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SHARPE'S SINGLE INDEX MODEL AND ITS APPLICATION TO CONSTRUCT OPTIMAL PORTFOLIO: AN EMPIRICAL STUDY

Niranjan Mandal

B.N. Dutta Smriti Mahavidyalaya, Burdwan

Abstract. An attempt is made here to get an insight into the idea embedded in Sharpe's single index model and to construct an optimal portfolio empirically using this model. Taking BSE SENSEX as market performance index and considering daily indices along with the daily prices of sampled securities for the period of April 2001 to March 2011, the proposed method formulates a unique cut-off rate and selects those securities to construct an optimal portfolio whose excess return to beta ratio is greater than the cut-off rate. Then, proportion of investment in each of the selected securities is computed on the basis of beta value, unsystematic risk, excess return to beta ratio and cut-off rate of each of the securities concerned.

*Keywords***:** Sharpe's Single Index Model, Return and Risk Analysis, Risk Characteristic Line, Portfolio Analysis, Optimal Portfolio Construction The modern portfolio theory was developed in early 1950s by Nobel Prize Winner

Harry Markowitz in which he made a simple premise that almost all investors invest in multiple securities rather than in a single security, to get the benefits from investing in a portfolio consisting of different securities. In this theory, he tried to show that the variance of the rates of return is a meaningful measure of portfolio risk under a reasonable set of assumptions and also derived a formula for computing the variance of a portfolio. His work emphasizes the importance of diversification of investments to reduce the risk of a portfolio and also shows how to diversify such risk effectively. Although Markowitz's model is viewed as a classic attempt to develop a comprehensive technique to incorporate the concept of diversification of investments in a portfolio as a risk-reduction mechanism, it has many limitations that need to be resolved. One of the most significant limitations of Markowitz's model is the increased complexity of computation that the model faces as the number of securities in the portfolio grows. To determine the variance of the portfolio, the covariance between each possible pair of securities must be computed, which is represented in a covariance matrix. Thus, increase in the number of securities results in a large covariance matrix, which in turn, results in a more complex computation. If there are n securities in a portfolio, the Markowitz's model requires n average (or expected) returns, n variance terms

and $\dfrac{n(n-1)}{2}$ covariance terms (i.e. in total $\dfrac{n(n+3)}{2}$ data-inputs). Due to these practical

difficulties, security analysts did not like to perform their tasks using the huge burden of data-inputs required of this model. They searched for a more simplified model to perform their task comfortably. To this direction, in 1963 William F. Sharpe had developed a simplified Single Index Model (SIM) for portfolio analysis taking cue from Markowitz's concept of index for generating covariance terms. This model gave us an estimate of a security's return as well as of the value of index. Markowitz's model was further extended by Sharpe when he introduced the Capital Assets Pricing Model (CAPM) (Sharpe, 1964) to solve the problem behind the determination of correct, arbitrage-free, fair or equilibrium price of an asset (say security). John Lintner in 1965 and Mossin in 1966 also derived similar theories

independently. William F. Sharpe got the Nobel Prize in 1990, shared with Markowitz and Miller, for such a seminal contribution in the field of investment finance in Economics (Brigham and Ehrhardt, 2002). Sharpe's Single Index Model is very useful to construct an optimal portfolio by analyzing how and why securities are included in an optimal portfolio, with their respective weights calculated on the basis of some important variables under consideration.

Objective of the Study

The main objectives of the study are:

1. To get an insight into the idea embedded in Sharpe's Single Index Model.

2. To construct an optimal portfolio empirically using the Sharpe's Single Index Model.

3. To determine return and risk of the optimal portfolio constructed by using Sharpe's Single Index Model.

Methodology

Relevant data have been collected from secondary sources of information (i.e.www.bseindia.com / www.riskcontrol.com). For this purpose BSE Sensex is taken as the market performance index. Daily indices along with daily prices of 21 sampled securities for the period of April 2001 to March 2011 are taken into consideration for the purpose of computing the daily return of each security as well as determining the daily market return. Taking the computed return of each security and the market, the proposed method formulates a unique Cut off Rate and selects those securities whose 'Excess Return-to-Beta Ratio' is greater than the cut off rate. Then to arrive at the optimal portfolio, the proportion of investment in each of the selected securities in the optimal portfolio is computed on the basis of beta value, unsystematic risk, excess return to beta ratio and the cut off rate of the security concerned. Different Statistical and Financial tools and techniques, charts and diagrams have been used for the purpose of analysis and interpretation of data.

SECTION I
SHARPE'S SINGLE INDEX MODEL: THE THEORETICAL INSIGHT

This simplified model proposes that the relationship between each pair of securities can indirectly be measured by comparing each security to a common factor 'market performance index' that is shared amongst all the securities. As a result, the model can reduce the burden of large input requirements and difficult calculations in Markowitz's mean-variance settings (Sharpe, 1963). This model requires only (3n+2) data inputs i.e. estimates of Alpha ( ) and Beta ( ) for each security, estimates of unsystematic risk (σ_{ei}^{2}) for each security, estimates for expected return on market index and estimates of variance of return on the market index (σ_{m}^{2}). Due to this simplicity, Sharpe's single index model has gained its popularity to a great extent in the arena of investment finance as compared to Markowitz's model.

Assumptions Made

The Sharpe's Single Index Model is based on the following assumptions:

1. All investors have homogeneous expectations.

2. A uniform holding period is used in estimating risk and return for each security.

3. The price movements of a security in relation to another do not depend primarily upon the nature of those two securities alone. They could reflect a greater influence that might have cropped up as a result of general business and economic conditions.

4. The relation between securities occurs only through their individual influences along with some indices of business and economic activities.

5. The indices, to which the returns of each security are correlated, are likely to be some securities' market proxy.

6. The random disturbance terms (e_i) has an expected value zero (0) and a finite variance. It is not correlated with the return on market portfolio (R_m) as well as with the error term (e_i) for any other securities.

Symbols and Notations Used

Following symbols and notations are used to build up this model:

R_i = Return on security i (the dependent variable)

R_m = Return on market index (the independent variable)

$_i$ = Intercept of the best fitting straight line of R_i on R_m drawn on the Ordinary Least Square (OLS) method or 'Alpha Value'. It is that part of security i's return which is independent of market performance.

$_i$ = Slope of the straight line (R_i on R_m) or 'Beta Coefficient'. It measures the expected change in the dependent variable (R_i) given a certain change in the independent variable (R_m) i.e. $\dfrac{dR_i}{dR_m}$.

e_i = random disturbance term relating to security i

W_i = Proportion (or weights) of investment in securities of a portfolio.

σ_{ei}^2 = unsystematic risk (in terms of variance) of security i

R_p = Portfolio Return

σ_p^2 = Portfolio Variance (risk)

$_p$ = Portfolio Beta

e_p = Expected value of all the random disturbance terms relating to portfolio.

σ_{ep}^2 = Unsystematic risk of the portfolio

i = 1, 2, 3, ……………, n

Mathematical Mechanism Developed

a) SIM: Return in the context of security.- According to the assumptions and notations above it is found that the return on security R_i depends on the market index R_m and a random disturbance term e_i. Symbolically,

$$R_i = f(R_m, e_i) \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (1)$$

Let the econometric model of the above function with R_i as the explained variable and R_m as the explanatory variable be:

$$R_i = \alpha_i + \beta_i R_m + \beta_i e \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (2)$$

where α_i and β_i are two parameters and e_i be the random disturbance term which follows all the classical assumptions i.e. $E(e_i) = 0$, $E(e_i\, R_m) = 0$, $E(e_i\, e_j) = 0\ \forall\ i \neq j$ (non-auto correlation) and $E(e_i, e_j) = \sigma_e^2\ \forall\ i = j$ (homosedasticity).

To determine the value of α_i and β_i we use the OLS method and get the following two normal equations :

$$\sum R_i = n\alpha_i + \beta_i \sum R_m \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3)$$

$$\sum R_i R_m = \alpha_i \sum R_m + \beta_i \sum R_m^2 \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (4)$$

Solving these two normal equations above by 'Cramer's Rule', we get

$$\alpha_i = \frac{\begin{vmatrix} \sum R_i & \sum R_m \\ \sum R_i R_m & R_m^2 \end{vmatrix}}{\begin{vmatrix} n & \sum R_m \\ \sum R_m & R_m^2 \end{vmatrix}}$$

or $\alpha_i = \dfrac{\sum R_i \sum R_m^2 - \sum R_m \sum R_i R_m}{n \sum R_m^2 - (\sum R_m)^2} \quad \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots$ (5) and

$$\beta_i = \frac{\begin{vmatrix} n & \sum R_i \\ \sum R_m & R_i R_m \end{vmatrix}}{\begin{vmatrix} n & \sum R_m \\ \sum R_m & R_m^2 \end{vmatrix}}$$

or $\beta_i = \dfrac{n \sum R_i R_m - \sum R_i \sum R_m}{n \sum R_m^2 - (\sum R_m)^2}$

$$\text{or } \beta_i = \frac{\frac{1}{n}\sum R_i R_m - \left(\frac{\sum R_i}{n}\right)\left(\frac{\sum R_m}{n}\right)}{\frac{1}{n}\sum R_m^2 - \left(\frac{\sum R_m}{n}\right)^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

(Dividing both sides by $\frac{1}{n^2}$)

$$\text{or } \beta_i = \frac{Cov(R_i R_m)}{Var(R_m)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

$$\text{or } \beta_i = \frac{r_{i\,m}}{\sigma_m^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Putting $Cov(R_iR_m) = r_{im}$

$$\text{or } \beta_i = \frac{i}{\sigma_m} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Following statistical table is prepared to show the necessary calculations for determining the value of $_i$ and $_i$:

Table-1 Necessary Calculations for Determining $_i$ & $_i$

| Number of pairs = n	R_i	R_m	R_m^2	$R_{im}R$
	R_{i_1}	R_{m_1}	$R_{m_1}^2$	$R_{i_1} \times _{m_1}$
	R_{i_2}	R_{m_2}	$R_{m_2}^2$	$R_{i_2} \times _{m_2}$
	.	.	.	.
	.	.	.	.
	.	.	.	.
	.	.	.	.
	R_{i_n}	R_{m_n}	R_m^2	$R_{i_n} \times _{m_n}$
	$\sum$	$\sum$	$\sum{}^2$	$\sum R_iR_m$

Putting these respective values of $\sum _i, \sum _m, \sum {}^2 _m, \sum R_iR_m$ and n in equation (6) we get the value of $_i$ and $_i$, then using the value of $_i$ and $_i$ we get required estimated (or regression) line of R_i on R_m as under:

$$R_i = {}_i + {}_i R_m \quad \ldots\ldots\ldots\ldots\ldots\ldots (10),$$ which establishes the linear relationship between security return and market return and is known as the Sharpe's Single Index Model. This model can graphically be represented in Figure-1 as follows:

Figure-1: Sharpe's Single Index Model (Graphical Exposition)
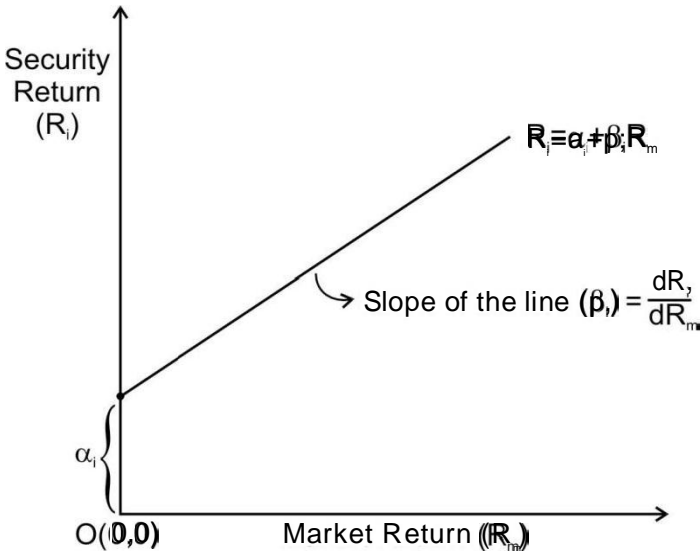
Thus, SIM divides the return into two parts:

1. Unique part α_i and

2. Market related part $\beta_i R_m$

The unique part α, the intercept term, is called by its Greek name 'Alpha' and is a micro event affecting an individual security but not all securities in general. It is obviously the value of R_i when $R_m = 0$. The market related part $\beta_i R_m$, on the other hand, is a macro event that is broad based and affects all or most of the firms. Beta (β), the slope of the line, is referred to as 'Beta Coefficient'. It is a measure of sensitivity of the security return to the movements in overall market returns. It shows how risky a security is, if the security is held in a well-diversified portfolio.

b) SIM: The Risk Characteristic Line- The line representing Sharpe Index Model is also known as the risk characteristic line. The concept of risk characteristic line conveys the message about the nature of security simply by observing its β value as follows:

1. Securities having $\beta > 1$ are classified as aggressive securities, since they go up faster than the market in a 'bull' (i.e. rising market), go down in a 'bear' (i.e. falling market).

2. Securities having $\beta < 1$ are categorized as defensive securities, since their returns fluctuate less than the market variability as a whole.

3. Finally, limiting case of securities having $\beta = 1$, are neutral securities, since their returns fluctuate at the same rate with the rate of market variability of return.

The risk characteristic lines of the above three cases are represented in Figure-2 below:

Figure-2: Risk-characteristic Lines of Security having $\beta < 1,$ $\beta > 1$ *and* $\beta = 1$
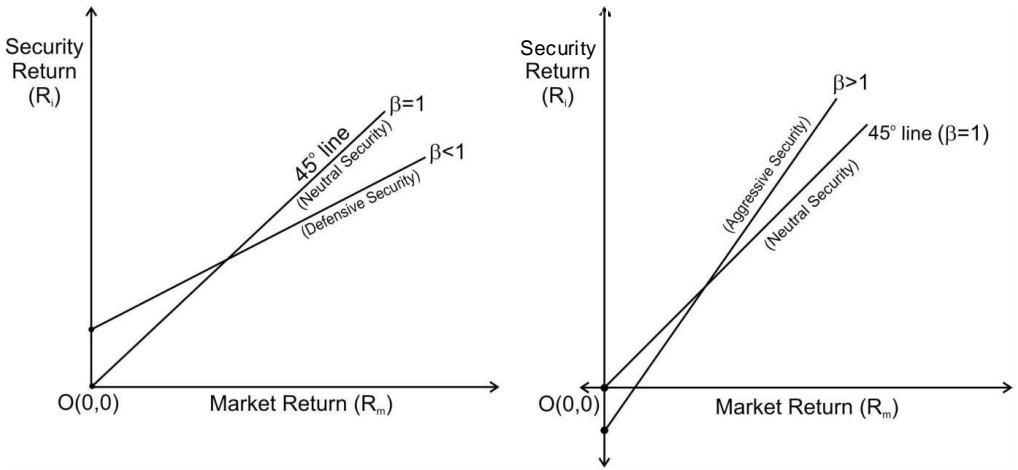
c) SIM: Return in the Context of Portfolio. - For establishing the relation between portfolio return and market return it is required to take the weighted average of the estimated returns of all the securities in the portfolio consisting of n-securities, as under :

$$\sum_{i=1}^{n} W_i R_i = \sum_{i}^{n} W_i \left(\alpha_i + \beta_i R_m + e_i \right) \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(11)$$

$$\text{or } \sum_{i=1}^{n} W_i R_i = \sum_{i}^{n} W_i \alpha_i + R_m \sum_{i}^{n} W_i \beta_i + \sum_{i=1}^{n} W_i e_i$$

$$\text{or } R_p = \alpha_p + \beta_p R_m + e_p \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (12),$$

$$\text{where } R_p = \sum_{i=1}^{n} W_i R_i, \quad \alpha_p = \sum_{i}^{n} W_i \alpha_i, \quad \beta_p = \sum_{i=1}^{n} W_i \beta_i \text{ and } e_p = \sum_{i=1}^{n} W_i e_i$$

According to the classical assumption, $e_p = \sum_{i=1}^{n} W_i e_i = $ and hence,

$$R_p = \alpha_p + \beta_p R_m \quad \dots\dots\dots\dots\dots (13).$$ This is the required estimated (or regression) equation of R_p on R_m, which establishes the relationship between portfolio return (R_p) and market return (R_m).

