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Modeling The Performance Enablers Of Public Sector Banks Using Cfa And Conjoint Analysis.

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ABSTRACT

The progression of an economy is significantly dependent upon deployment as well as optimum utilization of resources and most importantly operational efficiency of the various sectors, of which banking sector plays a very vital role. Banking sector helps in stimulation of capital formation, innovation and monetization in addition to facilitation of monetary policy. It is imperative to carefully evaluate and analyze the performance of banks to ensure a healthy financial system and an efficient economy. Performance measurement is the most important activity of a management's control function of any organization.

Keywords: Operational efficiency, Performance Measurement, Component factors, Multi-attribute Decision-Making technique

1. Introduction

. Performance measurement can be done in a systematic way for the entire organization to determine things, such as determining the needs of customers and seeing if they are able to fulfill their requests or not and making sure that the taken decisions are made with facts.

This study suggested a model with twenty one performance enablers under five performance dimensions to evaluate the performance of banks through confirmatory factor analysis. Five performance dimensions namely: 1) Capital Adequacy (CA) 2) Asset Quality (AQ) 3) Management Efficiency (ME) 4) Earning Quality and 5) Liquidity are considered. In the present chapter, a framework is developed for modeling the performance dimensions of public sector banks. The proposed model demonstrates the relative importance of performance dimensions through conjoint analysis. The performance enablers reflect the financial performance, financial condition, operating soundness, regulatory compliance of the banking institution. The result produces a validated model that can help in diagnosing performance of banks.

2. Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) and exploratory factor analysis (EFA) are powerful statistical techniques. Exploratory factor analysis could be described as orderly simplification of interrelated measures. Confirmatory factor analysis is a useful statistical technique to verify the factor structure of a set of observed variables. CFA allows the researcher to test the hypothesis that a relationship between observed variables and their underlying latent constructs exists. The researcher uses knowledge of the theory, empirical research, or both, to postulates the relationship pattern and then tests the hypothesis statistically.

CFA requires the specification of a factor model, including the number of factors and the pattern of zero and nonzero loadings on those factors. A small number of theory-driven competing models might be specified as well. CFA provides information on how well the hypothesized model explains the relations among the variables. CFA has the advantages of allowing hypothesis testing on the data.

The confirmatory factor analysis was done using LISREL 8.52. The measurement model fit with the data was checked with model chi-square goodness-of-fit and approximate fit indices. Insignificant model chi-square goodness-of-fit (set at 0.05) signifies model fit. For approximate fit indexes, goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI), relative fit index (RFI), incremental fit index (IFI), tucker-lewis fit index (TFI) and comparative fit index (CFI) of above 0.9 would indicate model fit . For another approximate fit index, root mean square error of approximation (RMSEA) value less than 0.08, Root Mean Squared Residual (RMSR) value less than 0.05 would signify reasonable model fit. Significance of standardized regression weight (standardized loading factor) estimates signifies that the indicator variables are significant and representative of their latent variable. The

threshold values of propriety indicators are shown in Table :

Propriety indicators

Indicators	Propriety Indicators	Ideal Figures (Bogozzi and Yi, Y, 1988)
Absolute Propriety Indicators	$\chi 2$/d.f	1.0 - 3.0
	GFI	>0.90
	AGFI	>0.90
	SRMR	≤0.05
	RMSEA	≤0.08
Relative Propriety Indicators	NNFI	≥0.90
	NFI	≥0.90
	CFI	≥0.90

