

CONSTRUCTION OF STATISTICAL INDEX FOR BANKING SECTOR IN INDIAN STOCK MARKET

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Abstract: The banking sector is a key sector of Indian economy. The dynamics of stock market, the rise and the fall of Sensex is highly affected by the performance of Banking Sector Shares. BSE Bankex is available but it is based on only 10 banks chosen on the basis of highest capitalization in stock market. The BSE-Bankex is constructed using free float market capitalization methodology. The present paper is an effort to construct a representative index for this sector. In this paper the Principal component analysis is used to construct the index using daily closing stock prices of 32 major banks listed in Bombay Stock exchange on 1st Jan 2008. The constructed index is named as Bidex.

Key words: Bombay stock Exchange (BSE), Reserve bank of India (RBI), Factor analysis (FA), Principal component analysis (PCA), Kaiser-Meyer-Olkin (KMO), daily closing price, Bankex, Bidex.

1. Introduction

In India, the stock market fluctuates with respect to various sectors of economy. Banking sector is one of the influential sectors of the Indian economy. Banking sector comprises of various public and private sector banks. This sector directly influences the Indian stock market as well. Banks are a vital organ of any economic system; the banking sector provides an important platform to any economy. In Indian economic system, the banks are governed and monitored by Reserve Bank of India (RBI). The dynamics of stock market, the rise and the fall of Sensex is highly affected by the performance of Banking Sector Shares.

In this paper the research question was taken under study is whether the stock market fluctuates by the performance of bank shares. To study this aspect a separate banking sector index was needed. BSE Bankex is available but it is based on only 10 banks chosen on the basis of highest capitalization in stock market. The Bombay Stock Exchange Started "BSE BANKEX Index (Bankex)" on 23 June 2003 with base points 1000. Bankex consists of major Public and Private Sector Banks listed on BSE on the basis of market capitalization. Initially 12 banks were taken for the construction of Bankex but now only 10 banks (Annexure A1) are being used for the calculation of Bankex. The BSE-Bankex is constructed using free float market capitalization methodology.

In this study we have taken all banks listed in BSE on the date of 1st January 2008 to construct a new more representative index. The 32 banks were listed on this date. We have taken the daily closing stock prices of all banks listed. Hence 32 banks were selected for this study. In this study we propose that 32 banks can be taken for the calculation instead of using 10 banks. Hence a new index named as Bidex for banking sector is proposed here for banking sector.

2. Review of Literature

Popovska [4] constructed banking financial stability index using principal component analysis for Macedonian economy. It is a fair attempt to establish a methodology to construct an index for finding the reflection of economy. Luthra and Mahajan [2] studied the relationship of macroeconomic factors on BSE-Bankex using regression modeling. The exchange rate, inflation and GDP growth affect the Bankex significantly. Rao [5] studied the effect of monetary policy on the profit of banks in India using regression method. This study indicates a major impact of credit policy on the banks. The association between bank profitability and the monetary policy was found insignificant statistically for public sector banks. Chakrabarti and Sen [1] studied the latent structure of Indian stock market through exploratory factor analysis. The authors proposed the insight of possible portfolio mix for trading in Indian stock market. Munda and Nardo [3] provided the guidelines to find weights in their collaborative research. This paper shows real theoretical meaning of weights by the standard practice in constructing composite indicators.

3. Research Methodology

The index named as Bidex is constructed by applying the following step by step methodology.

Step 1 – Selection of Banks

We have taken closing stock prices of 32 listed banks on 1st Jan 2008 in BSE. The list is given in annexure.

Step 2 – Data

The secondary data were collected for consecutive 1733 days from 1st Jan 2008 to 31st Dec 2015 from Website of BSE.