The following statistical table is prepared to show the necessary calculations for determining α_p and β_p :

n = Number of securities in the portfolio	W_i	α_i	$W_i\alpha_i$	β_i	$W_i\beta_i$
	W_1	α_1	$W_1\alpha_1$	β_1	$W_1\beta_1$
	W_2	α_2	$W_2\alpha_2$	β_2	$W_2\beta_2$
	.	.	.	.	.
	.	.	.	.	.
	.	.	.	.	.
	W_n	α_n	$W_n\alpha_n$	β_n	$W_n\beta_n$
	$\sum_{i=1}^{n} W_i = 1$	--	$\sum_{i=1}^{n} W_i\alpha_i$	--	$\sum W_i\beta_i$

d) SIM: Risk in Context of Security. In Sharpe's index model total risk of a security, as measured by variance, can be deduced by using the relationship between security return and market return (equation 2) as under:

$$Var\,(R_i) = Var\,(\alpha_i + \beta_i R_m + e_i)$$

or $Var\,(R_i) = Var\,(\alpha_i) + Var(\beta_i R_m) + Var(e_i)$

or $Var\,(R_i) = Var(\beta_i R_m) + Var(e_i)$ $\qquad [\because Var\,(\alpha_i) = 0,\ \alpha_i$ being a parameter]

or $\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{ei}^2$ ……………………………………..………………. (14)

Thus, total variance $\left(\sigma_i^2\right)$ = Explained variance $\left(\beta_i^2 \sigma_m^2\right)$ + Unexplained variance $\left(\sigma_{ei}^2\right)$.

According to Sharpe, the variance explained by the market index is referred to as systematic risk. The unexplained variance is called residual variance or unsystematic risk. It follows:

Total risk of a security $\left(\sigma_i^2\right)$ = Systematic risk $\left(\beta_i^2 \sigma_m^2\right)$ + unsystematic risk $\left(\sigma_{ei}^2\right)$.

e) **SIM: Risk in the context of portfolio.** - In SIM, the total portfolio risk (measured by variance) can similarly be deduced by using the relationship between portfolio return and market return [using equation-11] as under:

$$Var\left\{\left(\sum_{i=1}^{n} W_i R_i\right)\right\} = Var\left\{\left(\sum_{i=1}^{n} W_i (\alpha_i + \beta_i R_m + e_i\right)\right\}$$

or $Var\left\{\left(\sum_{i=1}^{n} W_i R_i\right)\right\} = Var\left\{\left(\sum_{i=1}^{n} W_i \alpha_i\right)\right\} + Var\left\{\left(R_m \sum_{i=1}^{n} W_i \beta_i\right)\right\} + Var\left\{\left(\sum_{i=1}^{n} W_i e_i\right)\right\}$

or $\sigma^2_{} = \left(\sum_{i=1}^{n} W_i \beta_i\right)^2 \sigma^2_m + \sigma^2_{ep}$

$\left[\because Var \sum_{i=1}^{n} W_i \alpha_i \alpha = 0, \text{ weights being constants and } _i\text{'s being parameters}\right.$

or $\sigma^2_p = \beta^2_p \sigma^2_m + \sigma^2_{ep}$ ....(15)

Sharpe's analysis suggests that total risk of the portfolio also consists of two components: (i) systematic risk and (ii) unsystematic risk of the portfolio. Therefore, we have

Total Portfolio Risk $\left(\sigma^2_p\right)$ = Systematic risk of the portfolio $\left(\beta^2_p \sigma^2_m\right)$ + Unsystematic risk of the portfolio $\left(\sigma^2_{ep}\right)$.

Advantages of SIM

The following are the main advantages of SIM:

a) The apparent advantage to Sharpe's Single Index Model (SIM) is that it considerably simplifies the portfolio problem in comparison to Markowitz's Full-Covariance Model. If we have n securities at our disposal, it requires (3n+2) estimates [i.e. $_i$, $_i$, σ^2_{ei} for each security] but Markowitz's model requires $\dfrac{n(n+3)}{2}$ estimates [i.e. R_i and σ^2_i for each security and $\dfrac{n(n-1)}{2}$ covariance terms].

b) It simplifies the computational techniques required for solving the problem.

c) It gives us an estimate of security's return as well as of the index value.

d) It greatly helps in obtaining the following inputs required for applying the Markowitz's model:

i) The expected return on each security i.e. $E(R_i) = {}_i + {}_i E(R_m)$,

ii) The variance of return on each security i.e.

$Var(R_i) = \beta^2_i Var(R_m) + Var(e_i)$, and

iii) The covariance of return between each pair of securities i.e.

$Cov(R_i R_j) = {}_i {}_j Var(R_m)$

All of the above inputs may be estimated on the basis of historical analysis and/or judgemental evaluation (i.e. ex-post and/or ex-ante analysis).

e) It is very useful in constructing an optimal portfolio for an investor by analyzing the logic behind the inclusion or exclusion of securities in the portfolio with their respective weights.

Sharpe found that there is a considerable similarity between the efficient portfolios generated by SIM and the Markowitz's model. From other studies (viz. Elton et al 1978 and Benari 1988), it is found that SIM performs fairly well. Since SIM simplifies considerably the input requirements and performs well, it represents a greater practical advance in portfolio analysis (Sinaee and Moradi, 2010).

Limitations Found

One of the most important limitations with Sharpe's Single Index model is that it does not consider uncertainty in the market as time progresses; instead the model optimizes for a single point in time (Khan and Jain, 2004). Moreover, this model assumes that security prices move together only because of common co-movement with the market. Many researchers have identified that there are influences beyond the general business and market conditions, like industry-oriented factors that cause securities to move together (Chandra, 2009). However, empirical evidence shows that the more complicated models have not been in a position to outperform the single index model in terms of their ability to predict ex-ante covariances between security returns (Reilly and Brown, 2006).

SECTION-II
CONSTRUCTION OF OPTIMAL PORTFOLIO BY USING SHARPE'S SINGLE INDEX MODEL

The construction of optimal portfolio is an easy task if a 'single value' explains the desirability of the inclusion of any security in a portfolio. This single value exists in Sharpe's Single Index Model where it is found that the desirability of any security is directly related to its 'excess return to beta ratio' (i.e. $\dfrac{R_i - r_f}{\beta_i}$). This means that the desirability of any security is solely a function of its excess return-to-beta ratio (Fischer & Jordan, 1995). If securities are ranked on the basis of excess return-to-beta ratio (from highest to lowest), the ranking represents the desirability of including a security in the portfolio. The selection of securities to construct an optimal portfolio depends on a unique cut off rate, C^* such that all the securities having $\dfrac{R_i - r_f}{\beta_i} \geq C^*$ will be included and at the same time all the securities having

$\dfrac{R_i - r_f}{\beta_i} < C^*$ will be excluded. Thus, to determine how and in what way judicious inclusion of securities is made in the construction of the optimal portfolio by using Sharpe's Single Index Model, the following steps are necessary:

1. Calculation of 'Excess Return-to-Beta ratio for each and every security under consideration.

2. Ranking of securities from highest 'Excess Return to Beta' $\left(i.e. \dfrac{R_i - r_f}{\beta_i} \right)$ lowest.

3. Calculation of values of a variable C_i for each and every security by using following formula:

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^{n} \frac{(R_i - r_f)}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum_{i=1}^{n} \frac{\beta_i^2}{\sigma_{ei}^2}}$$

4. Finding out the optimum C_i (i.e. C^*) upto which all the securities under review have excess return to beta above C^{**} i.e. $\frac{R_i - r_f}{\beta_i} \geq C$ and after that point all the securities have excess return to beta below C^{**} i.e. $\frac{R_i - r_f}{\beta_i} < C$.

5. Inclusion of securities having $\frac{R_i - r_f}{\beta_i} \geq C^*$ in the optimal portfolio.

6. Arriving at the optimal portfolio by computing the proportion of investment in each security included in the portfolio.

The proportion of investment in each of such security is given by :

$$W_i = \frac{Z_i}{\sum_{i=1}^{K} Z_i}, \quad \text{where} \quad Z_i = \frac{\beta_i^2}{\sigma_{ei}^2}\left(\frac{|i| - r_f}{\beta_i} - C^*\right) \quad i = 1, 2, \ldots, K \text{ out of } n$$

securities under review. It is to be noted that to determine how much to invest in each security the residual variance on each security, σ_{ei}^2 has a great role of play here.

Analysis of Data

To construct the optimal portfolio using Sharpe's single index model various statistical measures have been made on the basis of data relating to daily security prices along with daily market indices under study. Specifically, various statistics such as mean daily return (R_i), variance (σ_i^2) and standard deviation (σ_i) of daily return, standard deviation of market returns (σ_m), covariance (σ_{im}) and correlation (r_{im}) between daily security returns and the daily market returns, beta (β_i), systematic risk (σ_{im}) and unsystematic risk (σ_{ei}^2) of all the twenty one sampled securities have been calculated on the basis of daily share prices along with the market indices over a period of ten years (i.e. from April 2001 to March 2011). All these statistics as data input have been arranged in Table-1.

From Table-1 it is found that two securities viz. MTNL and DLF have contributed negative returns which could be due to some macroeconomic events in the secondary market. From Table-1 it is also seen that out of twenty one sampled securities only seven securities (viz. BHEL, DLF, Reliance India, HindalCo, ICICI Bank, SBI, Canara Bank) bearing beta

greater than one, have contributed 0.0445% to 0.1725% mean daily return except DLF (-0.0049% return). These seven securities are called the aggressive securities according to their beta values, greater than one. The rest of the securities having beta less than one are called defensive securities. All defensive securities have contributed positive mean daily return, ranging from 0.0402% to 0.1872%, with the exception of MTNL (having return -0.0197%) and SAIL (having negative beta, -1.3134, with positive return 0.1905%). The systematic (σ_{im}^{2}) risk of all the securities ranges from 1.6525% to 4.8112% and the domain of unsystematic risk (σ_{ei}^{2}) component of such securities is 2.0813% to 11.7754%. The total risk (σ_{i}^{2}) of all these securities ranges from 4.0188% to 16.8960%. The correlation coefficient of securities with the market ranges from 0.2774 to 0.7360.

As a criterion for the selection of securities, the Sharpe's Single Index Model proposes that the stocks having negative return are to be ignored. Actually, determining which of these securities should be selected in the portfolio depends on the ranking of securities (from highest to lowest) based on excess return to beta ratio $\left| \dfrac{R_{if} - r}{\beta_i} \right|$. The rule of ranking, applied here, states that the securities having highest *'excess return to beta ratio'* would be placed first, then comes the securities having second highest *'excess return to beta ratio'* and so on and so forth.

From Table-2 it is clearly seen that the security of Airtel India, having the highest *excess return to beta ratio* (0.37138904), occupies the first place. The security of Allahabad Bank, having the second highest excess return to beta ratio (0.18050778), occupies the second place. In this way Canara Bank, is third and BPCL fourth and so on. The security of Infosys Tech, having excess return to beta ratio (0.01932743), occupies the last place (18th) within the data set.

Table-1 : Data Need to Construct Optimal Portfolio Using Sharpe's Single Index Model $\sigma_m = 1.67$

Sl. No.	Company Security i	Mean Daily Return (R_i)	Variance (σ_i^2)	Standard Deviation (σ_i)	Covariance (σ_{ijm}) with Market	Correlation with the Market r_{im}	Beta (β_i)	$\beta_i \times \sigma_m$	(Systematic risk)^2 $\beta_i^2 \sigma_m^2$	Unsystematic Risk (σ_{ei}^2)
1.	ONGC	0.09354146	8.62416090	2.93669217	0.00023736	0.48387015	0.85067810	1.42063242	2.01819649	6.60596441
2.	BPCL	0.10146048	7.86666643	2.80475782	0.00017244	0.36806358	0.61801100	1.03207837	1.0651857	6.80148073
3.	SAIL	0.19059022	12.72599158	3.56735078	-0.00036954	0.61757295	-1.31344593	-2.1934547	4.81124353	7.91474805
4.	BHEL	0.14064942	7.92329822	2.81483538	0.00028252	0.60086421	1.01252867	1.69092288	2.85922018	5.06407804
5.	NALCO	0.10046810	11.83528449	3.44024483	0.00024778	0.43116904	0.88800397	1.48296663	2.19919002	9.63609447
6.	NTPC	0.07937121	4.59124749	2.14271965	0.00024799	0.6448048	0.76976635	1.28550980	1.65253545	2.93871204
7.	MTNL	-0.01972479	4.27890853	2.06855228	0.00017841	0.60836555	0.88766810	1.48240573	2.19752674	2.08138179
8.	GAIL	0.12277797	7.08111014	2.66103554	0.00024316	0.54702753	0.87142443	1.45527879	2.11783638	4.96327376
9.	COAL INDIA	0.06965161	4.01883828	2.00470404	0.00006830	0.27742122	0.45286009	0.75627635	0.57195392	3.44688436
10.	ENGINEERS INDIA LTD.	0.11720708	13.63777682	3.69293607	0.00022860	0.37010238	0.81716231	1.36466105	1.86229980	11.77547702
11.	ALLAHABAD BANK	0.1872439	8.12317261	2.8501180	0.0002693	0.5510804	0.9158945	1.52954381	2.33950428	5.78366833
12.	AMBUJA CEMENT	0.07048470	8.44529050	2.9060782	0.0002139	0.4405523	0.7664482	1.27996849	1.63831934	6.80697116
13.	DLF	-0.0049767	16.89600801	4.1104754	0.0006214	0.7359169	1.4725510	2.45916017	6.04746874	10.84853927
14.	INFOSYS TECH	0.04019130	9.87370678	3.1422455	0.0002638	0.5026080	0.9454694	1.57893389	2.49303225	7.38067453
15.	RELIANCE INDIA	0.0808451	6.89289948	2.6254332	0.0002844	0.6486778	1.0197465	1.70297665	2.90012948	3.9927700
16.	AIRTEL INDIA	0.1378261	8.35084925	2.8897836	0.0002236	0.2890469	0.3120940	0.52119698	0.27164629	8.07920296
17.	HINDALCO	0.0445422	10.71122376	3.2728006	0.0002805	0.5130665	1.0052432	1.67875614	2.8182222	7.89300156
18.	ICICI BANK	0.1240136	9.13774787	3.0228708	0.0003536	0.7003472	1.2673921	2.11654480	4.47976192	4.65798595
19.	SBI	0.1348221	6.10157828	2.4701373	0.0002960	0.7174836	1.0609895	1.77185246	3.13946115	2.96211713
20.	UCO BANK	0.1411155	9.11336355	3.0188348	0.0003074	0.5754004	0.9815735	1.63922774	2.68706759	6.42629596
21.	CANARA BANK	0.1725621	9.58923626	3.0966492	0.0003314	0.5916341	1.0128097	1.69139220	2.8608075	6.72842876

Compilation is based on:

i) Data : Daily share prices of sampled securities and daily market index.

ii) Period : 1st April, 2001 – 31st March, 2011

iii) Data Source : www.bseindia.com and www.riskcontrol.com.

Table-2 : Ranking of Securities on the Basis of Excess Return to Beta Value where $r_f = 8\%$ p.a. = 0.02192% per day is taken

Sl. No.	Company Security i having Positive Mean Return and Positive Beta Value	Mean Daily Return (R_i)	Excess of Mean Daily Return over Risk-free Rate (daily) (R_i-r_f)	Beta Value (β_i)	Excess Return to Beta $\left(\dfrac{R_i - r_f}{\beta_i}\right)$	Rank according to Highest to Lowest $\left(\dfrac{R_i - r_f}{\beta_i}\right)$
1.	ONGC	0.09354146	0.07162365	0.85067810	0.08419595	11
2.	BPCL	0.10146048	0.07954267	0.61801100	0.12870753	4
3.	BHEL	0.14064942	0.11873161	1.01252867	0.11726247	6
4.	NALCO	0.10046810	0.02191781	0.88800397	0.02468211	16
5.	NTPC	0.07937121	0.0574534	0.76976635	0.07463745	13
6.	GAIL	0.12277797	0.10086016	0.87142443	0.11574172	8
7.	COAL INDIA	0.06965161	0.0477338	0.45286009	0.10540518	10
8.	ENGINEERS INDIA LTD.	0.11720708	0.09528927	0.81716231	0.11660997	7
9.	ALLAHABAD BANK	0.1872439	0.16532609	0.9158945	0.18050778	2
10.	AMBUJA CEMENT	0.0704847	0.04856689	0.7664482	0.0633662	14
11.	INFOSYS TECH	0.0401913	0.01827349	0.9454694	0.01932743	18
12.	RELIANCE INDIA	0.0808451	0.05892729	1.0197465	0.05778621	15
13.	AIRTEL INDIA	0.1378261	0.11590829	0.3120940	0.37138904	1
14.	HINDALCO	0.0445422	0.02262439	1.0052432	0.02250638	17
15.	ICICI BANK	0.1240136	0.10209579	1.2673921	0.08055580	12
16.	SBI	0.1348221	0.11290429	1.0609895	0.10641414	9
17.	UCO BANK	0.1411155	0.11919769	0.9815735	0.12143532	5
18.	CANARA BANK	0.1725621	0.15064429	1.0128097	0.14873899	3

Compilation is based on:

i) Data : Daily share prices of sampled securities and daily market index.

ii) Period : 1st April, 2001 – 31st March, 2011

iii) Data Source : www.bseindia.com and www.riskcontrol.com.