Literature review is a study involving a collection of literatures in the selected area of research in which the scholar has limited experience. In the past, various studies relating to the financial performance of banks have been conducted by researchers. Studies by Saveeta and Verma Sateesh (2001), Shravan Singh (2001), Kantawala Amita S (2004), Ketkar W Kusum et al. (2004), analyze the performance of banks from a profitability point of view, using various parameters. Most of the studies (Ganesan P 2001; Rayapati Vijayasree, 2002; Das M R, 2002-2003; and Gupta V & Jain P K, 2003) compared the performance of public, private and foreign banks by using measures of profitability, productivity, and financial management (Trehan Ruchi and Sonu Nitti, 2003). P Janaki Ramudu and S Durga Rao (2006) conducted a study on A Fundamental Analysis of Indian Banking Industry, by analyzing the performance of SBI, ICICI and HDFC. Gunjan M Sanjeev (2009) conducted a study on Efficiency of Indian public sector banks and found that the efficiency of public sector banks not increased during the period 2003-07. R.C.Dangwal and Reetu Kapoor (2010) conducted a study on financial performance of commercial banks. In this study they compared financial performance of 19 commercial banks with respect to eight parameters and they classified the banks as excellent, good, fair and poor categories. Raj Mohan S and Pashupati S (2010) conducted a study to evaluate the performance of TAICO bank using profitability ratios.

3. CONJOINT ANALYSIS (CA)

In the CA, respondents (customers) indicate their preference for a series of hypothetical multi-attribute alternatives, which are typically displayed as profiles of attributes. Given the responses to these profiles, conjoint analysis computes a mathematical regression to tell us how important each of the given attribute or factor is to the individual responding consumer, and to the group of responding consumers as a whole to yield estimates of the relative importance of the attributes.

The procedure of conjoint analysis consists of six steps. The fig 3.1 shows the step by step procedure for conducting conjoint analysis. The first step is to formulate the problem, which involves the identification of the salient attributes and their levels that are to be used in constructing the stimulus profiles in the second step. There are two approaches available in constructing the conjoint analysis stimuli namely pair-wise approach (two-factor evaluation) and full-profile approach (multiple-factor evaluations).

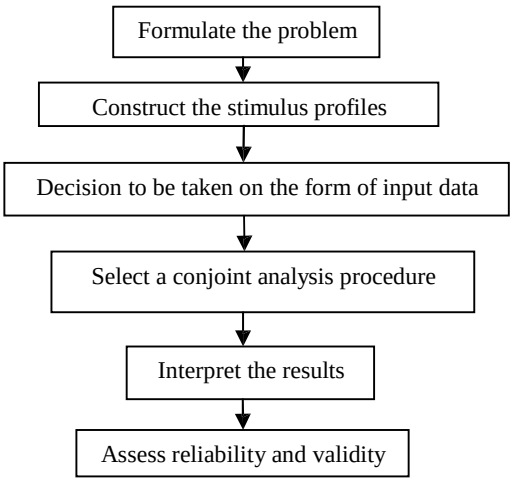


Fig.1

Procedure of conducting conjoint analysis:

In a simple conjoint analysis with a small number of factors and levels, the respondent evaluates all possible profiles. For example, 3 factors with 2 levels, the possible number of profiles (2×2×2 = 8) are 8. This format is known as a factorial design. If the conjoint task involves 4 factors with 4 levels for each factor, 256 profiles would be created in a full factorial design. In such a situation, it is too difficult for a respondent to rank all the profiles. The earlier research has shown that respondents can evaluate up to 30 profiles, but after that point the quality of the data may come into question. Therefore, the number of profiles in the full factorial design must be reduced. The process of selecting a sub set of all possible profiles must be done in a manner to preserve the orthogonality (no correlation among levels of an attribute) and balanced design aspect (each level in a factor appears the same number of times). A fractional factorial design is the most common method for defining a subset of profiles for evaluation. In this work, fractional factorial design is used to obtain convenient number of profiles for evaluation.

The next step is the decision to be taken on the form of input data. The input data can be

either non metric or metric. For non metric data, the respondents are typically required to provide rank order evaluations. In the metric form, the respondents provide ratings, rather than rankings. For the full-profile approach, respondents rank all the stimulus profiles. Non metric form of input data is considered in this work. In the fourth step, analysis of the data is carried out on the basis of choices made in the previous steps. If the rankings are collected, Monotonic Analysis of Variance (MONANOVA) is recommended. Part-worth utility for each level of customer needs is calculated in this step. Part-worth utility scores are used to determine the importance of each attribute (customer need) for that product. The basic conjoint analysis model is represented by the following formula.