Step 4 – Standardization of data values

The transformation of closing prices of banks is done using the means and standard deviations of data for 1733 days 32 banks individually and used for standardization as follows:

Standardized closing price = (closing price - mean price) / (SD)

Step 5 – Weighting of banks

The weights were calculated using factor analysis with Principal component method on the data collected for 32 banks. The four principal components were detected. The loadings were used to calculate the weights as follows (annexure)-

- a. Loadings were squared for all four components.
- b. The squared loadings were rationalized by their respective sum of squares.
- c. The highest rational square of loading was taken as weight for the corresponding bank.

Step 6 – Calculation of index (Bidex)

The Bidex was calculated by using the following formulae-

$$\text{Bidex} = [\sum (\text{Weight} \times \text{Standardized closing price}) / \sum \text{Weight}] \times 100$$

4. Results and Discussion

The Bidex is constructed using Factor analysis with Principal component method. The Varimax rotation method was selected for rotation of components. 86.74% variance is explained by the four principal components extracted in factor analysis. The KMO test was performed for the sampling adequacy and found 0.912 which signifies that the sample is adequate for conducting the PCA. Bartlett's test for sphericity was performed and found significant. The Bidex is constructed using loadings of banks on principal components. The Bidex and BSE- Bankex are presented graphically in graph 1 & graph 2 for the study period from 1st Jan to 31st Dec 2014. It can be observed that the Bidex shows rises and falls more clearly. Since Bidex is constructed using mean values hence negative values show the falls and positive values show the rises more clearly than Bankex. During the study period, major downfalls which were observed due to aftermath of global economic crisis in 2009 and major rises were observed on the following dates-

Table: Rises and falls of Bidex

	Bidex	Date	Value
Highest	1	5-Nov-10	33.5947
	2	9-Nov-10	33.3524
	3	10-Nov-10	33.1892
	4	8-Nov-10	33.1865
	5	4-Nov-10	33.0399
Lowest	1	9-Mar-09	-32.0134
	2	12-Mar-09	-31.5839
	3	6-Mar-09	-31.3659
	4	5-Mar-09	-31.2058
	5	13-Mar-09	-30.678

Chart 1: BSE- Bankex during study period

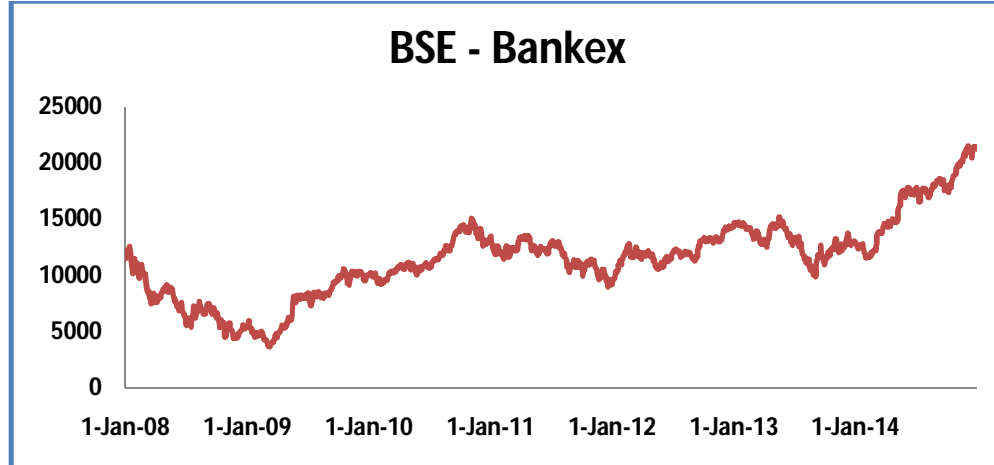
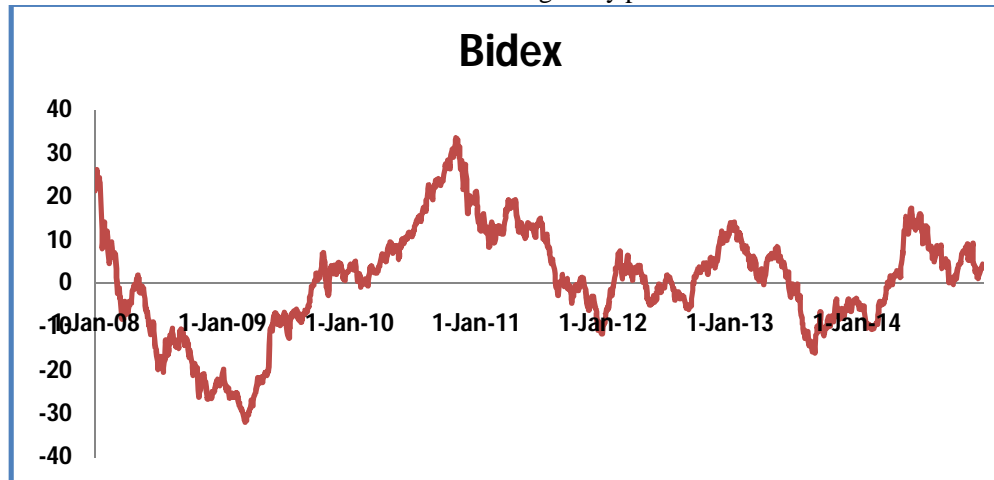