Now it is necessary to determine the securities for which *excess return to beta ratio* is greater than a particular cut off value C^* of the variable C_i. In Table-3 securities are arranged according to their rank and finally value of C_i for each of such securities are computed using the formula of C_i given as :

$$C_i = \frac{\sigma_m^2 \sum_{i=1}^{n} \frac{(R_i r_f)}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum_{i=1}^{n} \frac{\beta_i^2}{\sigma_{ei}^2}} , \text{ where}$$

σ_m^2 indicates the market index and σ_{ei}^2 refers to the variance of a security's movement that is not associated with the fluctuation of the market index.

Table-3 : Calculations for Determining the Cut off Rate, C where $_m = 1.67$, $r_f = 8\%$ p.a. = 0.02192% per day.

Rank on the Basis of Excess Return to Beta	Company Security i according to Rank	$\left(\dfrac{R_i - r_f}{\beta_i}\right)$	$\dfrac{(R_i - r_f)\beta_i}{\sigma_{ei}^2}$	$\dfrac{\beta_i^2}{\sigma_{ei}^2}$	$\sum_{i=1}^{n}\dfrac{(R_i-r_f)\beta_i}{\sigma_{ei}^2}$	$\sum_{i=1}^{n}\dfrac{\beta_i^2}{\sigma_{ei}^2}$	$C_i = \dfrac{\sigma_m^2 \sum_{i=1}^{n}\dfrac{(R_i-r_f)\beta_i}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum_{i=1}^{n}\dfrac{\beta_i^2}{\sigma_{ei}^2}}$
1.	AIRTEL INDIA	0.37138904	0.00447745	0.01205597	0.00447745	0.01205597	0.01208096
2.	ALLAHABAD BANK	0.18050778	0.02618083	0.14503991	0.03065828	0.15709588	0.05945442
3.	CANARA BANK	0.148738988	0.02267602	0.15245513	0.0533343	0.30955101	0.07982798
4.	BPCL	0.12870753	0.00722758	0.05615506	0.06056188	0.36570607	0.08361778
5.	UCO BANK	0.12143532	0.01820664	0.14992875	0.07876852	0.051563482	0.09010363
6.	BHEL	0.117262467	0.02373959	0.20244836	0.10250811	0.71808318	0.09521047
7.	ENGINEERS INDIA LTD.	0.116609967	0.00661262	0.05670719	0.10912073	0.77479037	0.09628118
8.	GAIL	0.11574172	0.01770847	0.15299993	0.1268292	0.9277903	0.09859583
9.	SBI	0.10641414	0.04044076	0.38003180	0.16726996	1.3078221	0.10037885
10.	COAL INDIA	0.10540518	0.00627138	0.05949786	0.17354134	1.36731996	0.10055213
11.	ONGC	0.08419595	0.00922328	0.10954543	0.18276462	1.47686539	0.09957593
12.	ICICI BANK	0.0805558	0.02777926	0.34484491	0.21054388	1.8217103	0.09656759
13.	NTPC	0.07463745	0.01504934	0.20163263	0.22559322	2.02334293	0.09471117
14.	AMBUJA CEMENT	0.0633662	0.00546851	0.08630018	0.23106173	2.10964311	0.09361519
15.	RELIANCE INDIA	0.05778621	0.01504993	0.26044147	0.24611166	2.37008458	0.09019543
16.	NALCO	0.02468211	0.00201981	0.08183305	0.24813147	2.45191763	0.08828787
17.	HINDALCO	0.02250638	0.00288141	0.12802656	0.25101288	2.57994419	0.08542187
18.	INFOSYS	0.019327426	0.00234084	0.12111526	0.253335372	2.70105945	0.08280551

Compilation is based on:

i) Data : Daily share prices of sampled securities and daily market index.

ii) Period : 1st April, 2001 – 31st March, 2011

iii) Data Source : www.bseindia.com and www.riskcontrol.com.

From Table-3 it is seen that $\dfrac{R_f - r_f}{\beta_i}$ values of the first ten securities exceed the C_i values of the respective securities. The C_i value of the 10th security (COAL INDIA) would be the cut off value $C^* = C_{10} (0.10055213)$ below which 'excess return to beta ratio' is less than the respective C_i value of the security $\left|\dfrac{R_f - r_f}{\beta_i}\right| \langle C_i$ and the collection of these top ten securities, having $\dfrac{R_f - r_f}{\beta_i} \geq C^*$, make it to the optimal portfolio.

After identifying the composition of the optimal portfolio, the next step is to determine the proportion of investment (i.e. weights) in each of the securities in the optimal portfolio as shown in Table-4, using the formula of W_i cited earlier.

Table-4 : Calculation of Zi and Wi for the Selected Securities in the Optimal Portfolio

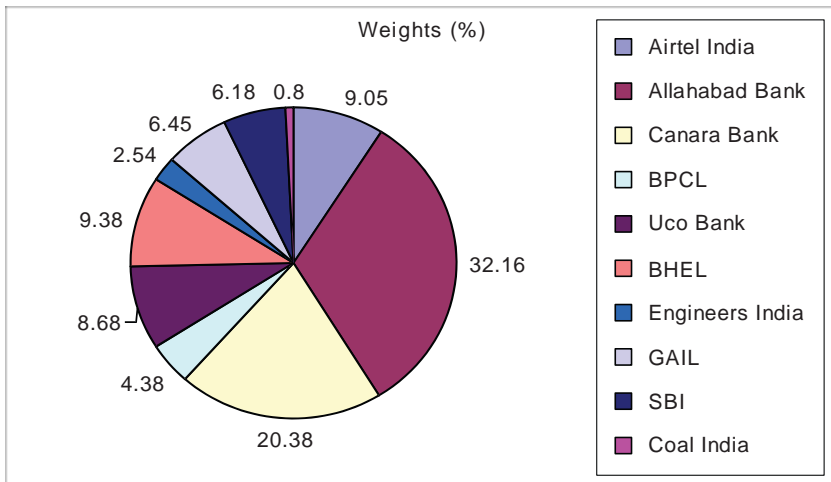| Selected Securities in the Optimal Portfolio	$\dfrac{R_i - r_f}{\beta_i}$	$\dfrac{\beta_i^2}{\sigma_{ei}^2}$	$Z_i = \dfrac{\beta_i^2}{\sigma_{ei}^2}\left(\dfrac{R_i - r_f}{\beta_i} - C^*\right)$	Percentage of Investment of each Selected Security $W_i = \dfrac{Z_i}{\sum Z_i} \times 100$	Approximate Value of W_i (%)
AIRTEL INDIA	0.37138904	0.01205597	0.00326520	9.05	9
ALLAHABAD BANK	0.18050778	0.14503991	0.01159676	32.16	32
CANARA BANK	0.148738988	0.15245513	0.00734633	20.38	20
BPCL	0.12870753	0.05615506	0.00158107	4..38	4
UCO BANK	0.12143532	0.14992875	0.00313099	8.68	9
BHEL	0.117262467	0.20244836	0.00338298	9.38	9
ENGINEERS INDIA LTD.	0.116609967	0.05670719	0.00091059	2.54	3
GAIL	0.11574172	0.15299993	0.00232401	6.45	7
SBI	0.10641414	0.38003180	0.00222775	6.18	6
COAL INDIA	0.10540518	0.05949786	0.00028875	0.80	1
TOTAL	–	–	$\sum Z_i = 0.03605443$	$\sum W_i = 100$	100

Compilation is based on:

i) Data : Daily share prices of sampled securities and daily market index.

ii) Period : 1st April, 2001 – 31st March, 2011

iii) Data Source : www.bseindia.com and www.riskcontrol.com.

From Table-4 it is seen that weight W_i for the selected securities in the optimal portfolio of stocks viz Airtel India, Allahabad Bank, Canara Bank, BPCL, Uco Bank, BHEL, Engineers India, GAIL, SBI, Coal India are 9.05%, 32.16%, 20.38%, 4.38%, 8.68%, 9.38%, 2.54%, 6.45%, 6.18% and 0.80% respectively.

This proportion of stocks in the composition of optimal portfolio can be shown in the following Pie diagram (Figure 3):

Figure 3 : Stock Composition in the Optimal Portfolio (Constructed)

Now the portfolio return, portfolio beta and risk components of the optimal portfolio constructed above can be computed on the basis of the compiled data shown in Table -5 below:

Table-5 : Calculation for Computing Portfolio Return $(R_p$ and Portfolio Risk $()_p$

Selected securities in the optimal portfolio	Mean Daily Return R_i	Standard Deviation of Returns σ_i	Beta Value β_i	Proportion of Investment W_i	σ_{ei}	W_iR_i	$W_i\beta_i$	$W_i\sigma_{ei}$
Airtel India	0.1378261	2.8897836	0.3120940	0.09	2.8424	0.0124	0.0281	0.2558
Allahabad Bank	0.1872439	2.8501180	0.9158945	0.32	2.4049	0.0599	0.2931	0.7696
Canara Bank	0.1725621	3.0966492	1.0128097	0.20	2.5928	0.0345	0.2026	0.5186
BPCL	0.10146048	2.80475782	0.61801100	0.04	2.6080	0.0041	0.0247	0.1043
UCO Bank	0.1411155	3.0188348	0.9815735	0.09	2.5350	0.0127	0.0883	0.2282
BHEL	0.14064942	2.81483538	1.01252867	0.09	2.2504	0.0126	0.0911	0.2025
Engineers India Ltd.	0.11720708	3.69293607	0.81716231	0.03	3.4315	0.0035	0.0245	0.1029
GAIL	0.12277797	2.66103554	0.87142443	0.07	2.2278	0.0086	0.0610	0.1559
SBI	0.1348221	2.4701373	1.0609895	0.06	1.7211	0.0081	0.0637	0.1033
Coal India	0.06965161	2.00470404	0.45286009	0.01	1.8566	0.0007	0.0045	0.0186
TOTAL	-	-	-	$\sum W_i = 1.00$		$\sum W_iR_i = 0.1571$	$\sum W_i\beta_i = 0.8816$	$\sum W_i\sigma_{ei} = 2.4597$

Compilation is based on:

i) Data : Daily share prices of sampled securities and daily market index,

ii) Period : 1st April, 2001 – 31stMarch, 2011,

iii) Data Source : www.bseindia.com and www.riskcontrol.com.

On the basis of information arranged in Table-5 the following results can be extracted:

i) Portfolio Return $(R_p) = (\sum W_i R_i)$ 0.1571% per day

$$= 4.713\% \text{ per month}$$
$$= 0.1571 \times 365 \text{ per annum}$$
$$= 57.34\% \text{ per annum}$$

ii) Portfolio beta, $\beta_{pi} = \sum W_i\beta_i$ 0.8816 less than one indicating the defensive nature of the portfolio.

iii) Systematic risk of the portfolio $(\beta_{pm}^2\sigma_m^2 =)$ $(0.8816)^2 \times (1.67)$ 2.1676% (approx), which comes from economy-wide factors.

iv) Unsystematic risk of the portfolio $(\sigma_{ep}^2) = (\sum W_i\sigma_{ei})^2$ 6.0501% , which comes from firm-specific factors i.e. the internal environmental factors.

v) Total risk of the portfolio $\left(\sigma_p^2\right) = 2.1676 + 6.0501 = 8.2177\%$ (in terms of variance)

Or

Total risk of the portfolio $\left(\sigma_p\right) = \sqrt{8.2177} = 2.87\%$ (in terms of S.D.)

From the above results it is seen that the portfolio return is higher than the average returns of the individual stocks in the optimal portfolio with the exception of Allahabad Bank and Canara Bank. The beta value of the optimal portfolio is less than one which indicates that the returns from the portfolio fluctuates at a slower rate than that of the market index. The unsystematic risk (firm specific) of the optimal portfolio is 6.05% in terms of variance which is much higher than that of the systematic risk (2.1676%), of the portfolio. The total risk of the portfolio (2.87%, in term of SD) is less than that of the securities in the portfolio with the exception of Airtel India, Canara Bank, UCO Bank & Engineers Ltd.

According to Markowitz's Mean-Variance Model, portfolio risk (in terms of variance) is given by:

$$\sigma_p^2 = \sum_{\substack{i=1 \\ ij=}}^{n} W_{ii}^2 \sigma \sigma + \sum_{\substack{i=1 \\ ij\neq}}^{n} W_i \sum_{j=1}^{n} \ldots\ldots W \ldots\ldots \ldots\ldots\ldots\ldots\ldots\ldots (16)$$

In terms of S.D. it as under:

$$\sigma_p = +\sqrt{\sum_{\substack{i=1 \\ ij=}}^{n} W^2 \sigma \sigma + \sum_{\substack{i=1 \\ ij\neq}}^{n} W_i \sum_{j=1}^{n} \ldots_j \ldots W} \quad (16A) \quad \text{[Symbols have their usual meanings.]}$$

Using the inputs from SIM, the covariance variance matrix is shown in Table-6 below. On the basis of information compiled in Table-6 the risk of the 10-security portfolio is calculated to be:

$$\sigma_p^2 = 1.503 + 1.694 = 3.19\%$$

or $\sigma_p = \sqrt{3.197}\% = 1.79\%$

Therefore, it is found that there is a significant difference between the total risk of the optimal portfolio calculated under two different mechanisms found in SIM and Markowitz's model. The total risk of the optimal portfolio is 2.87% (in terms of SD) under SIM and the total risk of the portfolio is found to be 1.79% (in terms of SD) in Markowitz's model taking the necessary input from SIM.

Findings

i)   It is observed that as compared to the Markowitz's Mean-Variance Model, the Sharpe's Single Index model gives an easy mechanism of constructing an optimal portfolio of stocks for a rational investor by analyzing the reason behind the inclusion of securities in the portfolio with their respective weights. Actually, it simplifies the portfolio problems found in the Markowitz's model to a great extent.

ii)   So far as the construction of optimal portfolio is concerned, there is a considerable similarity between SIM and the Markowitz's model though, in reality, SIM requires lesser input than the input requirement of Markowitz's model to arrive at the risk and return of the optimal portfolio. From the study, it is observed that only ten securities out of twenty one sampled securities are allowed to be included in the optimal portfolio using the steps behind its construction under SIM. To arrive at the risk and return of this portfolio, the number of inputs required in SIM is 32 (applying 3n+2) whereas the same is 65 (applying $\frac{n(n+3)}{2}$) in Markowitz's model. Therefore, SIM, obviously, reduces the burden of calculation under Markowitz's model and claims an extra credit in the field of investment finance.

iii)   There is a significant difference between the total risk of the optimal portfolio calculated under two different mechanisms found in SIM and Markowitz's model respectively. It is observed that the total risk of the optimal portfolio is 2.87% (in terms of SD) under SIM whereas the same is found to be 1.79% in Markowitz's model taking the necessary input from SIM.

Concluding Remarks

From the discussion and analysis so far it is clear that the construction of optimal portfolio investment by using Sharpe's Single Index Model is easier and more comfortable than by using Markowitz's Mean-Variance Model. In his seminal contribution Sharpe argued that there is a considerable similarity between efficient portfolios generated by SIM and Markowitz's Model. This model can show how risky a security is, if the security is held in a well-diversified portfolio. This study is made on the basis of small sample (n<30) i.e. 21 sampled securities. It can be extended to a large sample to get a more accurate result. Hope this study will contribute a little about a lot in the field of investment finance.

