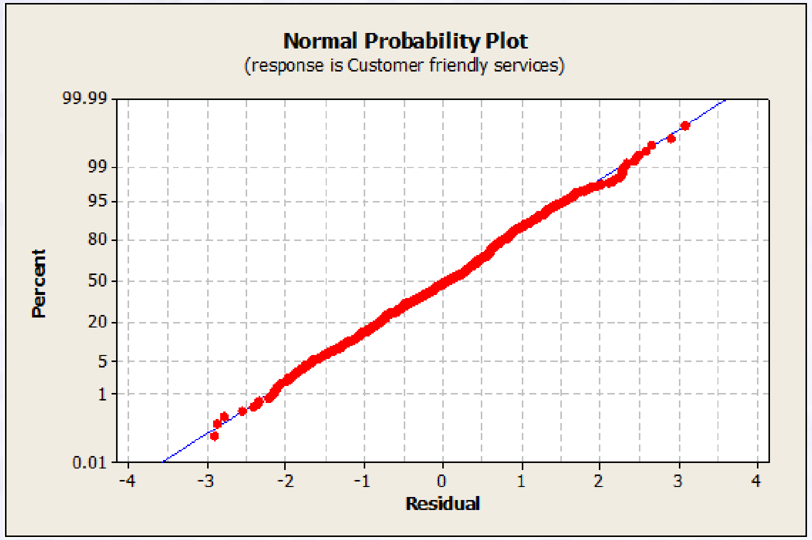
Students

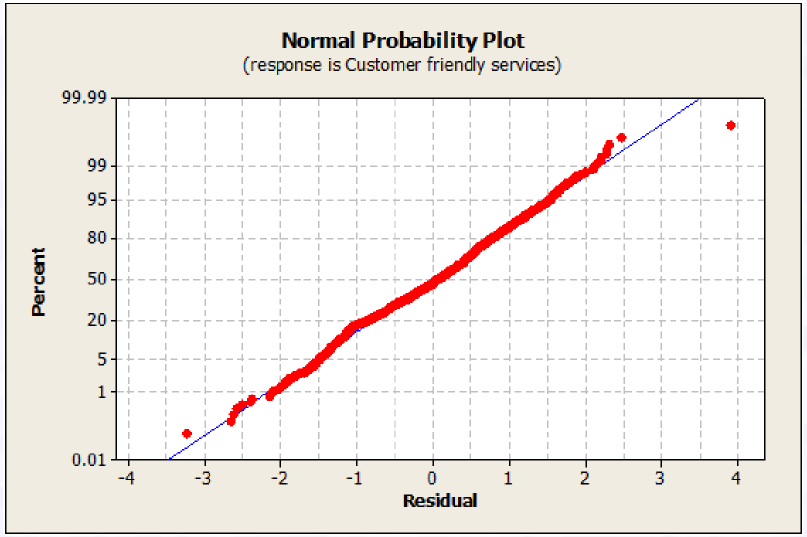
Others

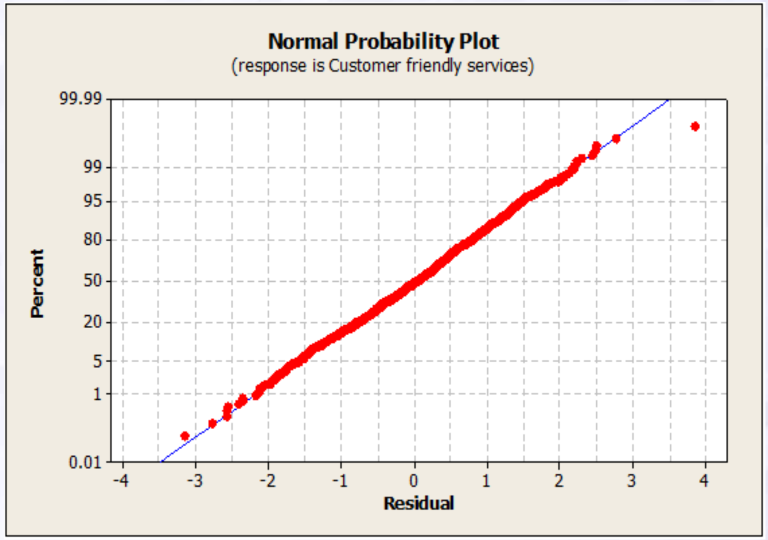
FACTOR SCORES

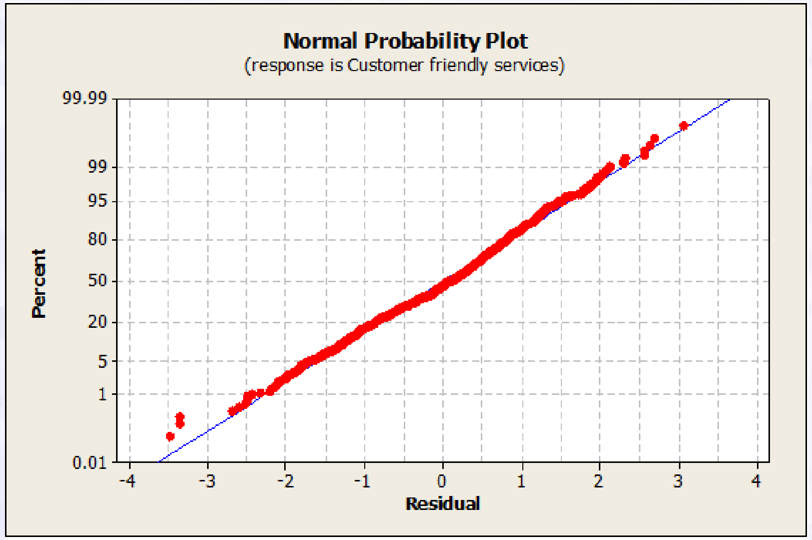
- Intuitively , factors are latent variables that underlie the scores in your observed variables. Usually the interpretation of each of these factors is based on the content of original variables so that each factor is interpreted as whatever the attributes with high loadings for this particular factor have in common.
- Factor scores are estimated values of the factors in factor analysis. Under this process , the computed factor scores are standardized to a mean of 0;however the standard deviation of the distribution of factor scores (by factor) will be 1 if principal component methods are used and will be the squared multiple correlation between factors and variables (typically used as communality estimate) if principal axis methods are used.
- Ideally , factor scores would therefore represent the score of each person on the underlying latent variable. The score of 0 on a factor therefore means that this persons ratings on the importance of relevant attributes is close to the average of your sample. Similarly a negative score means that the person gave lower than average importance ratings and vice-versa (all this holds for variables with positive loadings , for negative loadings the relationship is inverted i.e positive factor scores would correspond to lower than average ratings.)

