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IMPACT OF MACROECONOMIC VARIABLES ON SHARE PRICE OF SELECT BANKS: A FACTOR ANALYSIS APPROACH

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ABSTRACT   The Macroeconomic variables have influenced the share price of banking companies. This paper is based on the average monthly data (April, 2007 to March, 2017) of 12 macroeconomic variables. The factor analysis is adopted to derive the macroeconomic factors which determine the performance of stock market in India. Extracted factors were labelled namely, Macro Environment, Price Factor and Money Supply. Macro environment and money supply are the most influencing factors of share price in select Banks. Multiple regression is employed to analyze the impact of identified macro economic factors on share price of the select Banks. It has been established that there is a strong association between the share price of BSE and NSE.

KEYWORDS : Arbitrage Pricing Theory, Stock Market, Macro Environment, Data Reduction, Factor Analysis, Factor Scores.

Introduction

The Macroeconomic variables have considerable influence, positive as well as negative, in the stock market. The movement of stock prices, apart from the firms' fundamentals, also depends upon the level of development achieved in the economy and its integration towards the world economy. In this context, the two major theories on equilibrium pricing of securities have been developed namely-Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Markowitz (1952), Lintner (1965), Mossin (1966) and Arbitrage Pricing Theory (APT) suggested by Ross (1976). CAPM states that only non-diversifiable market risk influences expected security returns. However, APT does not restrict to market risk but many micro and macro factors can affect the security returns. Hence, APT gives better justification for stock market movement than other stock market proxies. Since macroeconomic variables are highly interdependent, using all of them as explanatory variables in affecting the stock market may pose severe multicolinearity problem and it becomes difficult to delineate the separate affects of different variables on the stock market movement. Deriving basic factors from such macroeconomic variables and employing these factors in pricing models can provide valuable information about the contents of priced factors in different stock markets. Generating orthogonal factor realizations eliminates the multicolinearity problem in estimating factor betas and serves to find the factors that are rewarded by the market. In this paper an attempt has been made to extract such factors from the multiplicity of macroeconomic variables in India and their impact on the Indian stock market.

II. Review of Literature

Rakesh kumar (2013) [1] attempted to find the influence of macroeconomic variables on the Indian stock market through the data reduction technique-factor analysis to derive the factors which determine the performance of stock market in India. The principal component analysis has highlighted that three factors are sufficient to explain the variation among the 12 variables included in the study. The study has concluded that industrial performance play significant role in influencing the stock market. Though some impact of policy rates cannot be denied but it does not seem sustainable. Market rely more on optimistic macroeconomic environment call for state's prudent efforts to maintain macro stability.

L.K.Tripathi, Arpan Parashar and Swathi Jaiswal (2014) [2] examined the long term relationship between selected external macro economic variables and different sectoral indices at national stock exchange the monthly statistical data for eight years covering the period from April 2005 to march 2013. In order to examine the relationship among variables multiple regression equation models was employed. The results revealed that there was a high correlation among the variables. Finally, it was stated that FII highly affects all sectoral Indices.

M.Jegadeeshwaran and R.Priya (2015) [3] they analysed the impact of macroeconomic factors on operational performance of commercial banks. Multiple regression was used to find significant relationship among macroeconomic variables and operational performance of commercial banks during the study period from 2006 to 2015. On the basis of overall analysis it is concluded that Gross domestic product, foreign direct investment, exports, Real interest rate and stock market turnover variables are relatively more significant and likely to influence the operational performance of commercial banks in India.

Dipi Sinha verma and KH. Anil Kumar (2016) [4] examined the relationship between share returns and macro economic variables among the sector specific indices of Indian stock market. They employed PCA to identify the relevant variables from the pool of ten variables under examination. As reported in correlation analysis, the variables under consideration are highly correlated and overall market index has significant influence on all sectorial index returns.

V.P.Velmurugan and K.A.Janardhanan(2016) [5] in their study attempted in empirically testing the relationship between macro economic factors and the performance of two major Indian security market indices of BSE- Sensex and NSE-Nifty. The yearly data from 1995-96 to 2014-15 are taken into consideration. FII's, Net investment, Exchange rates, Oil prices, Interest rates, inflation rates and gold rates are the macro economic factors involved in the study. Correlation and multiple regression analysis were used and the study found that stock market indices are influenced by macro economic factors.