Table-6 Variance – Co-variance Matrix (10×10 order)

	1	2	3	4	5	6	7	8	9	10
1	$W_1^2\sigma_1^2$ 0.068									
2	W_1W_2 Cov(1,2) 1.023	$W_2^2\sigma_2^2$ 0.830								
3	W_1W_3 Cov(1,3) 0.016	W_2W_3 Cov(2,3) 0.166	$W_3^2\sigma_3^2$ 0.384							
4	W_1W_4 Cov(1,4) 0.002	W_2W_4 Cov(2,4) 0.020	W_3W_4 Cov(3,4) 0.014	$W_4^2\sigma_4^2$ 0.013						
5	W_1W_5 Cov(1,5) 0.007	W_2W_5 Cov(2,5) 0.072	W_3W_5 Cov(3,5) 0.050	W_4W_5 Cov(4,5) 0.006	$W_5^2\sigma_5^2$ 0.074					
6	W_1W_6 Cov(1,6) 0.007	W_2W_6 Cov(2,6) 0.053	W_3W_6 Cov(3,6) 0.051	W_4W_6 Cov(4,6) 0.006	W_5W_6 Cov(5,6) 0.02	$W_6^2\sigma_6^2$ 0.064				
7	W_1W_7 Cov(1,7) 0.002	W_2W_7 Cov(2,7) 0.020	W_3W_7 Cov(3,7) 0.014	W_4W_7 Cov(4,7) 0.002	W_5W_7 Cov(5,7) 0.006	W_6W_7 Cov(6,7) 0.006	$W_7^2\sigma_7^2$ 0.012			
8	W_1W_8 Cov(1,8) 0.005	W_2W_8 Cov(2,8) 0.050	W_3W_8 Cov(3,8) 0.034	W_4W_8 Cov(4,8) 0.004	W_5W_8 Cov(5,8) 0.015	W_6W_8 Cov(6,8) 0.016	W_7W_8 Cov(7,8) 0.004	$W_8^2\sigma_8^2$ 0.035		
9	W_1W_9 Cov(1,9) 0.005	W_2W_9 Cov(2,9) 0.052	W_3W_9 Cov(3,9) 0.036	W_4W_9 Cov(4,9) 0.004	W_5W_9 Cov(5,9) 0.016	W_6W_9 Cov(6,9) 0.016	W_7W_9 Cov(7,9) 0.004	W_8W_9 Cov(8,9) 0.011	$W_9^2\sigma_9^2$ 0.022	
10	W_1W_{10} Cov(1,10) 0.0004	W_2W_{10} Cov(2,10) 0.004	W_3W_{10} Cov(3,10) 0.001	W_4W_{10} Cov(4,10) 0.0003	W_5W_{10} Cov(5,10) 0.001	W_6W_{10} Cov(6,10) 0.001	W_7W_{10} Cov(7,10) 0.0003	W_8W_{10} Cov(8,10) 0.001	W_9W_{10} Cov(9,10) 0.001	$W_{10}^2\sigma_{10}^2$ 0.001
Total	0.0674	0.437	0.209	0.0223	0.060	0.039	0.0083	0.012	0.001	0.847

N.B. – 1. Airtel India, 2. Allahabad Bank, 3. Canara Bank, 4. BPCL, 5. UCO Bank, 6. BHEL, 7. Engineers India Ltd., 8. GAIL, 9. SBI, 10. Coal India.

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THE MEDIATING OR MODERATING ROLE OF ORGANIZATIONAL CONTEXT IN FACILITATING AMBIDEXTERITY

Swarup Kumar Dutta

Institute of Management, Nirma University, Ahmedabad

Abstract. This is an attempt to understand the role of organizational context in facilitating ambidexterity in organizations, given the environmental dynamism that exists. The mediating or moderating role of organizational context is explored to understand the relationship between the antecedent (environmental dynamism) and consequence (ambidexterity) in organizations. The study is taken up based on a predicted relationship that organizational context mediates the relationship between environmental dynamism and ambidexterity. The research is based on an empirical study of five matured organizations to understand the relationship between the mentioned variables.

Ambidexterity has been widely studied recently in terms of both contextual and structural aspects and how firms go about building ambidexterity in organizations. Further it has been reported through empirical research that development of appropriate organizational context shapes or facilitates ambidexterity in organizations. So what is the nature of the role of organizational context in facilitating ambidexterity? If it is a mediating or moderating role, what does the organizational context mediate or moderate? Do firms develop appropriate organizational context as a response to the dynamism in the environment? If so, is environmental dynamism an antecedent to ambidexterity which is facilitated by organizational context? The paper attempts to study the nature of the relationship between environmental dynamism, organizational context and ambidexterity.

The premises on which the research is built focuses on the organization-context literature, in particular Ghoshal and Bartlett's (1994) framework for organizational effectiveness, as also the construct of contextual ambidexterity by Gibson and Birkinshaw (2004) which suggests that contextual ambidexterity emerges when leaders in a business unit develop a supportive organization context. According to this perspective business unit performance is achieved by building a carefully selected set of systems and processes that collectively define a context allowing the meta-capabilities of ambidexterity to flourish. However the role of the environment dynamism is not mentioned in the study.

This research attempts to explore the relationship between organizational context, environmental dynamism and ambidexterity, based on a predicted relationship between the three elements as mentioned in Figure 1.

The research process first elaborates the concepts of contextual ambidexterity, organizational context and environmental dynamism and tries to establish a relationship between them. The nature of the relationship is studied in detail from the following perspective—whether organizational context mediates or moderates the relationship between environment dynamism and ambidexterity.

Figure 1:Relationships Predicted
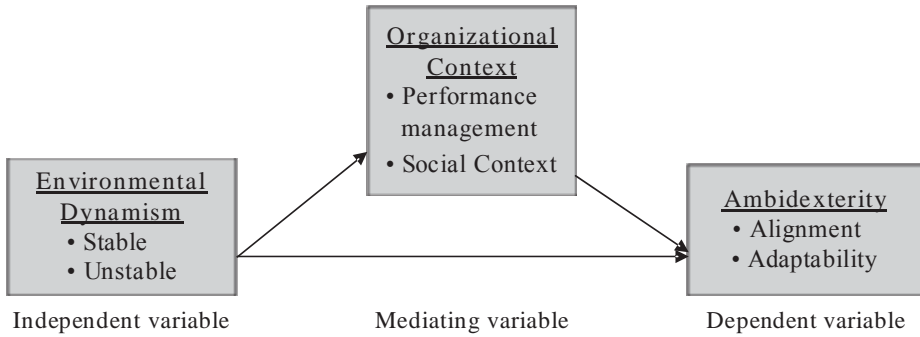
The Research Gap Identified

Detailed literature review has revealed that empirical work has already been done towards studying how organizational context in an organization shapes ambidexterity; however the role of environment in the mentioned context has not been adequately reported in literature for studies in ambidexterity. The present research attempts to study the individual and collective effect of both organizational context and nature of environmental dynamism in facilitating ambidexterity, as also what type of influence does organizational context exert on ambidexterity.

Objectives of the Study

The study would attempt to understand the relationship between the following:

i) How does organizational context facilitate ambidexterity?

ii) How does the assumed mediating variable (organizational context) facilitate the antecedent (environmental dynamism) in achieving the consequence (ambidexterity)?

iii) What is the nature of the relationship between environmental dynamism and organizational context?

iv) What is the combined effect of organizational context and environmental dynamism on ambidexterity?

THEORY AND HYPOTHESES

1. Five matured firms in diverse sectors in India (cement, Information Technology, textile, metallurgical process and venture finance) were taken up for administering a questionnaire whereby the organizational context, nature of environmental dynamism and levels of ambidexterity exhibited were surveyed based on primary research.

2. Based on the above study, attempts were made to establish the relationship between the variables (organizational context, environmental dynamism and ambidexterity) and the correlations between were arrived at. Thereafter linear regression was used to study the nature of the relationship and thereby support or reject the hypotheses mentioned.

3. Tests of mediation as also the statistical significance of the results were studied for interpretation of the results.

I) Environmental Dynamism

Environmental Dynamism refers to a rate of change and instability of the environment. Dynamic environments may be characterized by changes in various market elements such as customer preferences, technology and competitive structure. Turbulence and volatility are similar in terms of dynamism and are related to a degree of novelty in their changes or to their speed (Ansoff, 1979). In a highly dramatic environment, frequent changes in customer demand, technology and business practice require firms to continuously modify their products and services to remain competitive. Change renders the current product or service to be obsolete and requires the development of modified or new ones. On a similar note, abrupt and unpredictable changes can render the firm's existing knowledge to be redundant. Thus firms need to continuously acquire and refine capabilities to come up with new market offerings to minimise the threat of a firm's obsolescence. It means firms must focus on solving new problems through new knowledge creation. Alternatively, in less dynamic markets, customer preferences are relatively stable, and modifications in products and services are less required. As such, slow firms will not learn as fast as organizations facing higher environmental dynamism. Complexity is defined as the proliferation and diversity of factors in the environment (Duncan, 1972). The more the number of elements and the more the difference among them, the more is the environmental complexity.

Management theorists have studied the larger role of the external environment that helps organizations to sense and seize opportunities by virtue of acquiring dynamic capabilities as Teece et al. (1997) proposed. Other authors have tried to explain the moderating role of environmental uncertainty and complexity in the relationship between dynamic capabilities and sustainable competitive advantage.

II) Organizational Ambidexterity:

The construct of Gibson and Birkinshaw (2004) has been used for research in this area. While referring to organizational ambidexterity, contextual ambidexterity will be referred to as it arises from features of its organizational context. Gibson and Birkinshaw (2004) referred to contextual ambidexterity as a characteristic and the behavioural capacity to simultaneously demonstrate alignment and adaptability across a business unit. Alignment refers to nature or degree of cohesiveness among all the patterns of activities in the business unit that are working together toward the same goals. Adaptability is a characteristic feature to reconfigure and reorient activities in the business unit quickly to meet the ever-changing demands in the task environment. While this concept of contextual ambidexterity is studied in the current research study, it is noteworthy that this construct is different from the traditional and commonly understood concept of structural ambidexterity (Tushman & O'Reilly, 1996). Contextual ambidexterity is best achieved by building a set of processes or systems that encourage and enable individuals to make their own judgments about how to divide their time between conflicting demands for alignment and adaptability and not through the adoption of dual structures.

Contextual ambidexterity in organizations. Traditionally in the organization context literature, ambidexterity is broadly defined as an organization's ability to pursue two disparate things at the same time, be it manufacturing efficiency and flexibility (Adler et al.,

1999), differentiation and lost-cost strategic positioning (Porter, 1980, 1996), or global integration and local responsiveness (Bartlett & Ghoshal, 1989). As an effective illustration, Tushman and O'Reilly (1996) defined ambidexterity as the "ability to simultaneously pursue both incremental and discontinuous innovation and change." Duncan (1976) focused his work on the need for organizations to develop dual structural arrangements for managing innovation and March (1991) mentioned the balance between the conflicting demands for exploitation and exploration.

In essence contextual ambidexterity is a multidimensional construct, in which the characteristics of alignment and adaptability though separate and distinct, become interrelated elements. A further implication is that although ambidexterity is a characteristic of a business unit as a whole, it casts a huge shadow in the specific actions of individuals throughout the organization (Gibson and Birkinshaw, 2004). In short, the systems that are developed at the business-unit level encourage ambidextrous behavior that is both aligned and adaptable to meet customer requirements. As Gibson and Birkinshaw (2004) have mentioned, contextual ambidexterity is the interplay of alignment and adapting system capacities that simultaneously permeate an entire business unit. Thus the multiplicative index of alignment and adaptability is understood to be the effect of ambidexterity (Birkinshaw and Gibson, 2004).

The above conceptualization of ambidexterity suggests creating appropriate and conducive organizational mechanisms that can lead to firm performance and renewal. Alignment activities are geared towards improving firm performance and renewal in the short term and adaptability activities are geared for creating for the long term. The solutions to this dilemma may include acceptance and acknowledgement of the dual tensions or confrontation of the tensions; yet several authors have argued that a more powerful approach is to view the same as some form of transcendence whereby the elements are complementary and interwoven (Lewis, 2000; Schneider, 1990). Further, several views have been expressed suggesting that systems and processes that engage in exploration to the exclusion of exploitation are likely to find that they suffer the costs of experimentation without gaining many of the expected benefits, while systems that engage in exploitation to the exclusion of exploration are likely to find themselves trapped in suboptimal utilization of the existing systems that could have been better used for adaptations as well (Gibson and Birkinshaw, 2004). March (1991) suggested that simultaneous development of the two activities is a primary factor in system survival and sustainability. Thus the first hypothesis is:

Hypothesis 1. The higher the level of environmental dynamism, the higher the ambidexterity exhibited by firms.

III) Organizational Context

Based on organization-context literature on Ghoshal and Bartlett's (1994) framework for organizational effectiveness, superior renewal efforts are facilitated when leaders in a business unit create an appropriate behavioral context. According to this perspective, superior performance and renewal is achieved by building a selected set of systems and processes that collectively define a context which then guides the organization in

renewal efforts. Organization Context can be understood as the systems, processes and beliefs that shape individual-level behaviors in any organization (Gibson and Birkinshaw, 2004).

Ghoshal and Bartlett (1994) defined organizational context in terms of four behavior framing attributes—discipline, stretch, support and trust. A management context shaped by discipline does not rely on authority relationships or management policies as the means for influencing individual behavior; rather self-discipline in management processes induces members to voluntarily strive to meet the requirements and expectations of the system. Establishment of clear standards of performance, and a feedback system which is open, free and frank, constitutes discipline. Stretch is an attribute of context which induces employees to voluntarily strive for more. In self-renewing organizations, top management tries to put in systems and create an internal environment that raises individual aspiration levels and encourages people to give their best. Development of collective identity, shared vision and the ability to give personal meaning to the way in which individuals contribute to the overall purpose of an organization contribute to the establishment of stretch. Support is more than the vertical relationships that exist in organizations. A context of support induces fellow employees to frame horizontal linkages among peers—relationships that become characterized more by cooperation and collaboration. Experimenting and allowing a certain degree of freedom of initiative at lower levels results in sharing ideas and accessing resources. Senior members providing guidance to new initiatives of the lower levels by being developmental coaches gives credence to the establishment of Support. Trust is an attribute of context that induces members to rely on the commitments of each other. Business units can build trustworthiness if the decision of allocating resources is done objectively and with fairness.

These four attributes as conceptualized by Ghoshal and Bartlett are interdependent. An organization, they argued, needs to foster discipline and stretch to encourage individuals to push for ambitious goals, but it also needs support and trust to ensure that this happens within a cooperative environment. Organization context, as they mentioned , can be visualized in terms of the "the yin and yang" of continuous self-renewal (Ghoshal & Bartlett, 1997), a balance between a pair of hard elements(discipline and stretch) and a pair of soft elements (support and trust). They described discipline, stretch, support and trust as engendering individual-level behaviors that result in initiative, cooperation and learning at the firm level.

As defined in the work of Birkinshaw and Gibson (2004), performance management and social context constitute organizational context and the two are mutually reinforcing. Thus for the purpose of this research, the questionnaire used by the above mentioned authors in defining organizational context and the methodology used for finding an index for the same have been used. The second and third hypotheses are:

Hypothesis 2. The higher the environmental dynamism in organizations, the higher is the level of organizational context.

Hypothesis 3. The higher the organizational context, the higher is the ambidexterity achieved in organizations.

Antecedents to Ambidexterity

As had been explained above and based on our predicted relationships, organization context and environmental dynamism together, create and facilitate a way of driving ambidexterity in organizations. Accordingly the argument raised about the antecedents of ambidexterity is that it is a combination of both organization context and the nature of the dynamism in the environment and not either of these alone.