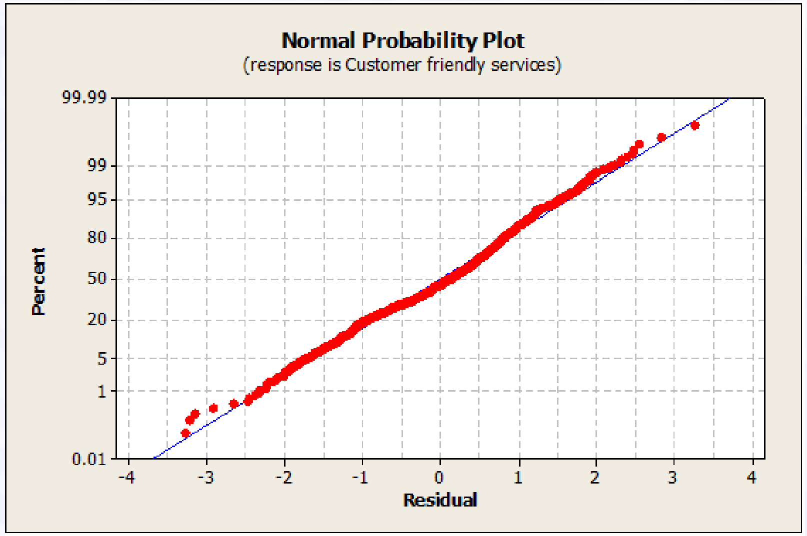
CHECKING OF NORMALITY ASSUMPTION

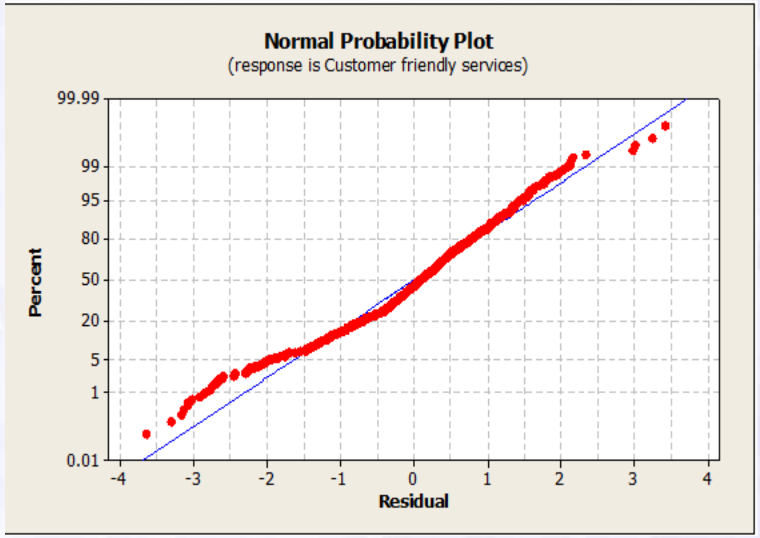












GENDER (T-TEST)

Hypothesis:

H_0 : There is no significant difference between males and females with respect to factor Fi ; i =1,2,3,4,5.

H_1: There is significant difference between males and females with respect to factor Fi.

Decision Criteria:

Reject H_0 if p-value < 0.05

Factors	Variance	Method	p-value	Decision	Conclusion
Customer friendly services (F1)	Equal	Pooled	0.292	Do Not Reject H0	$\mu_M = \mu_F$
Characteristics of Bank (F2)	Equal	Pooled	0.516	Do Not Reject H0	$\mu_M = \mu_F$
Convenient and Required facilities (F3)	Unequal	Satterthwaite	0	Reject H0	$\mu_M < \mu_F$
Additional facilities (F4)	Equal	Pooled	0	Reject H0	$\mu_M > \mu_F$
Recommendation from people (F5)	Unequal	Satterthwaite	0.003	Reject H0	$\mu_M < \mu_F$

AGE GROUPS (ANOVA TABLE)

Hypothesis:

H_0 : There is no significant difference between the different age groups with respect to factor Fi ; i =1,2,3,4,5.

H_1: There is significant difference between the different age groups with respect to factor Fi.

Decision Criteria:

Reject H_0 if p-value < 0.05

Factors	Variance	Method	p-value	Decision	Conclusion
Customer friendly services (F1)	Unequal	Welch Test	0.003	Reject H0	There is significant Difference In atleast One Pair
Characteristics of Bank (F2)	Equal	Anova	0	Reject H0	There is significant Difference In atleast One Pair
Convenient and Required facilities (F3)	Unequal	Welch Test	0	Reject H0	There is significant Difference In atleast One Pair
Additional facilities (F4)	Unequal	Welch Test	0	Reject H0	There is significant Difference In atleast One Pair
Recommendation from people (F5)	Unequal	Welch Test	0	Reject H0	There is significant Difference In atleast One Pair