III. Statement of the Problem

The last two decades have witnessed a dramatic change in world financial markets, particularly the stock markets and the banking sector. The fundamental causes of these changes were probably the end of fixed exchange rates and the international financial flows. Therefore, to predict the possible changes in the stock market those fundamental factors should be studied, which works as the triggers of changes and drives the market. There is a comprehensive group of macroeconomic variables that influences the stock prices in the share market of any country. The study of stock market is acquiring an important place in the modern business analysis. Hence, the present study is focused to understand the effects of the macroeconomic factors on the BSE and NSE banking stock indices.

IV. Objectives of the study

The objectives are

1) To study the relationship between the share price of select banks and macroeconomic variables and
2) To study the impact of macroeconomic variables on the share price of select banks.

V. Hypothesis of the Study
The hypotheses are

Ho1: There is no relationship between Macroeconomic variables and share price of select banks and

Ho2: There is no impact of selected sample macroeconomic variables on share price of select.

VI. Research methodology
Collection of Data
The study is based on secondary data only. It has been collected from stock exchange websites, published and unpublished financial reports, journals, magazines and various other websites.

Sample design
The top five banks in public and private sector have been selected based on market capitalization for the study. These banks are listed in BSE and NSE. The study has been undertaken to measure the various macro economic factors impact on the share price of select banks.

List of selected Banks and their classification

S.No	Public sector banks	Private sector banks
1	Bank of Baroda (BOB)	Axis Bank
2	Bank of India(BOI)	HDFC Bank
3	Canara Bank(CAN)	ICICI Bank
4	Punjab National Bank(PNB)	Indusind Bank
5	State Bank of India(SBI)	Kotak Mahindra Bank(KMB)

List of Macroeconomic Variables

NO	Variables	Symbol
1	Exchange rate	EXR
2	Foreign Exchange Reserve	FEXR
3	Gold Price	GP
4	Inflation Rate	WPI
5	Industrial Production	IIP
6	Foreign Direct Investment	FDI
7	Short Term Bond	STB
8	Long term Bond	LTB
9	NASDAQ Composite Index	NASDAQ
10	Foreign Institutional Investment	FII
11	Bombay Stock Exchange	BSE
12	National Stock Exchange	NSE

Period of the Study and Tools used
The study covers a period of 10 years from April 2007 - March 2017. The collected data was analyzed through, correlation, factor analysis and multiple regression analysis. VII. Data Analysis and Interpretation

Table 1 Correlations matrix for the Macroeconomic Variables for the period 2007-2017

	NSE	BSE	EXR	FEXR	GP	WPI	IIP	FDI	STB	LTB	NASDAQ	FII
NSE	1											
BSE	.999**	1										
EX RATE	.691**	.675**	1									
FOREX RESE	.800**	.782**	.941**	1								
GOLD	.636**	.621**	.809**	.822**	1							
WPI	-.249**	-.246**	-.336**	-.292**	-.053	1						
IIP	.735**	.721**	.728**	.809**	.840**	-.109	1					
FDI	.513**	.497**	.565**	.645**	.443**	-.348**	.470**	1				
SHT	.303**	.310**	.245**	.261**	.394**	.296**	.338**	.087	1			
LTM	.100	.125	-.105	-.077	.172	.337**	.094	-.147	.658**	1		
NASDAQ	.934**	.930**	.810**	.854**	.677**	-.231*	.740**	.535**	.455**	.128	1	
FII	.165	.169	.012	.013	.056	.076	.062	-.043	-.077	-.061	.093	1

The table 1 represents the correlation matrix for the macro economic variables. Correlation is a technique for investigating the relationship between any two quantitative, continuous variables. The strength of association between the price index of BSE and NSE is very high i.e.0.999 while compared to the other variables. Followed by the associations with Exchange rate and Foreign exchange reserve with 0.941. Association between NASDAQ price index and NSE price index stands third with 0.934. The high value of negative correlation is found between foreign direct investment and Whole sale price index with -0.348 and secondly, there is negative correlation between whole sale price index and Exchange rate with -0.336. The value of correlation determinant of correlation matrix close to zero confirms high relationship among all the variables.