Mediation and Moderation Effects

Mediation and moderation are means for refining and understanding a causal relationship. They, in essence, are researchers' hypotheses about how a cause leads to an effect (Wu & Zumbo, 2008). As mentioned by the authors, a mediator is a third variable that links a cause and effect. A moderator is a third variable that modifies a causal effect. Mediation is a causal model that explains the process of "why" and "how" a cause-and – effect happens (Baron & Kenny, 1986).Hence, a mediational analysis attempts to identify the intermediary process that leads from the independent variable to the dependent variable. In other words in a simple mediational model, the independent variable is presumed to cause the mediator, and in turn the mediator causes the dependent variable. As such a mediating variable is also termed as indirect effect, surrogate effect, intermediates effect or intervening effect (Mackinnon et al., 2002).

A moderation effect is a causal model that postulates "when" or "for whom" an independent variable most strongly (or weakly) causes a dependent variable (Baron and Kenny, 1986; Kraemer et al, 2002). In essence, a moderator modifies the strength or direction (i.e., positive or negative) of a causal relationship. The moderation effect is more commonly known as the statistical term "interaction "effect" where the strength or direction of an independent variable's effect on the dependent variable depends on the level or the value of the other independent variable.

The argument that follows from the predicted relationship defined earlier is that organizational context mediates the relationship between environmental dynamism and ambidexterity. That is, the attributes of environment influence ambidexterity through the development of appropriate contexts. When context has not been developed, the environmental influences may or may not influence ambidexterity. Thus the four attributes of context that shape individual and collective behaviors mediate environmental influences in shaping ambidexterity in organizations.

Based on the construct for the research, it is sought to be tested if organizational context has an intervening or intermediate effect between environmental dynamism and ambidexterity. If not, the findings will be tested for the moderating or interaction effect. Thus our fourth hypothesis was:

Hypothesis 4. Organizational Context mediates the relationship between the antecedent (environmental dynamism) and the consequence (ambidexterity).

METHOD

The approach used was to administer a questionnaire to a sample of individuals in particular business units of five organizations on all the variables considered namely environmental dynamism, ambidexterity and organizational context.

Procedures and Sample

1. A survey was done of a random sample of employees at two hierarchical levels (top and middle) in each of the five organizations with a structured questionnaire containing the key elements of organizational context, ambidexterity and environmental dynamism. A total number of 86 valid responses by employees were considered for analysis.

2. The questions administered were on a 7-point Likert Scale. Scores on these measures were means calculated across items. The survey was based on an earlier testing of the questionnaire on a pilot study, tested on a small sample of managers to ensure the meanings were clear.

The Questionnaire

Towards Ambidexterity (dependent variable) questions were asked in matters of alignment and adaptability. In matters of alignment questions asked were whether the organization works coherently to support the overall objectives of the organization; do people work at cross purposes and whether organizational activities involve wasting resources on productive/unproductive activities. Adaptability questions focused on whether management systems in this organization encourage people to challenge outdated traditions and practices; are management systems flexible enough to allow employees to respond quickly to changes in the respective markets; do the management systems in the organization evolve rapidly in response to shifts in business priorities. The multiplicative score of alignment and adaptability is the score attained for organizational ambidexterity.

In matters of Environmental Dynamism, typical questions were raised in terms of how stable the company and the industry operated, and how complex the environmental factors were: questions included product ideas made through technological breakthroughs in the industry; the rate of technological changes; customer preferences changing with time; firm product/service complexity; process complexity; knowledge intensity of the product development process and whether technological changes provided opportunities in the industry.

Towards Organizational Context, questions were asked on two areas namely performance management (stretch and discipline) and social support (attributes included trust and support) based on the scales mentioned (Birkinshaw and Gibson, 2004). On performance management questions related to discipline and stretch were asked and questions under trust and support were clubbed under social context. The multiplication of the average scores of performance management and social support is understood to be the score for organizational context.

Analysis

Internal consistency. The validity of the scales used in the questionnaire for internal consistency was tested by finding the Cronbach's alpha for each of the variables-

Organizational Context = 0.838
Ambidexterity = 0.637
Environmental Dynamism=0.783

The analysis was done with a view to study the predicted relationship. The scores attained in the three variables namely Environmental Dynamism (ENV_DYN), Organizational Context (OC), and Ambidexterity (AMB) were taken up for statistical analysis using SPSS package.

RESULTS

As can be seen from the Correlation Table 1 (output of SPSS), the coefficient of Pearson Correlation is significant to suggest such a relationship exists as per the predicted way with strong significance of the correlation between the variables.

Table 1: Correlations between OC, AMB and ENV_DYN

		OC	ENV_DYN	AMB
OC	Pearson Correlation	1	.560(**)	.355(**)
	Sig. (2-tailed)	.	.000	.001
	N	86	86	86
ENV_DYN	Pearson Correlation		1	
	Sig. (2-tailed)	.000	.	.000
	N	86	86	86
AMB	Pearson Correlation			1
	Sig. (2-tailed)	.001	.000	.
	N	86	86	86

** Correlation is significant at the 0.01 level (2-tailed).

Thereafter at the micro level the elements of organizational context i.e. performance management and social support were further analyzed, in terms of how individually they affect organizational context. As shown in Table 2, the individual effects showed a strong positive correlation with organizational context.

Table 2:Correlations between OC_PERf, OC_SOC and OC

		OC_PERf	OC_SOC	OC
OC_PERf	Pearson Correlation	1	.533(**)	.868(**)
	Sig. (2-tailed)	.	.000	.000
	N	86	86	86
OC_SOC	Pearson Correlation	.533(**)	1	.871(**)
	Sig. (2-tailed)	.000	.	.000
	N	86	86	86
OC	Pearson Correlation	.868(**)	.871(**)	1
	Sig. (2-tailed)	.000	.000	.
	N	86	86	86

** Correlation is significant at the 0.01 level (2-tailed).

Also as shown in Table 3, the individual elements of ambidexterity (alignment and adaptability) have a significant correlation with the overall effect of ambidexterity. There was a positive correlation between alignment and adaptability, indicating that business units can indeed achieve both simultaneously. This finding indicates the importance of the dual capacity**.**

Table 3: Correlation between AMBI_ALI, AMB_ADA andAMB

		AMBI_ALI	AMB_ADA	AMB
AMBI_ALI	Pearson Correlation	1	.297(**)	.840(**)
	Sig. (2-tailed)	.	.005	.000
	N	86	86	86
AMB_ADA	Pearson Correlation	.297(**)	1	.745(**)
	Sig. (2-tailed)	.005	.	.000
	N	86	86	86
AMB	Pearson Correlation	.840(**)	.745(**)	1
	Sig. (2-tailed)	.000	.000	.
	N	86	86	86

** Correlation is significant at the 0.01 level (2-tailed).

Hypothesis 1 stipulated that environmental dynamism will be positively related with ambidexterity (the multiplicative index of alignment and adaptability). As depicted in model-1 of Table 4, the coefficient for environmental dynamism was significant and positive (Beta=0.450, p=0.0005) supporting Hypothesis 1. Thus Hypothesis 1 which states the higher the environmental dynamism, the higher the ambidexterity is proved. This basically tries to explain that organizations which face higher dynamism and complexity in the environment are more likely to exhibit higher ambidexterity. This also basically says higher the environmental dynamism, higher is the adaptability index, and hence higher the ambidexterity.

Table 4: Results of Regression analysis

Parameter	Model-1 Dep: AMB Ind: ENV_DYN	Model-2 Dep: OC Ind: ENV_DYN	Model-3 Dep: AMB Ind: OC	Model-4 Dep: AMB Ind : OC, ENV_DYN (with ENV_DYN controlled)	
R	0.450	0.560	0.355	0.467	
R^2	0..203	0.313	0.126	0.218	
Adjusted R^2	0.193	0.305	0.116	0.199	
ANOVA F	21.363 P=0.0005	38.327 P=0.0005	12.144 P=0.001	11.590 P=0.0005	
Significance of Regression Coefficients	Beta 0.450 t=4.622 p=0.0005	Beta=0.560 t=6.191 p=0.0005	Beta=0.355 t=3.485 p=0.001	OC	Beta=0.151 T=1.285 P=0.202
				ENV_DYN	P=0.002

Significance =0.0005, Dep =Dependent Variable, Ind = Independent Variable

The hypothesis testing was done by linear step wise regression.

Hypothesis 2. As depicted in model-2 of Table 4, the higher the effect of environmental dynamism the higher is the effect of organizational context (multiplicative index of performance management and social support). This has been found to be significant. (Beta value of Environmental Dynamism is 0.560, p=0.0005). This also supports and proves Hypothesis 2, that higher the environmental dynamism, higher the organizational context. Basically this hypothesis explains the fact that organizations adopt supporting organizational context mechanisms in response to the nature of environmental dynamism. The higher the complexity and instability in the environment, the higher is the level of organizational context (represented by the multiplicative index of performance management and social support).

Hypothesis 3. As depicted in model-3 of Table 4, the higher the organizational context the higher is the ambidexterity achieved in organizations. This has also been found to be significant suggesting a positive relationship. (Beta values of organizational context is 0.355, p=0.001). This also supports Hypothesis 3. Thus a higher value of organizational context leads to higher ambidexterity in organizations. This basically explains that a context higher in performance management (stretch and discipline) as also a higher social support (trust and support) leads to higher organizational context which influences ambidexterity in organizations.

Hypothesis 4: Testing the Mediating Effect

Hypothesis 4 predicts that organizational context will mediate the relationship between environmental dynamism and ambidexterity.

Analyzing mediation involves three steps (Baron & Kenny, 1986; Kenny, Kashy and Bolger, 1998; Mackinnon and Dwyer, 1993).

The first step is to establish the independent variable (here environment dynamism) influences the mediator (organizational context). This step was supported in model-2 of Table 4. Environmental dynamism had a significant and positive correlation.

The second step is to demonstrate that the independent variable (environmental dynamism) influences the dependent variable (ambidexterity).This step was supported in model-1 of Table 4. Environmental Dynamism had a significant positive relationship with ambidexterity.

Lastly one has to demonstrate that the mediator (organizational context) influences the dependent variable (ambidexterity), with the independent variable (environmental dynamism) controlled. If in this final step, the effect of environment is no longer significant when the **mediator**, organization context is in the model, full mediation is indicated (Baron & Kenny, 1986; Kenny et al., 1998). Otherwise the results needs to be further explored.

As shown in model-4 of Table 4, the coefficient of context and environmental dynamism was positive. However in this step of finding the influence of context on ambidexterity with environmental dynamism controlled, suggests that context had a non-significant effect (Beta values of context =0.151 p=0.202). As revealed by the probability values, the null hypothesis would suggest organizational context had no significant mediation though a positive relationship exists. Thus we can say that Hypothesis 4 did not obtain support and organizational context did not mediate the relationship between environmental dynamism and ambidexterity.

However we are now left to explore what then is the nature of this relationship?

The coefficient of correlation of model-1 (with ENV_DYN as the independent and AMB as dependent variable) is 0.450 and model-3 of Table 4 (with OC as independent and

AMB as dependent variable) is 0.355.Hoever the combined effect of both the independent variables (ENV_DYN and OC) on ambidexterity gives coefficient of correlation to be 0.467. It clearly suggests that the combined effect has a much stronger relationship suggesting a case of moderating effect or interaction effect of organizational context. Thus organizational context has a moderating effect and basically plays the role of a catalyst.

DISCUSSION

This study has important implications for both theory and practice of management. The research findings suggest the following:

i) Organizations need to be careful about the nature of environmental dynamism that is affecting the industry in general and the firm in particular, before developing appropriate organizational context that may drive ambidexterity. As has been proved, higher the nature of environmental instability and complexity, higher is the level of organizational context that is developed. This explains why firms facing a highly unstable and volatile environment are likely to develop suitable organizational contexts for driving ambidexterity and firm performance. This also explains that firms facing instability in the environment are more likely to create appropriate contexts which support both performance management and social support.

ii) Firms exhibiting higher environmental instability are more likely to develop higher capabilities of ambidexterity, due to the important factors of both alignment and adaptability. This explains why successful firms in a volatile environment are highly adaptable (this is not to suggest that firms will not be highly aligned within their businesses). This has an important implication for both theory and practice that managers can take note of. As the research was done with matured firms, the higher degree of correlation between environment dynamism and ambidexterity suggests that firms in unstable and complex environments are more likely to exhibit higher ambidexterity.

iii) Organization context has an important positive influence on ambidexterity, which suggests that firms that have developed suitable organization context mechanisms can exhibit better ambidexterity. However the point worth taking note for the practice of management is, when firms face instability in the environment and develop suitable organizational mechanisms for renewal and firm performance, the aspect of environment and not context dominates the way firms develop ambidexterity. That is, when organization context and environmental dynamism are in the equation while trying to exhibit characteristics of ambidexterity, organization context has a marginal role in influencing ambidexterity, and the major influence is triggered by environment. This suggests that organizational context has an interaction affect and not intermediate effect and hence organizational context acts as a moderator and not a mediator. Regarding ambidexterity it has also been observed that because of the strong correlation between alignment and adaptability, both needs to coexist for ambidexterity to flourish in the organization.

Thus firms, based on environmental influences acquire ambidextrous characteristics. The degree of ambidexterity is influenced through the interactive effect of organizational context.

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NON-LINEAR RELATIONSHIPS OF KEY DETERMINANTS IN INFLUENCING THE PROFITABILITY OF A LARGE PUBLIC SECTOR BANK IN INDIA

Rajveer Rawlin & Ramaswamy Shanmugam
Bharathiar University, Coimbatore

Abstract. Earlier work helped us identify key determinants of bank profitability and share price performance. The focus of this paper is to further study the interactions of these determinants in influencing the profitability of a leading public sector bank in India. The key performance indicators (deposits, advances and business-per-employee) that influence profitability were selected from our earlier study and subjected to curve estimation analysis with net profit as dependent variable. The analysis suggested a non-linear relationship between net profitability and these determinants. A step wise multiple regression was performed on non -linear combinations of these determinants. The natural logarithm of deposits proved to be the critical determinant of profitability. This suggests that the chosen indicators can have a non-linear relationship with profitability.

Keywords: Net Profit, Stock Price, Key Performance Indicators, Indian Public Bank, Non Linear Combination, Step Wise Multiple Regression, Synergy.

Introduction of banking sector reforms has redefined the entire Indian banking landscape. National, institutional and international boundaries are becoming increasingly less relevant. Globalization of operations and implementation of new technologies are taking place at a rapid pace. A shift in marketing philosophy of banks is visible with the rising focus on customer service. However, banks are now facing a number of challenges such as technological change, stringent prudential norms, increasing competition, worrying level of NPAs, rising customer expectations, increasing pressure on profitability, rising operating expenditure and shrinking levels of spreads. The reforms in banking sector have also brought margins under pressure. The Reserve Bank of India's (RBI) efforts to adopt international banking norms is forcing banks to adopt measures to control and maintain margins.

The profitability of a bank is predominantly driven by a series of internal and external factors. The internal determinants of bank profitability include, but are not limited to bank size, capital, risk management procedures adopted, expenses, and diversification adopted (Molyneux & Thornton, 1992; Goddard et al., 2004; Bodla & Verma, 2006). External determinants of bank profitability include, both industry structural determinants such as market concentration, industry size and ownership, and macroeconomic determinants such as inflation, interest rates, money supply and Gross Domestic Product (GDP) (Athanasoglou et al., 2008; Chirwa, 2003).

In the current study we study the nature of the impact of some key internal factors on bank profitability that we have identified in a recent study (Rajveer and Shanmugam, 2013). These factors were narrowed down from a host of other factors that include deposits, advances, net NPAs, return on assets, the capital adequacy ratio, business-per-employee and profit-per-employee. The effect of these factors on bank profitability was examined over a 10 year period spanning from 2002-2011 through multivariate regression analysis.

METHODOLOGY

This study used historical data to study the impact of the key variables namely, deposits (D), advances (Adv), and business-per-employee (BPE), that were identified as key determinants in an earlier study (Rajveer and Shanmugam, 2013), on the dependent variable namely, the Net Profit (NP) of a large Indian public sector bank. The study was conducted with annual data for the past ten year period i.e. from the financial year 2002 to 2011. Historical data on all of the above were obtained from the *Capitaline* financial database (www.capitaline.com).

Curve estimation was used to determine the nature of the relationship between the variables. The relationship between non-linear combinations of the variables identified above and the dependent variable namely net profitability was analyzed with the SPSS 18.0 package through a step-wise multiple regression.