The part-worth utility for each level $\left(PW_{il}\right)$ can be obtained by$_i$

$$U(x)=\sum_{i=1}^{m}\sum_{j=1}^{k_i}\alpha_{ij}x_{ij} \qquad (3.1)$$

where

$U\left(x\right)$ = overall utility of an alternative

α_{ij} = the part-worth utility associated with the j^{th} level $\left(j=1,2,...k_i\right)$ of the i^{th} customer nee

k_i = number of levels of i^{th} customer need

m = number of customer needs

x_{ij} = 1, if the j^{th} level of the i^{th} customer need is present

= 0, otherwise

The importance of a customer need I_i is defined in terms of the range of the part-worths, α_{ij} across the levels of that customer need.

For each customer need

$$I_i=\left\{\max\left(\alpha_{ij}\right)-\min\left(\alpha_{ij}\right)\right\} \qquad (3.2)$$

The relative importance (priority rating) w_i of the i^{th} customer need relative to other customer needs can be obtained by using the following equation.

$$w=\frac{I_i}{\sum_{i=1}^{} I_i} \qquad (3.3$$

Determination of relative weights of performance dimensions through conjoint analysis is explained in the following steps.

Step 1: Determination of relative weights of performance dimension

Relative weights of performance dimensions are determined through conjoint analysis. To conduct conjoint analysis, the levels of the performance dimensions are identified through discussions with banking professionals. The levels namely; Low, Medium and High are considered in the study.

Step 2: Generation of Profiles

Sixteen profiles are considered to facilitate the rating by the respondents through SPSS.

Step 3: Rating of the profiles

The preferential ranking data from bank employees on design profiles are collected through structured questionnaire to obtain utility scores with the help of SPSS.

Step 4: Determine utility scores

The preferential ranking data collected from students are used to obtain utility scores by conducting conjoint analysis with the help of SPSS.

Step 5: Prioritization of performance dimensions

Prioritization of performance dimensions is obtained by taking the utility range for the particular factor and dividing it by the sum of all the utility ranges

PRIORITIZATION OF PERFORMANCE ENABLERS OF BANKS:

The outline of the proposed methodology is discussed below.

Step 1: Validation of measurement items of performance dimensions

CFA is conducted to validate the measurement items (Performance enables) of performance dimensions. The performance of banks, both public and private, has been analyzed by academicians, scholars and administrators using CAMEL model in the last decade. The performance dimensions under CAMEL approach are Capital Adequacy (CA), Asset Quality (AQ), Management Efficiency (ME), Earning Quality (EQ) and Liquidity (LI) are considered in the study. Performance dimensions and their enables are briefly explained below.

In this study, in order to determine the domain that encompasses banks' performance measures an exhaustive theoretical, empirical and practitioner literature were reviewed. A conceptual

frame work is developed by incorporating ideas, theories and studies from literature. In this context, the following hypotheses are introduced and the conceptual frame work is shown in the Fig. 1.