Table 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.764
Bartlett's Test of Sphericity	Approx. Chi-Square	2147.968
	Df	66
	Sig.	0.000

Table 2 reveals the two tests which indicate the suitability of the data for factor analysis. Two tests, namely Kaiser-Meyer-Olkin measures of sampling adequacy (KMO) & Bartlett's Test of Sphericity have been applied to test whether the relationship among the variables has been significant or not. Bartlett's Test of Sphericity is used to test whether the data are statistically significant or not. With the value of test statistic and the associated significance level, it shows that there exists a high relationship among the variables (Not >0.05). The value of KMO measure of sampling adequacy is 0.764, which shows that the factor analysis may be considered an appropriate technique for analyzing the data. The value of chi-square = 2147.968, df = 66 is significant (p< 0.000) which further shows the appropriateness of data for factor analysis.

Table 3 Factors Derived by Principal Component Analysis Method Using Kaiser Criterion

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.334	52.785	52.785	6.334	52.785	52.785	6.326	52.713	52.713
2	2.012	16.765	69.551	2.012	16.765	69.551	2.020	16.834	69.547
3	1.110	9.254	78.804	1.110	9.254	78.804	1.111	9.258	78.804
4	.784	6.534	85.339						
5	.537	4.471	89.809						
6	.492	4.099	93.908						
7	.354	2.950	96.859						
8	.220	1.834	98.693						
9	.096	.803	99.495						
10	.043	.361	99.857						
11	.017	.140	99.996						
12	.000	.004	100.000						

The table 4.4 depicts the principal component analysis (PCA) method which provides the relationship between the extracted factors and the variables included in the analysis. It is technically termed as the factor loadings. The value of the factor loadings though indicates the relationships clearly but it is unable to group all the variables clearly identified with the factors. First factor consists of higher variance i.e.52.713. Hence, researcher is unable to extract the orthogonal factors. By continuing with these extractions researcher is not able to fully eliminate the problem. So, the unrotated and rotated matrix is performed.

Chart 1
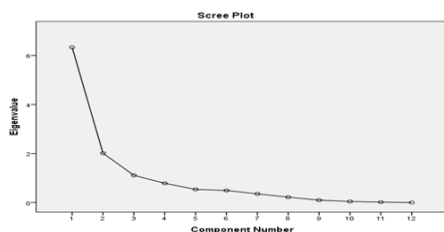
Scree Plot is a graphical criterion to determine the number of factors. It has been plotted in the figure. With the Scree Test (Cattell, 1966), the Eigen value associated with each factor and look for a break between the factors with relatively large Eigen values and those with smaller Eigen values. The factors that appear before the break are assumed to be meaningful and the retained for rotation; those appearing after the break are assumed to be unimportant and are not retained. In the figure, component numbers are listed on the horizontal axis while Eigen values are listed on the vertical axis. The figure clearly shows that after component 3, the plot shows a clear break, hence, corroborate our earlier result of the extraction of three factors.

Table 4 Rotated Component Matrix

Rotated Component Matrixa			
	Component		
	1	2	3
EX RATE	**.897**	-.130	-.108
FOREX RESE	**.954**	-.099	-.079
GOLD	.832	.196	-.041
WPI	-.303	**.664**	.210
IIP	**.861**	.124	.016
FDI	**.657**	-.284	-.212
SHT.BOND	.358	**.805**	-.147
LTM BOND	.047	**.866**	-.074
NASDAQ	.939	.112	.063
FII	.079	-.042	**.949**
BSE	**.899**	.060	.193
NSE	**.910**	.042	.184

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

Table 4 explains that the principal components analysis and rotated factor loading method is used to identify the factors. From the above table, it is observed that out of 12 variables, 3 factors namely, Macro Environment, Price Factor and Money Supply were identified by the rotation method.