Correlation coefficients were determined to study the relationship between the respective variables. Significant F values from ANOVA were used to assess the statistical significance of the correlations observed at 95% confidence intervals. Relationships that were not statistically significant at 95% confidence intervals were excluded from further analysis and these variables were eliminated. Variables also exhibiting correlation coefficients less than 0.9 were excluded from further analysis.

Variance Inflation Factor (VIF) was used to detect multicollinearity.

FINDINGS

Table 1: Relationship between Profitability and Deposits: Curve Fitting Analysis

Dependent Variable (Profitability)	Independent Variable (Performance Indicators)	Model Fit	Correlation Coefficient (R)	Regression Coefficient (R^2)	F Value	Sig. F Value
Net Profit	Deposits	Linear	0.957	0.916	87.18	0.000
Net Profit	Deposits	Logarithmic	0.968	0.938	121.22	0.000
Net Profit	Deposits	Inverse	0.949	0.901	72.71	0.000
Net Profit	Deposits	Quadratic	0.975	0.951	67.47	0.000
Net Profit	Deposits	Cubic	0.990	0.981	100.66	0.000

Table 1 shows the results of curve fitting analysis. Profitability as measured by net profit is considered as the dependent variable while the independent variable is deposits. Linear and non-linear models were fitted to depict the relationship between the variables. All the relationships were found to be strong and statistically significant. The values of 'R' and 'R^2' values exceeded 0.9 and these relationships were considered for further analysis.

Table 2: Relationship between Profitability and Advances: Curve Fitting Analysis

Dependent Variable (Profitability)	Independent Variable (Performance Indicators)	Model Fit	Correlation Coefficient (R)	Regression Coefficient (R^2)	F Value	Sig. F Value
Net Profit	Advances	Linear	0.945	0.893	67.02	0.000
Net Profit	Advances	Logarithmic	0.941	0.885	61.61	0.000
Net Profit	Advances	Inverse	0.887	0.786	29.46	0.001
Net Profit	Advances	Quadratic	0.954	0.910	35.49	0.000
Net Profit	Advances	Cubic	0.975	0.950	37.80	0.000

Table 2 shows the results of curve fitting analysis. Profitability as measured by net profit is considered as the dependent variable while the independent variable is advances. Linear and non-linear models were fitted to depict the relationship between the variables. The relationships were found to be strong and statistically significant. The values of 'R' and 'R^2' values exceeded 0.9 for most of the relationships. The inverse relationship had an R value less than 0.9 and was excluded from further analysis.

Table 3: Relationship between Profitability and Business Per Employee (BPE):
Curve Fitting Analysis

Dependent Variable (Profitability)	Independent Variable (Performance Indicators)	Model Fit	Correlation Coefficient (R)	Regression Coefficient (R^2)	F Value	Sig. F Value
Net Profit	Business Per Employee	Linear	0.955	0.913	83.70	0.000
Net Profit	Business Per Employee	Logarithmic	0.958	0.918	89.23	0.000
Net Profit	Business Per Employee	Inverse	0.929	0.862	50.16	0.000
Net Profit	Business Per Employee	Quadratic	0.964	0.930	46.30	0.000
Net Profit	Business Per Employee	Cubic	0.980	0.960	47.98	0.000

Table 3 shows the results of curve fitting analysis. Profitability as measured by net profit is considered as the dependent variable while the independent variable is business per employee. Linear and non-linear models were fitted to depict the relationship between the variables. All the relationships were found to be strong and statistically significant. The values of 'R' and 'R^2' values exceeded 0.9 and these relationships were considered for further analysis.

Table 4: Relationship between Profitability and Performance Indicators: Step-Wise Multiple Regression Analysis

Dependent Variable	Independent Variable	Correlation Coefficient R	Regression Coefficient R^2	F Value	Sig. F Value	VIF
Net Profit	Ln (Deposits)	0.968	0.938	121.22	0.000	1.0

Table 4 shows the results of a step-wise multiple regression performed taking net profit as the dependent variable and non-linear functions of deposits, advances and business per employee as selected from Tables 1, 2 and 3 as independent variables. The step wise regression eliminated most variables due to multicollinearity issues and chose the natural logarithm of deposits (VIF<5) as the most significant independent variable.

Table 5: Multicollinearity Analysis

Independent Variable (Performance Indicators)	Dependent Variable (Profitability)	Variance Inflation Factor (VIF)
Deposits	Net Profit	39.50
Ln (Deposits)	Net Profit	1.00
1/Deposits	Net Profit	35.76
$Deposits^2$	Net Profit	11.62
$Deposits^3$	Net Profit	6.29
Advances	Net Profit	53.17
Ln (Advances)	Net Profit	45.94
$Advances^2$	Net Profit	10.70
$Advances^3$	Net Profit	5.18
BPE	Net Profit	49.82
Ln (BPE)	Net Profit	114.42
1/BPE	Net Profit	18.88
BPE^2	Net Profit	13.13
BPE^3	Net Profit	6.63

Table 5 shows the results of multicollinearity analysis of the independent variables. Most of the variables exhibited a high level of multicollinearity with each other characterized by VIF values greater than 5 and were excluded from the step-wise regression. The natural logarithm of deposits alone had a VIF < 5 and was taken as the contributory independent variable.

DISCUSSION AND ANALYSIS

In the current study we focused exclusively on the impact of internal factors closely monitored by the RBI on the profitability of one of India's large public banks. These factors were selected from our earlier study (Rajveer & Shanmugam, 2013) and include deposits, advances, and business-per-employee. This study examined both linear and non linear relationships between profitability and the respective independent variables.

We find a strong positive correlation between linear and non-linear combinations of deposits and net profit, with non linear combinations often exhibiting a greater correlation with profitability (Table 1) . Deposits are often seen as a barometer of a bank's financial health and stability. Similar results have been observed earlier by Smirlock & Brown (1986), who found a strong positive relationship between demand deposits and bank profitability. Ganesan (2001) also found a strong correlation between deposits and profitability for a group of public sector banks in India.

We also find a strong positive correlation between linear and non-linear combinations of advances and net profit (Table 2). Banks generate significant profits from their margins on advances. Ganesan (2001) found a similar relationship between priority sector advances and profitability for a group of Indian public sector banks.

We find a strong positive correlation between business generated-per-employee and net profit (Table 3). Non-linear combinations of business per employee exhibited a greater correlation with profitability than business per employee taken alone. This indicator helps in assessing the productivity of the work force and the extent of their contribution to the operational efficiency of banks. Ben Naceur and Goaied, (2008) found that the best performing Tunisian banks are those that improve labor and capital productivity.

A step wise multiple regression analysis (Table 4) showing the combined effect of all the variables and their non-linear combinations on net profit was carried out in the study. The results showed that most of the variables exhibited a high degree of multicollinearity (Table 5) and were excluded from the step wise multiple regression (Table 4). The natural logarithm of deposits emerged as the most important contributory variable (Table 4) . With a similar multi-variate analysis Bodla and Verma, (2006) found that variables such as non-interest income, operating expenses, provisions, contingencies and spread have significant relationship with net profits.

Conclusion

In this paper, we study the impact of some key internal determinants of profitability namely deposits, advances and business-per-employee on the profitability of a large Indian public bank. The effect of both linear and non-linear combinations of the independent variables on profitability was assessed in the study. Linear and non-linear combinations of deposits, advances, business-per-employee and profit-per-employee positively influenced profitability. A step wise multiple regression analysis of the data indicated that the natural logarithm of deposits emerged as the single most important independent variable in influencing profitability. Thus one must consider non-linear combinations of key determinants in addition to the determinants themselves while assessing their impact on profitability.

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COMPARATIVE ANALYSIS OF BANKING MODELS

Abhishek Pinyani, Prateek Saluja, & Vaibhav Kumar Daga
Great Lakes Institute of Management,Chennai

Narendar V. Rao
Northeastern Illinois University, Chicago, USA

Abstract. This study compares 3 diverse banking models namely Islamic, American and Canadian and provides insights on how these banks performed during the period 2007-2010. CAMEL model has been used to assess the performance of 3 major banks under each banking model. The study suggests that despite good profit figures, a banking system can collapse if the fundamentals are not followed and risks are not properly evaluated. The analysis shows that Canadian banking system has outperformed American and Islamic banking system in terms of asset quality, expenses, securities, liquidity and earnings. Also, Islamic banks have performed better than others in terms of capital adequacy and management ratios. Based on the analysis, recommendations for a robust banking model have been identified.

Keywords: Islamic banking, American Banks, Canadian Banks, CAMEL Model.

The role of financial services firm in a nation is to provide financial services and products that help citizens participate in the broader economy. By offering vehicles for investment of savings, extension of credit and of risk management, they fuel the modern capitalistic society. Banking is at the center of all financial services firms and is a lifeline of any nation. Thus, when a major banking institution fails in any nation, it causes a ripple effect on the entire economy of the nation and even has global repercussions. In recent past some of the largest and most reputed banking institutions have collapsed. Hence, it becomes imperative to understand and compare disparate banking models. There are various banking models followed in different countries and regions. This study is based on comparative analysis of banking models. The study focuses on three major banks from each of Islamic, US and Canadian banking models.

1. Islamic banks are based on the principles of Islamic Law (Shariah). The Islamic banking model has a huge untapped potential and has shown strengths over the existing conventional banking models. Islamic banks exclude interest-based transactions. The Islamic banking model is included in this comparative study because of its inherent features and uniqueness.

2. Considering the collapse of major financial houses and banks in US during the 2008 recession and its ripple effect globally, US banks have been a focal point of a lot of studies. Also, US banking model is fragmented compared to banking models of other major countries. It is regulated both at federal as well as state level.

3. Canada has been recognized as a country which was able to weather the financial crisis better than other countries. Universal Bank model,

diversification of funds, healthy loan to deposit ratio, interprovincial lending are some of the factors which make the Canadian banking model different from other models.

Although a lot of research has been done on comparison of Conventional Banks & Islamic Banking models, it was found that a research gap exists in comparison of Islamic banks with American and Canadian banks as separate entities. Although these are conventional banks, the structure and operations of the banks are distinct in nature. The study strives to compare three diverse banking models described above.

The study focuses on the positives and negatives of these banking models in terms of profitability, risk of default, recovery of lent amount and banking regulations. This study aids understanding of the ability of different banking models to weather crisis situations. This study also provides recommendations in terms of banking procedures which could be incorporated to come up with a better and sustainable banking model.

LITERATURE REVIEW

Wael Moustafa Hassan (2011) examined the degree to which the Islamic and conventional banks use risk management practices and techniques in dealing with different types of risk in Middle East region. The research was aimed at understanding how the risk perceptions of Islamic banks differ from Conventional banks. Another aspect of the study was to understand the most important risk type facing Islamic and conventional banks. He analyzed the data and concluded that there is no significant difference between Islamic Banks and conventional banks concerning risk identification, understanding risk and risk management. However, there are differences in risk assessment and analysis, risk monitoring, risk management practices and credit risk analysis.

In the study done in 2010 by Sat Paul Parashar and Jyothi Venkatesh, on performance of Islamic banks during financial crisis, it is shown that Islamic banks underperformed as compared to conventional banks in terms of capital ratio, leverage and ROE. On the other hand, Islamic banks outperformed conventional banks in terms of return on assets and liquidity measures. Overall Islamic banks performed better than conventional banks in the period from 2006-2009. The Key Performance Indicators used were: Capital Adequacy Ratio, Cost to Income ratio, Return on Average Assets, Return on Average Equity, Equity to Total Assets Ratio. The changes in means of these ratios before and after the crisis were statistically tested.

Maher Hasan and Jemma Dridi (2010) performed a comparative study of the effect of the Global crisis on Islamic Banks and Conventional Banks. They highlighted the key challenges faced by Islamic Banking - (i) the infrastructure and tools for liquidity risk management, which remain underdeveloped (ii) a legal framework, which is incomplete or untested; (iii) the lack of harmonized contracts; and (iv) insufficient expertise (at the supervisory and industry levels) relative to the industry's growth. They showed that factors related to IB's business model helped them contain the adverse impact on profitability in 2008. Also Larger IBs have fared better than small ones on account of better diversification, economies of scale and stronger reputation. During crisis, IBs asset and credit growth grew at twice the rate of CBs.

According to the study by Malaysia International Islamic Financial Centre (2010) the market of Islamic instrument *sukuk* is growing very rapidly. Big companies like GE are considering sukuk as a good investment because of its ability to survive during bad market

conditions. Islamic finance follows asset based financing structure and is relatively new in the market as the first instrument came to the market in 1963 in Egypt.

The study by Shayerah Ilias (2010) focused on the comparison of conventional banks and Islamic banks in purview of their ability to sustain during financial crisis and economic downturn. According to few analysts the reason behind Islamic banks to be more resilient is their avoidance of investing in speculative activities. But as per the study Islamic finance industry is not completely immune to general decline in demand and investor uncertainty. For an instance, the issuance of fastest growing instrument sukuk (capital market securities) dropped from $35billion to $15 billion in 2008 and recovered to $20 billion in 2009. Islamic banks are considered to be immune from economic downturns because their financial transactions are backed by physical assets. But Islamic banks might be more vulnerable to fluctuations in mortgage market considering their high activity in real estate sector compared to conventional banks. A Slowdown in real estate activities in Gulf countries raised concerns about the financial position of Islamic banks.

Abdus, Gardner, and Cook (2005) studied two Islamic banks in Malaysia and Bahrain and showed that Islamic banks follow the Shari`ah's injunction to pay zakat and finance economic activities through Islamic contracts. The data indicates that for the two Islamic banks studied here, mudarabah, musharakah, and qard al-hassan financing are the least significant financial instruments. Mark-up products, such as murabahah and ijarah, appear to be the most popular, for they dominate all other modes of Islamic financing.

Bley and Kermit (2004) interviewed students across 40 countries to test their knowledge of Islamic Finance and proved that the use of Arabic language terminology in labeling Islamic finance products and services seems to hinder understanding for the vast number of non-Arabic language populations, which includes the majority of Muslims. Their research supported other studies, that found that a primary reason for choosing Islamic financial service organizations and products was religious in nature and not based on any specific understanding of the products themselves. Hence they concluded that ignorance is widespread regarding Islamic finance in general. They proved that students who had completed more education tended to possess more knowledge of both conventional and Islamic financial concepts.

The paper by Brent Dalrymple, University of Central Florida (2009) discussed the positives and negatives of asset-based and interest-based systems and their common ground that could provide a platform for a more stable world economy. The findings of this study are that the confidence of Federal Reserve and the SEC is reducing and that they are not planned for rapidly changing financial instruments and markets. Study concludes that a cultural change is required in U.S for banking system to ensure better resilience from economic downturns.

According to the study by M. Mansoor Khan, Business and Regional Enterprise, Mount Gambier Regional Centre, University of South Australia (2008), Islamic banks have acquired a great market share in Middle East, South East and South East Asia. These Islamic hubs are acting as a promoter for Islamic banks and as a financer in western business and financial markets. Major factors contributing to this success are amplification of oil prices worldwide, long-lasting boom in the Middle Eastern economies, product innovation and sophistication, increasingly receptive attitude of conventional regulators and information technology advancements. According to the study Islamic banking has a much greater potential as there is a huge Muslim population worldwide which constitutes 24% of world population.

Shaikh, Salman and Jalbani (2008) studied the risk management in Islamic and Conventional Banks and empirically established the result that the risk management procedures in Islamic banks are adequate to mitigate the large equity based investments and provide their customers with adequate returns comparable with conventional banks. The risk management procedures of an Islamic Bank are effective and adequate.

The paper authored by Jason Allen, Walter Engert and Ying Liu in the year 2007, compared the 6 largest Canadian banks with 2 groups of US banks using three different approaches: ratios, economies of scale and cost inefficiency using the finest performing bank of comparable size in each country. Based on the ratio analysis Canadian and US banks were found to be equally productive. Moreover, Canadian banks have been found to be less efficient in terms of scales. Authors have suggested that countries with more banking concentration have more efficient payment systems.

Ahmed Al Janahi and David Weir (*2005 Wiley Periodicals)* showed that the Islamic banking model can be leveraged to tackle business problems in developing markets. Authors have attempted to provide empirical evidence for the traditional and conventional characteristics of Islamic institutions, which was missing in earlier literatures as indicated by the authors.