POST-HOC FOR AGE GROUPS

Factors	Significant Difference in		p-value	Mean Difference	More importance
Customer friendly services (F1)	15-25	25-35	0.016	-0.238772	25-35
		Above 45	0.039	-0.3107346	Above 45
Characteristics of Bank (F2)	15-25	35-45	0	0.396909	15-25
	25-35	35-45	0.003	0.291981	25-35
		Above 45	0.026	-0.257776	Above 45
	35-45	Above 45	0	-0.549757	Above 45
Convenient and Required facilities (F3)	15-25	35-45	0.012	0.315759	15-25
		Above 45	0.003	0.358535	15-25
	25-35	35-45	0	0.4716656	25-35
		Above 45	0	0.514442	25-35
Additional facilities (F4)	15-25	35-45	0	0.5097034	15-25
		Above 45	0	0.709907	15-25
	25-35	35-45	0.004	0.356613	25-35
		Above 45	0	0.556817	25-35
Recommendation from people (F5)	15-25	35-45	0	-0.582329	35-45
	25-35	35-45	0	-0.45346	35-45
	35-45	Above 45	0	0.5216502	35-45

OBJECTIVE - 5

To rank the levels of each socio-demographic groups according to the importance they give to each factors.

962
People

Socio-demographic
Groups

Gender

Male

Female

Occupation

Housewives

Students

Others

Rank

R1

R2

R3

GENDER

Factor	1	2
Customer friendly services (F1)	Male	Female
Characteristics of Bank (F2)	Female	Male
Convenient and Required facilities (F3)	Male	Female
Additional facilities (F4)	Female	Male
Recommendation from people (F5)	Male	Female

AGE

Factor	1	2	3	4
Customer friendly services (F1)	15-25	35-45	25-35	45 Above
Characteristics of Bank (F2)	35-45	25-35	15-25	45 Above
Convenient and Required facilities (F3)	45 Above	35-45	15-25	25-35
Additional facilities (F4)	45 Above	35-45	25-35	15-25
Recommendation from people (F5)	15-25	45 Above	25-35	35-45

EDUCATIONAL LEVEL

Factor	1	2	3	4	5	6
Customer friendly services (F1)	HSC	Graduate	Professional-Course	SSC	Post-Graduate	Below SSC
Characteristics of Bank (F2)	Professional-Course	Post-Graduate	SSC	HSC	Graduate	Below SSC
Convenient and Required facilities (F3)	Below SSC	Professional-Course	SSC	HSC	Graduate	Post-Graduate
Additional facilities (F4)	Below SSC	SSC	HSC	Post-Graduate	Graduate	Professional-Course
Recommendation from people (F5)	SSC	Below SSC	Graduate	Post-Graduate	HSC	Professional-Course

OCCUPATION

Factor	1	2	3	4	5	6
Customer friendly services (F1)	Student	Public sector	Private sector	Housewives	Other	Self-Employed
Characteristics of Bank (F2)	Public Sector	Housewives	Self-Employed	Students	Private sector	Other
Convenient and Required facilities (F3)	Self-Employed	Housewives	Other	Students	Private sector	Public sector
Additional facilities (F4)	Housewives	Public sector	Other	Self-Employed	Private sector	Student
Recommendation from people (F5)	Other	Private sector	Student	Self-Employed	Housewives	Public sector