Chart 2: Bidex during study period



5. Conclusion

The construction of the index of the banking sector in this paper is an effort towards construction of a more adequate method for assessment as compare to the BSE-Bankex. The Bidex provides an insight of the fluctuations of banking sector of Indian economy. Since it is constructed using means hence negative values shows the downfalls and positive values shows the rises of the banking sector. Bidex shows the banking sector fluctuations more clearly in comparison to BSE- Bankex.

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7. Annexure

A1 : List of banks in BSE- Bankex	
Axis Bank Ltd	IndusInd Bank Ltd
Bank of Baroda	Kotak Mahindra Bank Ltd
Federal Bank Ltd	Punjab National Bank
HDFC Bank Ltd	State Bank of India
ICICI Bank Ltd	Yes Bank Ltd

A2 : KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.912
Bartlett's Test of Sphericity	Approx. Chi-Square	143598.893
	df	496
	Sig.	0.000

A3 : Communalities					
Bank	Initial	Extraction	Bank	Initial	Extraction
ALLAHABAD BANK	1	0.967	IDBI	1	0.912
ANDHRA BANK	1	0.962	INDIAN	1	0.879
AXIS	1	0.747	INDUSIND	1	0.95
BANK OF MAHARASTRA	1	0.913	IOB	1	0.875
BOB	1	0.837	J&K BANK	1	0.871
BOI	1	0.91	KARNATAKA BANK	1	0.839
CANARA	1	0.969	KARUR VYSYA	1	0.829
CBI	1	0.894	KOTAK MAHINDRA BANK	1	0.72
CITY UNION BANK	1	0.542	OBC	1	0.936
CORPORATION BANK	1	0.964	PNB	1	0.895
DCB BANK	1	0.883	SBI	1	0.917
DENA	1	0.894	SYNDICATE	1	0.907
DHANLAXMI BANK	1	0.858	UCO	1	0.868
FEDERAL	1	0.614	UNION BANK OF INDIA	1	0.925
HDFC	1	0.757	VIJAYA BANK	1	0.909
ICICI	1	0.847	YES	1	0.966

Extraction Method: Principal Component Analysis.