Donsyah Yudistira (2004) analysed the technical and scale efficiencies of 18 Islamic banks using a non-parametric approach called Data Envelopment Analysis (DEA). DEA is a linear programming technique for examining how a particular decision making unit operates relative to other banks in the sample. To calculate the efficiencies, staff costs, fixed assets and total deposits were used as input variables while total loans, other income and liquid assets were used as output variables. Donsyah showed that the overall efficiency results suggest that inefficiency across 18 Islamic banks is small at just over 10 percent which is considerable compared to many conventional banks. He also proved that Islamic banks are closely coupled with other financial systems and that regulating authorities should consider Islamic banking in search of global financial stability. It was also found that there are diseconomies of scale for small to medium Islamic banks, which suggests M&A should be encouraged. It was also found that publicly listed Islamic banks were less efficient than their counterparts.

Tarek S. Zaher and M. Kabir Hassan, in their paper (2001) have done a broad deliberation of the literature on Islamic Banking and Finance. The paper covers varied facets of Islamic banking and the emergence and growth of Islamic banking in some countries. The various financial instruments offered under Islamic banking are compared with those offered under conventional Western banking. Moreover, an empirical evaluation of Islamic banks is done and the various legal problems, challenges and underlying investment opportunities are discussed.

The paper (2009) by Daniela Erler of Middlebury college, aimed at empirically suggesting that Islamic Finance had emerged and boomed during the global recessionary periods of 1973 (oil crisis) and 2007 (subprime crisis). The study demonstrated a positive correlation between oil prices and development of Islamic finance. Also the compatibility of Islamic and Western finance was evaluated, and Islamic finance with an ethical and conservative approach was suggested as a complement to conventional Western finance.

The study (2006) by Jahongirbek Burhonov, covers problems in profit-sharing instruments of Islamic banking during mobilization of savings and allocation of funds. The empirical evaluation of the Islamic Banking Scheme of Malaysia is done to check the conformity of practice with the theoretical aspect of Islamic banking system. Performance Ratio analysis is done to compare the performance of Islamic banks with the industry

average. Regression method is used to find a relationship between banking characteristics and the performance of Malaysian Islamic Banking Scheme banks.

Charles Freedman in his paper on "The Canadian Banking System" in 1998 suggested that US and Canadian banking systems differ chiefly on three major aspects: diversification, bank regulations and interest rate restrictions. Canadian banks did not impose the bans on interprovincial banking and hence diversified their exposure to a far greater extent. US banks on the other hand faced failures because of undiversified exposure to specific markets, recently the US housing market. Also in US regulation of interest rates was imposed by putting ceiling limits during inflationary times. This caused a setback to the banks as they could not finance the loans efficiently.

METHOD

To initiate the research, three banks were short-listed under each banking model as the sample set. To maintain consistency across models, large commercial banks were selected under each model. Following banks were used for the research.

1. American Banks
    a. Bank of America
    b. Citibank
    c. Wells Fargo and Company

2. Canadian Banks
    a. Royal Bank of Canada
    b. Toronto-Dominion bank
    c. Bank of Nova Scotia

3. Islamic Banks
    a. Al Baraka
    b. Abu Dhabi Islamic Bank
    c. Sharjah Islamic Bank

The data used for analysis were collected from secondary sources. The financial statements were downloaded from the websites of the above-mentioned banks. The period of study was taken from 2007-2010. This allowed a comparison before, during, and after recession. The annual data for the banks were used for calculating the key financial ratios which helped analyze the performance of these banks.

Based on the literature review, CAMEL model was found to be a good financial instrument to measure a bank's performance. The performance of a bank is measured across 5 areas—Capital Adequacy, Asset quality, Management Capability, Earnings capacity and Liquidity using financial ratios specific to each category. The ratios that we have calculated are CAR (Capital Adequacy ratio), Net NPA to Net Advances (Asset quality ratio), ROA and ROE (all Earnings ratio), Exp to Net Income, Earnings/employee, Expenses/employee, credit/deposit (all Management Ratios), Liquid assets/total assets ratio, Govt & other sec/total assets and liquid assets/deposits (all Liquidity ratios).
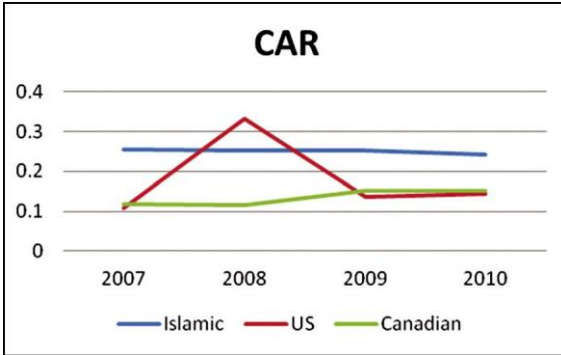
The averages for the various ratios under the CAMEL model over four years for three banks in each category viz. Islamic, American and Canadian were taken and plotted using line graphs.

Below are the details of the analysis done for the various ratios:-

Capital Adequacy Ratio

Figure 1: CAR

	Islamic	US	Canadian
2007	25.40%	10.80%	11.88%
2008	25.22%	33.15%	11.68%
2009	25.22%	13.74%	15.15%
2010	24.20%	14.35%	15.09%

CAR: A bank with a higher capital adequacy is considered safer because if its loans go bad, it can make up for it from its net worth. Islamic banks maintained the highest CAR except for the year 2008 when US banks showed the highest CAR. This is quite surprising because US banks plummeted in the very same year. The Canadian banks maintained the moderate CAR of 12% in 2007 and 2008 and later on increased to about 15% in year 2009 and 2010.

Figure 2 – Leverage Ratio
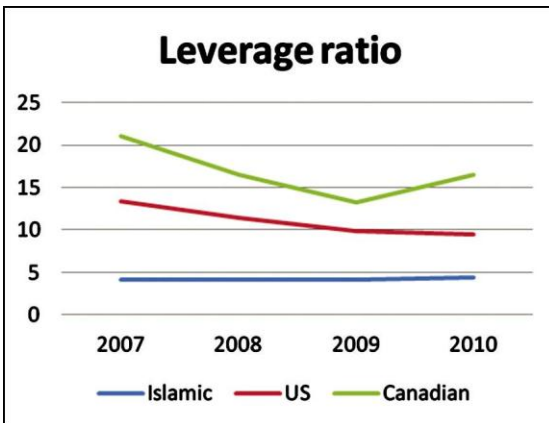
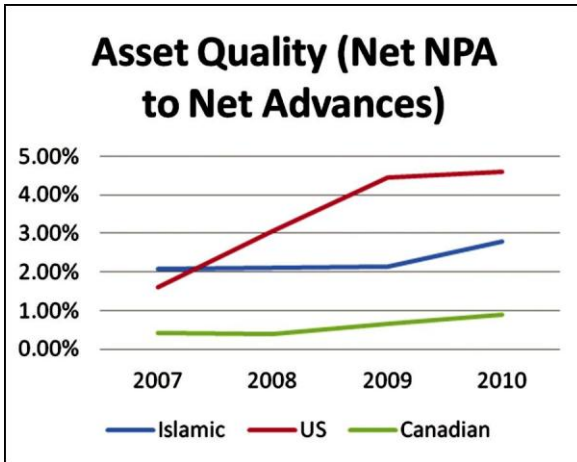|	Islamic	US	Canadian
2007	4.161686	13.35046	21.05837
2008	4.174009	11.39072	16.49719
2009	4.184238	9.820571	13.2951
2010	4.404505	9.434959	16.43842

Too much leverage leads to high risk of bankruptcy and very little leverage will lead to high cost of capital. Leverage of Canadian banks is the most. It ranges from 22%-13%. On

the other hand Islamic banks had the lowest leverage among the three. The leverage of US banks was between 10%-14%.

*Asset Quality Ratios*

Figure 3 - Net NPA to Net Advances

	Islamic	US	Canadian
2007	2.09%	1.60%	0.41%
2008	2.12%	3.06%	0.39%
2009	2.15%	4.46%	0.67%
2010	2.79%	4.61%	0.88%

If we see average asset quality of the three banking systems, Canadian banks have the least non- performing assets and US banks have the most which increased drastically in the period 2007-2009.

Management Ratios

Figure 4 - Earnings per Employee (USD)
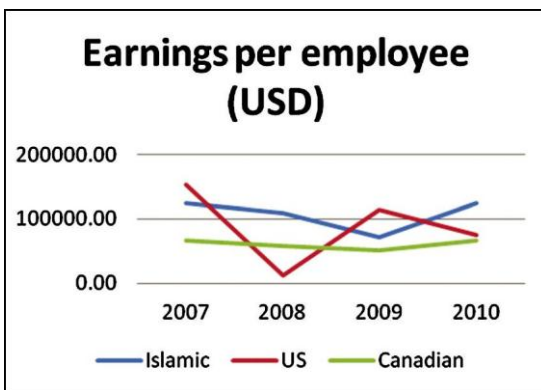
	Islamic	US	Canadian
2010	124094.09	75390.25	65687.44
2009	71082.97	113536.10	50433.36
2008	108260.70	11452.18	57263.25
2007	124644.38	153317.07	66376.39

Earnings per employee were stable for both Islamic and Canadian banks for the period 2007-2010. But if we see US banks their earnings came down drastically in 2008 and in 2009, because they had laid off many employees, their earnings per employee went up again.

Figure 5 - Expenses per Employee (USD)
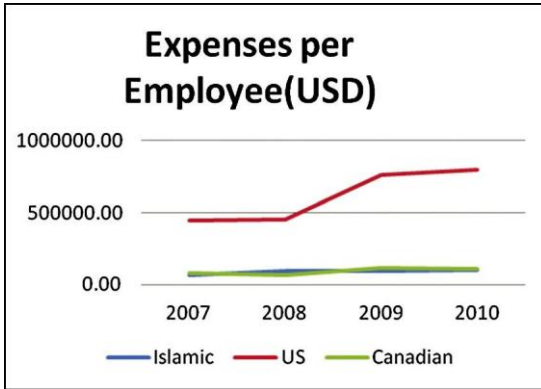
	Islamic	US	Canadian
2010	104874.17	792558.78	112795.75
2009	97544.20	757767.95	113906.02
2008	93515.48	454141.11	66866.19
2007	67306.43	443660.89	77290.92

Expenses per employee are highest for US banks. The top executives get very high compensation and bonuses. After retiring they are given extraordinary severance packages. Since these are not regulated, stockholders' money gets wasted in such activities. In comparison to the US, Canadian and Islamic banks have stable expenses per employee.

Figure 6 – Credit to Deposit Ratio
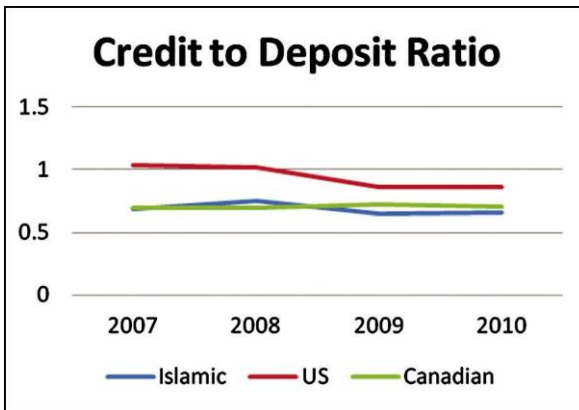
	Islamic	US	Canadian
2007	0.69	1.04	0.70
2008	0.75	1.02	0.70
2009	0.64	0.86	0.72
2010	0.66	0.86	0.70

Credit to deposit ratio is very high for US banks. Credits are more than deposits. As credit is high, if people start defaulting the impact will be highest for US banks as they won't be able to pay their depositors.
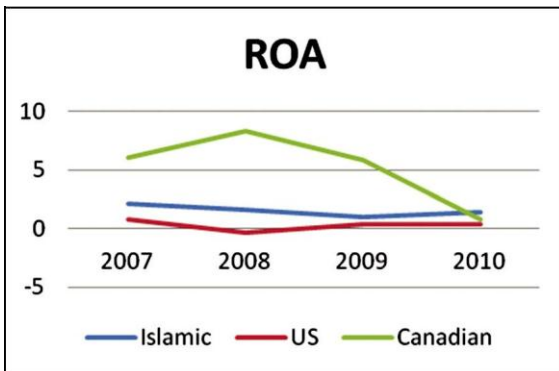
Figure 7 - Expenditure to Net Income Ratio
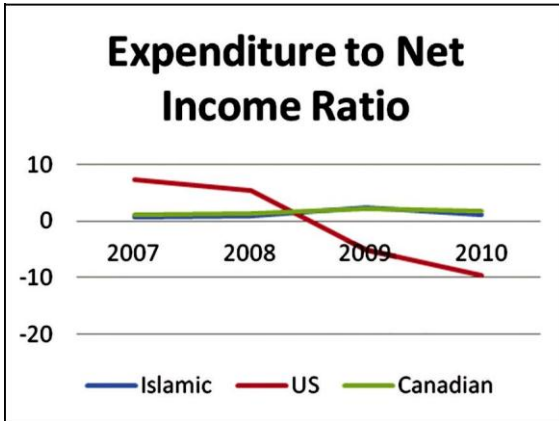
	Islamic	US	Canadian
2007	0.67	7.28	1.09
2008	0.98	5.46	1.28
2009	2.29	-5.05	2.09
2010	1.11	-9.53	1.68

Expenditure is highest for US banks and in 2009 and 2010 net income is negative, which makes this ratio go below zero. But if we see Canadian and Islamic banks they have maintained a constant ratio.

Earnings Ratio

Figure 8 – Return on Assets

	Islamic	US	Canadian
2007	2.17	0.83	6.09
2008	1.66	-0.36	8.36
2009	1.01	0.39	5.79
2010	1.39	0.37	0.75

Canadian banks had the highest Return on Assets except for the year 2010. US banks had the lowest ROA with a negative average ROA in year 2008. This was the crisis period. Islamic banks had the lowest ROA in year 2009 followed by 2010

Figure 9 – Return on Equity
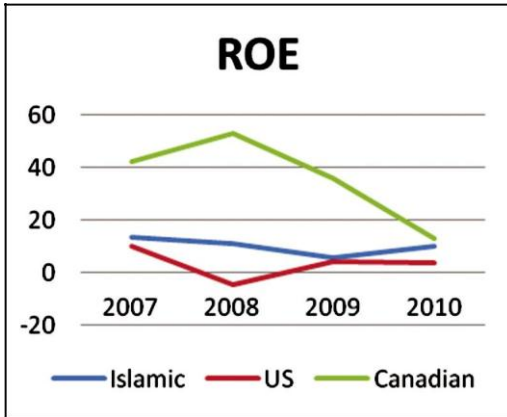
	Islamic	US	Canadian
2007	13.52	10.10	42.38
2008	11.21	-4.87	52.79
2009	5.60	4.14	35.97
2010	9.79	3.79	13.10

Return on equity was very impressive for Canadian banks and during crisis situation also they showed a good growth. On the other hand US banks had negative ROE during 2008 (crisis period). Islamic banks showed very stable return on equity for period 2007-2010.

Liquidity Ratios

Figure 10 – Liquid Asset/Total Asset Ratio
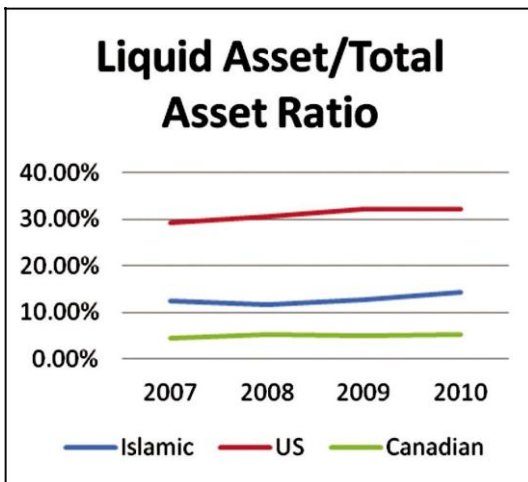
	Islamic	US	Canadian
2007	12.33%	29.24%	4.52%
2008	11.54%	30.40%	5.21%
2009	12.69%	32.14%	5.07%
2010	14.24%	32.25%	5.12%

This is a measure of the solvency. US banks had the highest value among the three categories. The US banks were on a spree of disbursing many loans even to non - creditworthy individuals. On the other hand the Canadian banks had the lowest value of this ratio. Islamic banks had moderate values of liquid assets to total assets ratio.