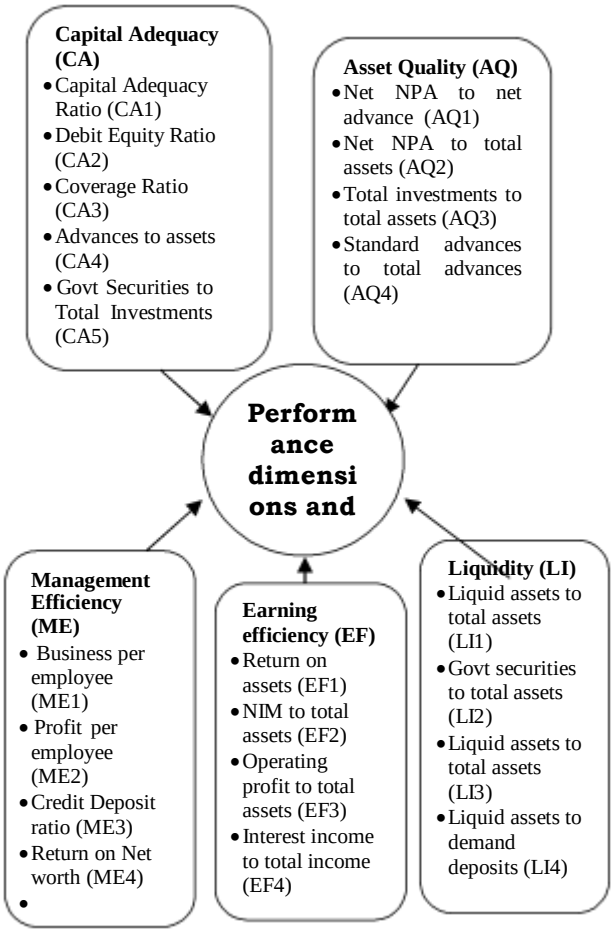
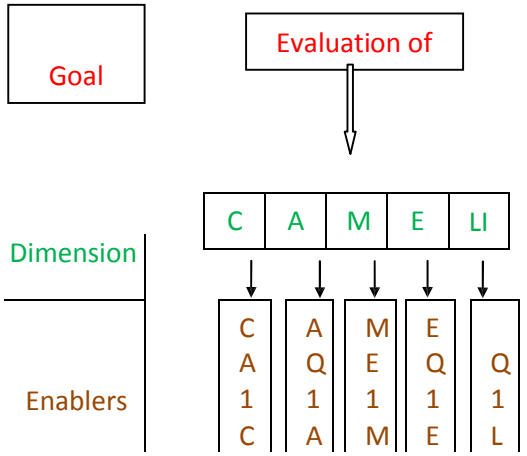


Figure 3.1: Conceptual Model

Data is collected through structured questionnaire survey and saved into LISREL 8.5 and analyzed. Statistical validity tests and analysis are then conducted such as reliability test and composite reliability tests, validity tests using confirmatory factor analysis (CFA) for construct validity, discriminant validity for multi-collinearity treatment.

Develop hierarchical decision making frame work

Hierarchical decision making frame work is developed with performance dimensions and their enablers. The performance enablers validated in the CFA will be considered in decision making frame work.



The conjoint analysis is adopted to provide the priority ratings by the stake holders. Relative weights of the performance dimensions are found through conjoint analysis. To conduct conjoint analysis, the levels of the performance dimensions of banks are identified through the discussions with the financial experts of the banks.

In the subsequent step, a full profile approach is adopted to carry out the conjoint analysis. This method requires that respondents rank a huge number of profiles. To reduce the number of profiles to a convenient size SPSS conjoint was used. The SPSS generates customized profiles which are ranked by the stake holders. The preferential ranking on profiles is used to obtain utility scores with the help of SPSS.

Prioritize the performance enablers of each performance dimension

Prioritization of the performance dimensions and their enablers of banks require the relative weights of the performance dimensions and the relative weights of the enablers of the respective dimension. In this study, relative weights of the performance dimensions are obtained through conjoint analysis. The relative weights of enablers are obtained through AHM (Analytic Hierarchy Model) approach from the aggregated responses from stake holders in terms of pair wise comparison matrices. The method can convert the relative importance between enablers into relative weights.

4. RESULTS AND DISCUSSION

Confirmatory Factor Analysis

Validation of the measuring items (performance enablers) of performance dimension is done through CFA. A list of 21 performance measurement items of banks is considered from literature on performance evaluation of banks. Each item was rated on a five-point Likert scale (1- Strongly disagrees; 2- Disagree; 3- Undecided; 4- Agree; 5-Strongly agree) according to the following question: "please assess the degree to which the performance measurement items of container terminals need to be adopted or implemented.

Data Collection

The data was collected by delivering the questionnaire to prospective respondents of bank's managers from various levels such as chief of department, chief of division and chief of sub division. They were requested to complete a questionnaire that contained measures of the concerned performance dimension. The questionnaires were distributed to the respondents by using proportionate stratified random sampling method. A total of 450 questionnaires were distributed, and only 259 completed surveys were

returned. The overall response rate was 57.9%. The demographic characteristics are shown below.