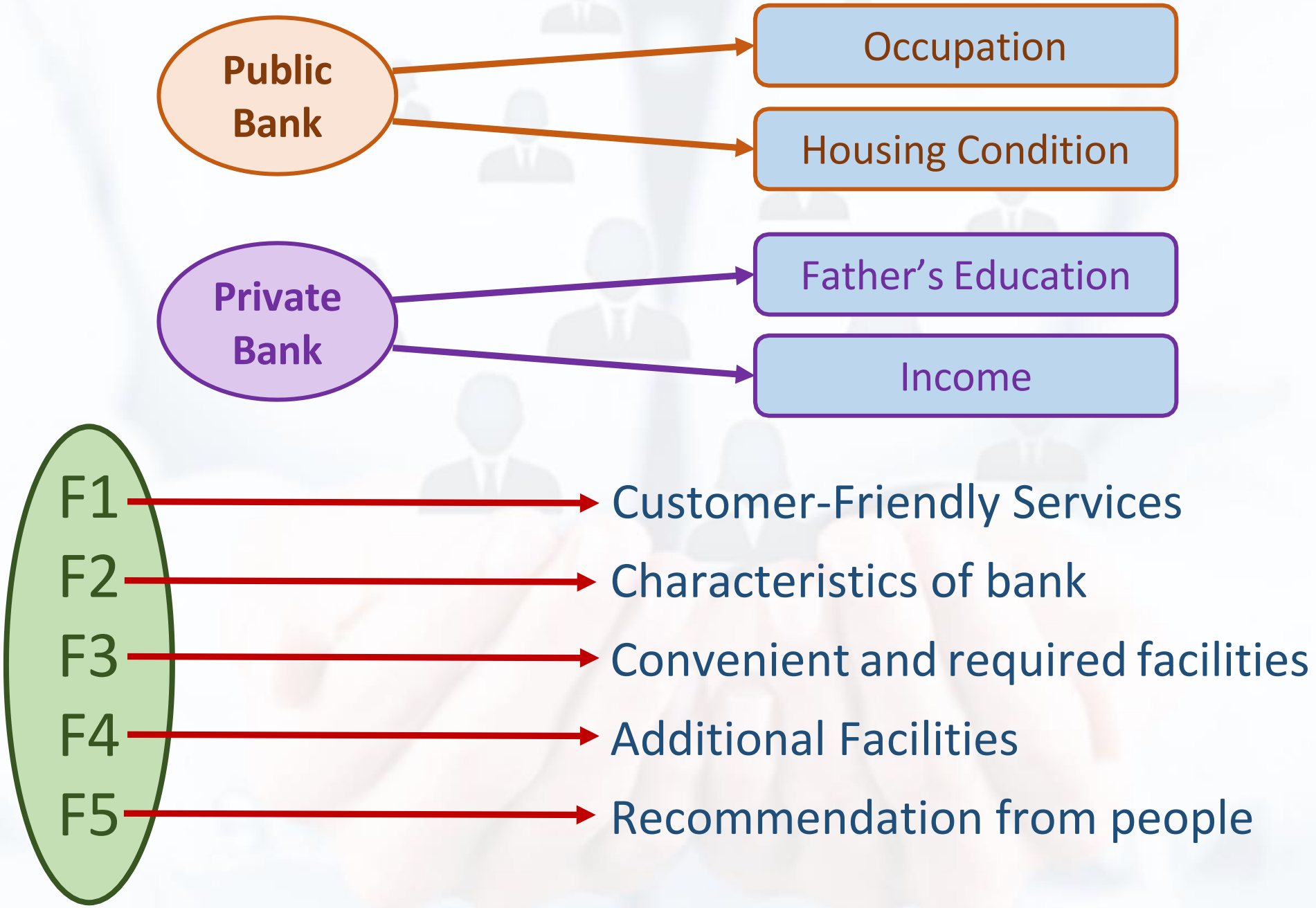
INCOME

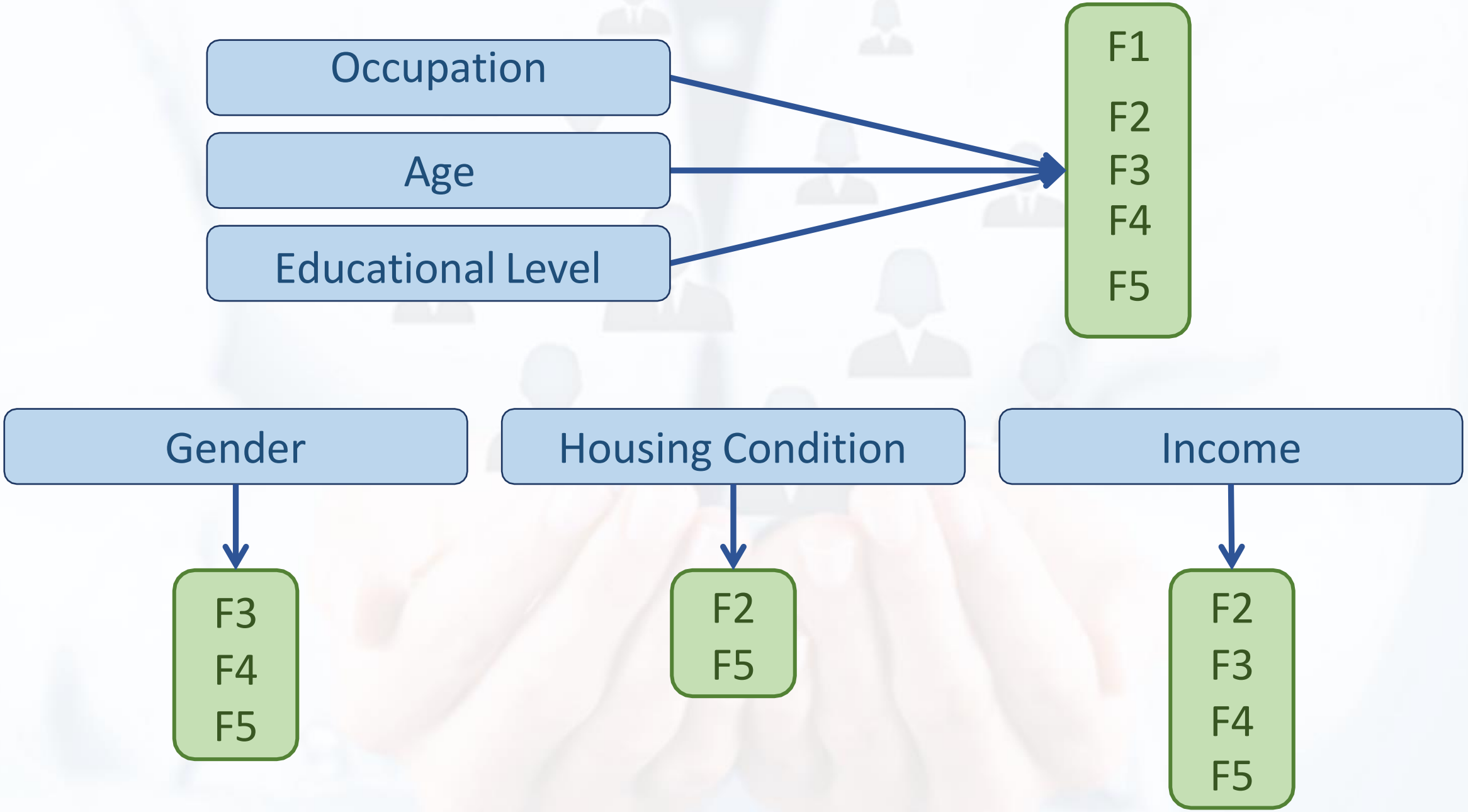
Factor	1	2	3	4	5
Customer friendly services (F1)	< 1-Lakh	Dependent person	Above 5 L	1-2 L	2-5 L
Characteristics of Bank (F2)	Above 5-L	2-5 L	1-2 L	< 1 L	Dependent person
Convenient and Required facilities (F3)	< 1-Lakh	Above 5 L	2-5 L	Dependent person	1-2 L
Additional facilities (F4)	< 1-Lakh	1-2 L	Above 5 L	Dependent person	2-5 L
Recommendation from people (F5)	Dependent person	1-2 L	2-5 L	< 1 L	Above 5 L

HOUSING CONDITION

Factor	1	2	3	4
Customer friendly services (F1)	Slum	Luxurious Apartment	Chawl	Building
Characteristics of Bank (F2)	Luxurious Apartment	Building	Chawl	Slum
Convenient and Required facilities (F3)	Slum	Luxurious Apartment	Chawl	Building
Additional facilities (F4)	Chawl	Building	Slum	Luxurious Apartment
Recommendation from people (F5)	Slum	Chawl	Building	Luxurious Apartment

CONCLUSION


Public Bank
Occupation
Housing Condition
Private Bank
Father's Education
Income
F1
F2
F3
F4
F5
Customer-Friendly Services
Characteristics of bank
Convenient and required facilities
Additional Facilities
Recommendation from people


Occupation
Age
Educational Level
F1
F2
F3
F4
F5
Gender
Housing Condition
Income
F3
F4
F5
F2
F5
F2
F3
F4
F5