A4 : Total Variance Explained						
Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	Variance (%)	Cumulative %	Total	Variance (%)	Cumulative %
1	17.331	54.16	54.16	13.428	41.962	41.962
2	5.462	17.068	71.228	5.21	16.283	58.244
3	3.32	10.376	81.604	5.105	15.952	74.196
4	1.643	5.135	86.739	4.014	12.543	86.739
5	0.941	2.942	89.682			
6	0.662	2.069	91.75			
7	0.534	1.669	93.419			
8	0.442	1.38	94.799			
9	0.29	0.905	95.704			
10	0.212	0.663	96.367			
11	0.195	0.609	96.976			
12	0.168	0.525	97.501			
13	0.125	0.391	97.892			
14	0.104	0.326	98.217			
15	0.07	0.219	98.436			
16	0.063	0.198	98.634			
17	0.059	0.183	98.817			
18	0.05	0.156	98.973			
19	0.046	0.145	99.118			
20	0.044	0.136	99.255			
21	0.04	0.125	99.38			
22	0.034	0.106	99.486			
23	0.029	0.092	99.577			
24	0.027	0.083	99.661			
25	0.025	0.077	99.737			
26	0.02	0.063	99.801			
27	0.018	0.055	99.856			
28	0.013	0.04	99.896			
29	0.012	0.037	99.934			
30	0.009	0.029	99.963			
31	0.008	0.026	99.989			
32	0.004	0.011	100			

Extraction Method: Principal Component Analysis.

A5 : Rotated Component Matrix				
Banks	Component			
	1	2	3	4
SBI	0.513	-0.307	0.690	0.289
ALLAHABAD BANK	0.944	0.019	0.260	0.087
ANDHRA BANK	0.935	-0.037	0.173	0.236
BOB	0.656	-0.028	0.619	-0.152
BOI	0.761	-0.249	0.232	0.464
BANK OF MAHARASTRA	0.714	0.189	0.412	0.444
CANARA	0.949	0.144	0.217	-0.005

CBI	0.802	0.091	-0.123	0.477
CORPORATION BANK	0.742	-0.313	0.465	0.315
DENA	0.807	0.009	0.481	0.107
INDIAN	0.902	0.108	0.083	0.216
IOB	0.531	-0.214	0.186	0.717
OBC	0.874	0.139	0.340	0.192
PNB	0.710	-0.297	0.522	0.176
SYNDICATE	0.618	0.550	0.446	-0.154
UNION BANK OF INDIA	0.917	-0.053	0.076	0.277
UCO	0.760	0.297	0.449	-0.034
VIJAYA BANK	0.841	0.103	0.260	0.352
IDBI	0.783	-0.080	0.159	0.517
AXIS	0.440	-0.078	0.734	0.096
CITY UNION BANK	-0.027	0.720	0.070	0.132
DCB BANK	-0.070	0.900	-0.234	0.115
DHANLAXMI BANK	0.603	-0.272	-0.002	0.648
FEDERAL	0.624	-0.285	0.375	0.050
HDFC	0.494	-0.052	-0.235	0.675
ICICI	0.248	0.049	0.874	0.136
INDUSIND	0.011	0.807	-0.165	-0.520
J& K BANK	0.039	-0.108	0.921	-0.094
KARNATAKA BANK	0.126	0.485	0.148	0.752
KARUR VYSYA	0.589	0.687	0.086	0.049
KOTAK MAHINDRA BANK	-0.122	0.836	-0.046	0.065
YES	0.118	0.865	-0.138	-0.430

A6 : Weights of banks			
Banks	Weight	Banks	Weight
SBI	3.385	UCO	1.561
ALLAHABAD BANK	2.407	VIJAYA BANK	1.911
ANDHRA BANK	2.363	IDBI	2.418
BOB	2.719	AXIS	3.827
BOI	1.949	CITY UNION BANK	3.613
BANK OF MAHARASTRA	1.781	DCB BANK	5.642
CANARA	2.434	DHANLAXMI BANK	3.793
CBI	2.053	FEDERAL	1.052
CORPORATION BANK	1.539	HDFC	4.113
DENA	1.758	ICICI	5.433
INDIAN	2.198	INDUSIND	4.538
IOB	4.640	J&K BANK	6.031
OBC	2.064	KARNATAKA BANK	5.109
PNB	1.934	KARUR VYSYA	3.286
SYNDICATE	2.106	KOTAK MAHINDRA BANK	4.863
UNION BANK OF INDIA	2.269	YES	5.212