Reliability Assessment

Establishing construct reliability involves testing each of the multiple indicators of a construct. The traditional measure of reliability is Cronbach's Alpha. Since the data for this research was generated using scaled responses, it was deemed necessary to test for reliability. Cronbach's Alpha tests were performed on the four constructs. Based on the coefficient values, the items tested were deemed reliable as they were greater than 0.70. Average Variance Extracted (AVE) of Squared Multiple Correlation (SMC), Composite Reliability (CR) of latent variables is presented in Table 1.Composite Reliability (CR) and Average Variance Extracted (AVE) was more than 0.6 and 0.5 respectively indicating good construct reliability and adequate convergent validity. Also, standardized factor loadings (>0.65) showed that all the items in the model are well loaded on respective performance dimension.

Reliability Analysis of the measurement model in table :1

Performance dimension	**Item**	**Cronbach's Alpha**	**Standardized Factor Loadings**	**SMC**	**Composite Reliability (CR)**	**AVE**
Capital Adequacy	CA1	0.9676	0.74	0.55	0.9240	0.7088
	CA2	0.9672	0.86	0.73		
	CA3	0.9675	0.82	0.68		
	CA4	0.9668	0.89	0.79		
	CA5	0.9666	0.89	0.49		
Asset Quality	AQ1	0.9668	0.90	0.81	0.8564	0.7934
	AQ2	0.9677	0.68	0.46		
	AQ3	0.9665	0.97	0.95		
	AQ4	0.9663	0.98	0.96		
Management efficiency	ME1	0.9674	0.79	0.63	0.8790	0.6475
	ME2	0.9662	0.92	0.85		
	ME3	0.9666	0.85	0.73		
	ME4	0.9692	0.65	0.39		
Earning Quality	EQ1	0.9684	0.68	0.46	0.8509	0.5912
	EQ2	0.9660	0.93	0.87		
	EQ3	0.9679	0.74	0.55		
	EQ4	0.9684	0.70	0.49		
Liability	LI1	0.9679	0.80	0.63	0.8650	0.6177
	LI2	0.9685	0.74	0.55		
	LI3	0.9675	0.84	0.61		
	LI4	0.9679	0.76	0.99		

Performance Dimensions	Levels
Capital Adequacy (CA)	L_{11}: Low ; L_{12}: Medium; L_{13}: High
Asset Quality (AQ)	L_{21}:Low; L_{22}:Medium; L_{23}: High
Management Soundness(MS)	L_{31}: Low; L_{32}: Medium; L_{33}: High
Earning Quality (EQ)	L_{41}: Low; L_{42}: Medium; L_{43}: High
Liability (LI)	L_{51}: Low; L_{52}: Medium; L_{53}: High
Service Quality (SQ)	L_{61}: Low ; L_{62}: Medium ; L_{63}: High

Goodness of Fit Indices:

To evaluate the goodness of fit of CFA model various goodness-of-fit indicators were determined and shown in table 3. From the fit indices it is observed that the conceptual model was satisfactorily fit the data.

Table : Fit indices of structure model

Indicators	Propriety Indicators	Research Findings
Absolute Propriety Indicators	χ^2 /d.f	2.97
	GFI	0.82
	AGFI	0.76
	SRMR	0.055
	RMSEA	0.094
Relative Propriety Indicators	NNFI	0.97
	NFI	0.96
	CFI	0.97

Relative weight of Performance dimensions

Relative weights of the performance dimensions are found through conjoint analysis. To conduct conjoint analysis, the levels of the performance dimensions of banks are identified through the discussions with the financial experts of the banks. The performance dimensions and their levels are shown in table **

In the subsequent step, a full profile approach is adopted to carry out the conjoint analysis. This method requires that respondents rank a huge number of profiles. To reduce the number of profiles to a convenient size SPSS conjoint was used. The SPSS generated 22 profiles which are presented in the table. The respondents

were asked to rank the profiles from 1 to 22. The preferential ranking data on design profiles is shown in appendix. The preferential ranking data is used to obtain utility scores with the help of SPSS.

Utility Scores of performance Dimensions:

The utility scores or part worth utilities for each performance dimension obtained through conjoint analysis are presented in table . Part-worth utility scores indicate the influence of each factor level on the respondent's preference for a particular combination.