Table 5 Identification of Macro Economic Variables Grouped by Factors

Factor	Variables	Name Assigned to the Factor
F1	Exchange rate, foreign exchange reserve, gold, industrial production, foreign direct investment, NASDAQ, BSE, NSE.	Macro Environment
F2	Wholesale price index, short term bond, long term bond.	Price Factor
F3	Foreign Institutional Investment	Money Supply

The table 5 elucidates that derived five factors have been named on their common features. Factor 1 is named as MACRO ENVIRONMENT FACTOR (MEF) as this group of variables are highly driven by demand and supply of market where as Factor 2 is named as PRICE FACTOR(PF) as this group of variables price of any economy. Factor 3 is named as MONEY SUPPLY FACTOR (MSF) as the variables of this group is related with the supply of money to the Economy.

Table 6 Impact of Extracted Factor Scores on the share price of select banks listed in BSE for the period 2007-2017

BSE	R^2	F-Statics (p value)	Constant	MEF Coefficient (p value)	PF Coefficient (p value)	MSF Coefficient (p value)
BOB	.621	63.435	0.000	0.000	0.002	0.002
BOI	.484	36.259	0.000	0.000	0.000	0.026
CAN	.211	10.358	0.000	0.304	0.000	0.000
PNB	.154	7.052	0.000	0.146	0.003	0.002
SBI	.466	33.702	0.000	0.361	0.000	0.000
AXIS	.863	2 43.343	0.000	0.000	0.275	0.000
HDFC	.949	713.434	0.000	0.000	.019	0.000
ICICI	.666	76.953	0.000	0.000	0.003	0.000
INDU SIND	.954	798.753	0.000	0.000	0.000	0.000
KMB	.909	387.064	0.000	0.000	0.950	0.000

Dependent Variable: share price of select banks Predictors: (Constant), Money Supply, Price Factor, Macro Environment

The table 6 depicts the regression results for the impact of Macroeconomic factors on share price of select banks listed on BSE and NSE. The dependent variable is the share price of select banks and the independent variables are extracted factors namely Money Supply, Price Factor, Macro Environment. R-square value indicates the per cent of performance variation accounted for the combined linear impact of independent variables. Coefficient implies the influence of factors over the share price of select banks listed in BSE. Macro environment does not influence the share price of Canara

bank, Punjab national bank and State bank of India. Price factor does not influence the share price of Axis bank and Kotak Mahindra bank. Money supply factor influences the share price of all the banks listed in BSE.

Table 7 Impact of Extracted Factor Scores on the share price of select banks listed in NSE for the period 2007-2017

NSE	R2	F-Statics (p value)	Constant	MEF Coefficient (p value)	PF Coefficient (p value)	MSF Coefficient (p value)
BOB	.621	63.283	0.000	0.000	0.002	0.002
BOI	.484	36.291	0.000	0.000	0.000	0.026
CAN	.211	10.347	0.000	0.307	0.000	0.000
PNB	.154	7.028	0.000	0.147	0.003	0.002
SBI	.466	33.730	0.000	0.362	0.000	0.000
AXIS	.862	242.260	0.000	0.000	0.274	0.000
HDFC	.948	710.756	0.000	0.000	0.017	0.000
ICICI	.670	78.521	0.000	0.000	0.003	0.000
INDU SIND	.953	798.614	0.000	0.000	0.000	0.000
KMB	.909	388.385	0.000	0.000	0.952	0.000

Dependent Variable: share price of select banks Predictors: (Constant), Money Supply, Price Factor, Macro Environment

Table 7 provides the regression results for the impact of Macroeconomic factors on share price of select banks listed on NSE. R-square value indicates the per cent of performance variation accounted for the combined linear impact of independent variables. Coefficient implies the influence of factors over the share price of select banks listed in NSE. Macro environment does not influence the share price of Canara bank, Punjab national bank and State bank of India. Price factor does not influence the share price of Axis bank and Kotak Mahindra bank. Money supply factor influences the share price of all the banks listed in NSE.

Conclusion

This study has investigated the effect of macroeconomic factors on select banks stock indices listed in BSE and NSE of India. This study performed necessary analysis to answer the research question of whether some of the identified macroeconomic factors have influence the share price of select Banks in India. On the basis of overall analysis it is concluded that Macro Environment and Foreign Institutional Investment are relatively more significant and likely to influence the share price of select banks listed in BSE and NSE India. Considering the changes in macroeconomic indicators, the banks should be able to anticipate potential crises in order to avoid negative consequences for the bank specific indicators.

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