

Construction of Financial Inclusion Index using Principal Component Analysis

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July 16, 2021

Financial Inclusion and the need for a Financial Inclusion Index

- India has made significant strides in financial inclusion
- As per CPHS, 2019 (Sep - Dec)

	% HH
Bank	94.5
Life insurance	51.7
Provident funds	13.8
Shares/mutual funds	2.47

- It is important to measure how households are faring on financial inclusion
- There is a literature on creating an index to aggregate this information
- Important because each instrument may not have the same effect on “financial inclusion”
- We use the method of “Principal Components Analysis (PCA)” to create an index.

- Components of the index:
 - ① Whether a household owns a financial asset
 - ② Whether a household has outstanding borrowing
 - ③ Number of adult members in a household who own financial assets
- Creating an index:
 - ① Inverse of mean as the weights - (INV) (Morris et al. ,2000)

$$I_j = w_1 \times (a_{1j}) + \dots + w_N \times (a_{Nj})$$
 - where a_{1j} to a_{Nj} are set of N variables(assets) for each household j
 - $w = \frac{1}{\bar{a}}$
 - ② First Principal Component as weights (PCA)(Filmer and Pritchett, 2001)

$$A_{1j} = w_{11} \times \frac{(a_{1j} - \bar{a}_1)}{(s_1)} + \dots + w_{1N} \times \frac{(a_{Nj} - \bar{a}_N)}{(s_N)}$$
 - where a_{1j} to a_{Nj} are set of N variables(assets) for each household j
 - \bar{a} is the mean and s is the standard deviation
 - w_1 is the coefficient of the first principal component
- Measuring the performance of an index:
 - Correlations with income and expenditure

- Centre for Monitoring Indian Economy's (CMIE) Consumer Pyramid Household Survey, Wave 3 (Sep - Dec), 2019.
- Four tables:
 - ① Household financial assets, borrowings: Aspirational India
 - ② Individual member assets: People of India
 - ③ Household consumption: Consumption Pyramids
 - ④ Household income: Income Pyramids.

Component 1 - Outstanding savings in financial instruments

- Whether household has outstanding savings in financial assets (binary variable)
 - ① Fixed Deposits
 - ② Provident Fund
 - ③ Life Insurance
 - ④ Mutual Funds
 - ⑤ Listed Shares
 - ⑥ Business
 - ⑦ Small Savings Instrument which includes Post Office Savings, NSC Bonds and Kisan Vikas Patra
 - ⑧ Other Financial Instruments

Component 2 - Outstanding borrowings

- Whether household has outstanding borrowings from financial sources (binary variable)
 - ① Bank
 - ② Credit Cards
 - ③ Money Lender
 - ④ Chit Funds
 - ⑤ MFI
 - ⑥ SHG
 - ⑦ NBFC Dealer
 - ⑧ Employer
 - ⑨ Shops
 - ⑩ Other Sources

Component 3 - Proportion of members with asset ownership

- Proportion of adults in the household that own financial instruments
 - ① Bank account
 - ② LIC
 - ③ Provident Fund account
 - ④ Health Insurance
 - ⑤ Credit Card
 - ⑥ Kisan Credit Card
 - ⑦ Demat account
- Each household will have a value between 0 and 1 for each of the assets.

Combinations of Financial Inclusion Index (FII)

- We take four combinations of components to create four indices
 - ① FII 1 - Outstanding savings in financial assets
 - ② FII 2 - Outstanding savings in financial assets + Magnitude of asset ownership
 - ③ FII 3 - Outstanding savings in financial assets + Magnitude of asset ownership + Outstanding borrowing
 - ④ FII 4 - Outstanding savings in financial assets + Outstanding borrowing

Weights of each variable

	Weights from PC1				
	IFW	Combination 1	Combination 2	Combination 3	Combination 4
Outstanding savings in financial instruments					
Business	12.11	0.13	0.04	0.04	0.13
Fixed Deposits	1.95	0.45	0.24	0.24	0.44
Life Insurance	1.72	0.48	0.39	0.38	0.46
Listed Shares	77.45	0.31	0.20	0.20	0.29
Mutual Funds	37.97	0.37	0.23	0.22	0.34
Other Fin Instruments	14.94	-0.08	0.05	0.06	-0.07
Provident Fund	5.70	0.37	0.37	0.36	0.35
Small Savings Instrument	3.40	0.42	0.23	0.23	0.40
Outstanding borrowings from					
Bank	7.66			0.09	0.15
Chitfunds	79.08			0.01	-0.01
Credit Cards	217.28			0.09	0.11
Employer	234.58			0.03	0.03
MFI	195.90			-0.00	-0.01
Money Lender	31.26			-0.00	-0.02
NBFC Dealer	35.40			0.06	0.04
Other Sources	50.73			0.04	0.03
Family & Friends	13.12			-0.02	-0.02
SHG	28.76			0.03	-0.07
Shops	3.53			-0.14	-0.22
Number of adult members in a household who own financial assets					
Bank account	1.06		0.03	0.02	
Credit Card	35.58		0.29	0.29	
Demat account	226.70		0.20	0.19	
Health Insurance	3.89		0.27	0.28	
Kisan Credit Card	51.05		0.03	0.03	
Life Insurance	2.25		0.41	0.40	
Provident Fund	15.27		0.36	0.35	

Eigen Values of First Principal Component for the four combinations

	Combination 1	Combination 2	Combination 3	Combination 4
Eigen value	1.94	3.27	3.38	2.05
Cumulative Variance percent	24.37	21.84	12.99	10.81

Spearman's correlation of indices and household monthly income and expenditure

Financial Inclusion Index	Inverse Frequency Weights		Principal Component Analysis	
	Expenditure	Income	Expenditure	Income
FII 1	0.43	0.47	0.5	0.55
FII 2	0.43	0.51	0.49	0.55
FII 3	0.35	0.38	0.48	0.56
FII 4	0.31	0.31	0.49	0.56

Future research

- Create index using additional Principal Components
- Multi-stage PCA (Noelia Camara & David Tuesta, 2018.)
- Create index based on rural- urban divide

Thank you