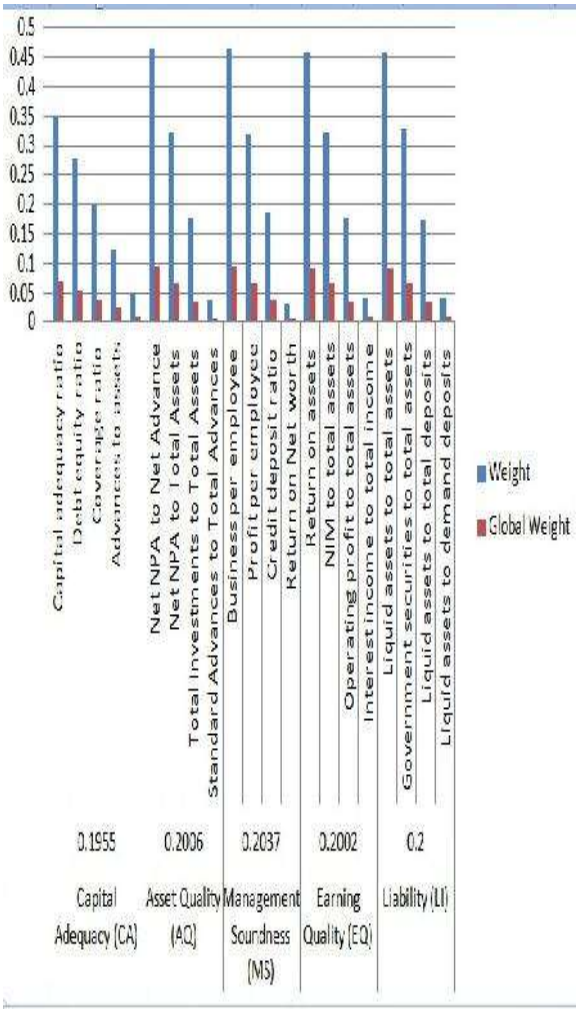
Table : Utility scores and their standard errors for each level of customer needs

The importance values are computed by taking the utility range for the particular factor and dividing it by the sum of all the utility ranges. The importance values for the customer needs are the priority ratings shown in table below are obtained by SPSS Conjoint. Relative weights of the performance dimensions are shown in table.

Utilities			
		Utility Estimate	Std. Error
CA	Low	-.213	.334
	Medium	.228	.334
	High	-.015	.334
AQ	Low	.245	.334
	Medium	-.166	.334
	High	-.079	.334
MS	Low	.389	.334
	Medium	.004	.334
	High	-.393	.334
ERQ	Low	-.017	.334
	Medium	-.275	.334
	High	.292	.334
LI	Low	-.169	.334
	Medium	-.264	.334
	High	.433	.334
(Constant)		9.500	.237

Performance Dimension	CA	AQ	ME	EQ	LI
Relative weights	0.196	0.201	0.204	0.200	0.200

Weight structure of the performance dimensions and their enablers are shown graphically



From the figure it is observed that high importance is obtained with business per employee, Net NPA to Net Advance, Return on assets and Liquid assets to total assets with weights of 0.0944, 0.0931, 0.0919 and 0.915 respectively. Medium importance is obtained with Capital adequacy ratio, Government securities to total assets, Profit per employee , NIM to total assets, Net NPA to Total Assets and debit equity ratio with relative weights

of 0.0684, 0.0656, 0.0653, 0.0648,0.0646 and 0,0543 respectively.

CONCLUDING REMARKS

This study suggested that the five factor model with 21 items of performance enablers of banks had a good fit. The present findings provide evidence to support that this is a valid instrument to determine enablers of performance dimensions of banks. The priority structure of performance dimensions is developed through conjoint analysis which is marketing research techniques adopted to consider the view points of multiple opinions of a group. The priority structure of enablers is obtained through AHM (Analytic Hierarchy Model) approach. The approach converts the subjective opinions of stakeholders on relative importance between the enablers into relative weights without consistency check as done in AHP. The proposed methodology is a robust multi-attribute decision-making technique for synthesizing the performance dimensions and their enablers. The study made in this chapter is useful to analyze the strategic decisions to improve the performance of banks by identifying the enablers upon which concentration are to be made by management.

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