Figure 11 – Securities/Total Assets Ratio
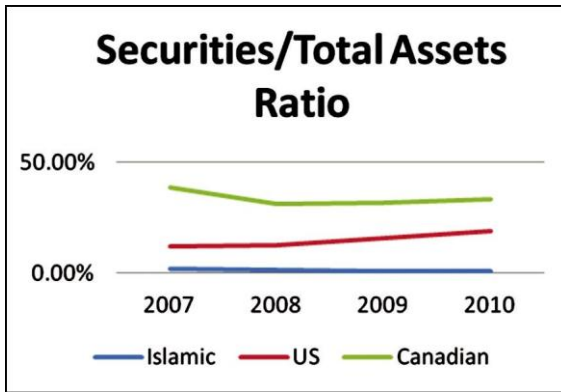
	Islamic	US	Canadian
2007	1.94%	11.87%	38.57%
2008	1.46%	12.71%	31.01%
2009	0.79%	15.69%	31.54%
2010	0.68%	18.94%	33.32%

Canadian banks had the highest average for the value of government and other securities per unit total assets. The Islamic banks had the lowest average of Securities per unit total assets throughout the years 2007-2010.

Figure 12 – Liquid Assets to Deposits Ratio
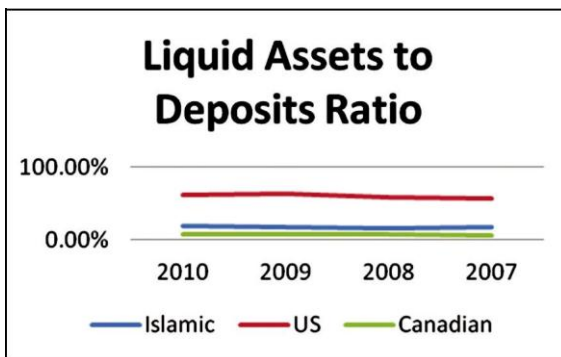
	Islamic	US	Canadian
2010	18.73%	61.38%	7.66%
2009	16.67%	63.48%	6.63%
2008	15.66%	58.94%	7.31%
2007	16.78%	56.96%	6.37%

US banks had the highest average value of liquid assets to deposits ratio. The Canadian banks maintained lower values for this ratio across the years 2007-2010. A low ratio of liquid assets to deposits indicates excess liquidity, and potentially low profits, compared to other banks. A high liquid assets -to-deposit ratio presents the risk that some loans may have to be sold at a loss to meet depositors' claims.

DISCUSSION

The result indicates that there is a significant difference in the way these banks have performed during the time frame considered in the study. All banking systems have their positives and negatives which have been highlighted. The CAR of Islamic banks over the period was consistent at an average of 25%. This is the highest among the three banking models under consideration. This suggests that Islamic banks are comparatively more capable of absorbing a reasonable amount of loss and meeting the time liabilities and other risks such as credit risk, operational risk, etc. The US banks reported a high CAR of 33% in year 2008

but this was the time when the banks were actually sitting on highly risky assets due to subprime lending and high leverages. A high CAR of US banks in 2008 indicates that risk evaluation was not appropriate and there was a high degree of ineffective regulation in the US banking sector. An important aspect with CAR is that the risk evaluation of assets should be proper, else CAR can be a misleading measure. The resilience of Canadian banks during the crisis can be attributed to discipline in lending, proper risk evaluation of assets and stable deposit funding.

The average leverage ratio for the period is at 4% for Islamic Banks, 11% for US Banks & 17% for Canadian Banks. For Islamic Banks, the leverage ratio is low while for US and Canadian banks the ratio is three times and five times respectively of that of Islamic Banks. Financial leverage measures the level of risk taken by a bank as a result of its capital structure since it relates to how much debt it has on its balance sheet. Based on these results, we can conclude that Islamic banks show a better leverage ratio and hence have a lower default and bankruptcy risk as compared to other two banking models.

Among the three banking models it is observed that Canadian banks have highest leverage. The reasoning behind this fact is over half of Canadian mortgages are guaranteed by Canadian government, with banks paying a low price to insure the mortgages. Virtually all mortgages where the loan to value ratio is greater than 80% are guaranteed indirectly or directly by the Canadian Mortgage and Housing Corporation. The system works well for banks; they originate mortgages and then pass on the risk to government agencies. Hence, Canadian banks can afford to live with comparatively higher leverage ratios.

Comparative results show that US banks have been extravagant in their expenditures. These expenditures involved severance packages to higher level employees, paid trips to management teams, private jets etc. But income was dropping because of the bad loans they had. Most of the banks were running into losses and they were finally bailed out by the government. Islamic and Canadian banks are disciplined in their expenditure which is evident in stable values of expenses to net income ratio for them.

Results also show that the non-performing assets have increased drastically for US banks in period 2008-2010 because of the fact that the quality of loans given by these banks was very poor. Credit score of the borrower was low but the loan was disbursed. This resulted in lots of defaults and increased the non-performing assets for US banks. On the contrary the regulation of Canadian banking system was strict and their quality of assets was not impacted during the period 2007-2010. Islamic banks have shown a stable ratio of NPAs to Net Advances.

US banks had very high credit to deposit ratio in the years 2007 and 2008. After the global financial crisis they changed their lending pattern and reduced their credits for the same level of deposits. The expenses per employee were more or less constant between 2007 and 2008 but the earnings per employee had a great downfall. This indicates a lowered profitability of US banks. Moreover, there was a sharp increase in the expenses per employee and earnings per employee between 2008 and 2009. The number of employees laid off during this period is very significant resulting in an increase in earnings per employee.

Based on the ratio analysis, following is the snapshot of performance of the three banking models on parameters indicated in the CAMEL Model.

Banking Models	US	Canadian	Islamic
Capital Adequacy Ratio	Moderate	Moderate	Strong
Asset Quality	Weak	Strong	Moderate
Management Ratios	Weak	Strong	Strong
Earnings Ratio	Weak	Strong	Moderate
Liquidity Ratio	Moderate	Strong	Moderate

Based on the literature review and research findings below are the recommendations for a robust banking system:

1. Diversified banks will be less exposed to concentrated exposure to specific markets. For instance, the recent global crisis was mainly due to concentrated exposure of US banks to real estate market.

2. Regulated banking systems: There should be a periodic reassessment and updating of the regulations and laws governing the banking systems in order to address the challenges and threats of the future needs of the financial sector. In Canada there is a reassessment of banking related laws and regulations every decade and hence it has evolved into a robust banking model.

3. Interest rates should not be tampered much artificially against the market forces. For example, US Federal cut the interest rates that led to excessive borrowings and later defaults happened when the interest rates were increased.

4. High banking concentration with leading nationalized banks is advisable. For example in Canada six nationalized banks comprise the major part of the banking system.

5. Prudent lending practices should be followed. Asset based securitized lending is also advisable, though care should be taken while evaluating the assets' worth. For instance, most of the financial transactions of Islamic banks are backed by physical assets.

6. A clear and transparent banking system is inevitable with inbuilt accountabilities.

7. Risk evaluation should be appropriate and over exposure should be avoided.

Limitations and Future Scope

The study can be broadened to include more banks under each category and time frame can be increased for more comprehensive trend analysis.

More key performance parameters can be included for comparing the banks.

Detailed analysis of the regulatory regime pertaining to these banking systems and corresponding impact on the performance of banks could be done.

Investigate the opportunities of development and growth as well as the main challenges to Islamic banking in non-Islamic countries.

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BOOK REVIEW

George A. Akerlof & Robert J. Shiller (2009). *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism* (Princeton and Oxford: Princeton University Press), pp. 230, p/b, ISBN 978-0-691-15090-1.

Reviewed by

Shiva Kumar Srinivasan, Indian Institute of Planning and Management (IIPM), Chennai

What is it that ultimately explains the behavior of economic agents in a capitalist society? This is, needless to say, the most important question that any economist can set out to answer. It is also a question that has not been adequately understood in economic theory. The answer to this question takes on the form of a convenient assumption rather than an empirical generalization in much of economic theory. John Maynard Keynes however made an attempt to answer this question without assuming that economic agents must be rational maximizers of whatever they define as their self-interest. Instead, he argued that the notion of animal spirits has been overlooked as an explanatory category in both economic theory and economic policy. It has at best been invoked as an interesting category to explain the psychology of entrepreneurs, but its implications for a general theory of economic behavior have not been fully understood. The rationale for understanding economic behavior is to make sense of why economies do not expand in a linear fashion, but experience cyclical variations. How are economists to make sense of contractions and expansions? Why are there limits to contractions and expansions? In the absence of strong policy interventions, for instance, will an economy correct itself? Can any policy maker take the risk of doing nothing and just wait it out? While there may not be empirically binding answers to these difficult questions, the approaches that economists take to these questions tells us a lot about their cognitive style, the conventions of the profession, and their intuitive sense of right and wrong. It also tells us a lot about the most intractable and incomprehensible category of economic explanation: confidence. While a lot of work has gone into understanding the economic consequences of 'expectations', not much has been done at the level of 'confidence' though this term is routinely used by economists and policymakers. George Akerloff of UC-Berkeley and Robert Shiller of Yale argue that the notion of confidence can be better understood if we think-through the range of meanings that are associated with the term 'animal spirits'. This is the element of Keynesian economics that was repressed in the attempt to institute the ideal of *homo economicus* as a rational agent. This is all the more interesting when a number of areas in the human sciences are trying to work-through the limits of rational behavior in firms, families, communities, and societies.

Let us consider for a moment the problem of 'economic recovery'. How exactly does this happen? Why, when, and how do economic agents develop the confidence necessary to initiate something new? During a recovery, as Walter Bagehot noted, the economy 'leaps forward as if by magic'. This magic can only be explained by the revival of animal spirits even though this idea has not been formalized in macroeconomics. The psychological factors related to animal spirits are listed and discussed in separate chapters in this book. These psychological factors, be it confidence, fairness, or stories, are not the sort of things that constitute the ontological stuff of economics, but have become increasingly necessary to make sense of magic. Some might argue that these sorts of categories are not completely new but implicit to some extent in Keynesian ontology. That however does not detract from the originality of the attempt made here to revive a Keynesian understanding of how the macro-economy really works. Akerlof and Shiller argue that the hard-won lessons of depression economics must not be forgotten. The recent economic meltdown, which is usually described as at least analogous to, if not homologous, to the Great Depression, forces us to rethink our economic agenda, priorities, and the need to re-institute an effective regulatory regime to stabilize the economy. While this book is a foray in economic theory rather than economic policy, it has interesting implications for policy makers because it forces them to revisit the routine assumptions that may not be warranted anymore. This book then

is pitched "at a high level of generality'. Nonetheless, some of the areas in which there are policy implications comprise the following: financial regulation, bankruptcy law, and equity. While Akerlof and Shiller don't pretend to have all the answers, they succeed in making a strong case for the fact that regulatory policy must take cognizance of how animal spirits comprising 'our sense of confidence, of fairness, of good faith, of realistic valuations' have a direct impact on the economy. The levers of regulation then determine whether we want to awaken or dampen the amount of animal spirits necessary to move the economy forward in the right direction. The main policy objective for them however as Keynesians is to further the goals of the Employment Act of 1946. These goals, in the words of the Act, are 'to promote maximum employment, production, and purchasing power'.

The etymology of the term 'animal spirits' comes from a Latin phrase which means 'animating'. Not only does the term capture the idea of a 'life force', it also conjures up 'a restless and inconsistent element in the economy' that is marked by 'ambiguity or uncertainty'. The first part of the book is an examination of the different psychological factors that constitute the notion of animal spirits. Each of these factors is examined in a separate chapter. The second part then proceeds to answer eight important questions on some of the perennial themes in macroeconomics such as economic depressions, the role of central bankers, inflation, unemployment, savings, investment, the housing market, and endemic poverty amongst minority communities. The test of whether the authors have succeeded in doing what they set out to do depends on how professional economists, policy makers, and readers feel about the answers to these questions. Their main wager, to reiterate, is that their answers to these questions will help readers to understand how the macro-economy really works. But since they cannot assume that all readers are privy to the theoretical nuances of these topics, the basic ideas that constitute these topics are built into the chapters so that both experts and novices will gain by reading the book. They also believe that invoking the notion of animal spirits will address the question that haunts the economics profession: Why didn't anybody see this crisis coming? Akerlof and Shiller conclude by stating that their description of the economy will make sense of both the qualitative and quantitative aspects of macroeconomic theory. In order to do this successfully, they draw upon statistics, history, and the stories that are used to 'talk up' or 'talk down' the economy, and how that shapes the problem of expectations, which, in turn, leads or does not lead to a range of policy options and interventions. If widely read, this book will do nothing less than reinvent macroeconomics, and re-calibrate it in the direction of the behavioral sciences. It will also make it possible to rethink the epistemology, ontology, and ethics of the economics profession.

Robert J. Shiller (2012). *Finance and the Good Society* (Princeton and Oxford: Princeton University Press), pp. 288, (h/b), ISBN 978-0-691-15488-6.

Reviewed by

Shiva Kumar Srinivasan, Indian Institute of Planning and Management (IIPM), Chennai

Why is it important for a society to understand finance? How can financial literacy contribute to the development of society? What, if anything, does finance have to do with the political ideal of a good society? And, most importantly, does it make sense for Robert Shiller to eulogize finance in the wake of a world-wide crisis (that has put the 'global financial system' under enormous pressure in the wake of the events of 2008)? These then are the sort of questions that will spring to a reader's mind on reading this lucid introduction to finance. Shiller's book should be read as a companion volume to his popular rendition of the theory and practice of finance in the series featured in Yale Open Courses. This course has not only attracted a large number of viewers (including this reviewer), but has given a tremendous fillip to Yale University's attempt to make the best of its faculty, available online. I will therefore start with the recommendation that readers of this book should also watch Shiller's online course. Juxtaposing this book with the course will work wonders in helping students who are attending a finance course for the first time to not only appreciate Shiller's sheer brilliance as an expositor on matters pertaining to the theory, practice, and institutional foundations of finance, but to also partake of his endearing personality, which combines idealism and irony in equal measure. Shiller has taught this course for over two decades and is therefore in a unique position to appeal to a large audience comprising those who are currently registered for the course, and the large alumni network that finds it worthwhile to hear Shiller revisit the perennial themes of behavioral economics and behavioral finance year after year.

The invocation of the good society relates to Shiller's preoccupation with how a technical knowledge of finance is necessary to construct the kind of social architecture that will increase the range of policy options for both governments and the private sector as a whole. Shiller's approach is interesting not only because of his wide-ranging knowledge of finance, but also because of his unusual ability to theoretically oscillate policy questions between the complementary loci of economics and finance. The notion of the social good as he understands it is not surprisingly then at the locus of convergence between economics and finance—both of which he insists must be rethought from a behavioral point of view. So while Shiller understands the importance of technical knowledge for constructing a financial system, the policy goals of that system, he argues, do not have to be internal to finance as a profession, but must instead engage with the evolution and development of socio-economic ideals in the contemporary global economy. In order to do that successfully, Shiller and the behavioral economists with whom he has co-authored in the past, find it necessary to understand why economic agents behave in the idiosyncratic ways in which they actually do in everyday life rather than work with the convenient and ubiquitous assumption that they are necessarily the self- maximizing rational agents posited in much of economic theory. Shiller's interest in psychology, behavioral sciences, economics, and finance then makes for a heady, almost wicked combination of theoretical interests that culminated not too long ago in a study on the problem of economic confidence (that John Maynard Keynes originally termed 'animal spirits'). Shiller is also a leading expert on the housing market, asset bubbles, and real estate, and is a regular commentator on these issues in the American and international media. In relation to almost all of these issues, Shiller argues that an important causative factor that economists and financiers might overlook in their attempts to be rationalists is the need for animal spirits as the animating force of economic activity. Robert Shiller and George Akerloff argue more or less that unless we think through the implications of this term, we will not

be able to account for the huge infusions of energy that entrepreneurs bring to the process of

starting new businesses, creating jobs, and in offering new products and services.

The prospects of economic revival are not reducible to the abstractions of economic policy, but are rather about the play of animal spirits as the main socio-economic impetus of society. This lacuna in economic theory is addressed elsewhere by theorists of entrepreneurial psychology, but not sufficiently incorporated into mainline economic theory. What behaviorists in economics and finance are trying to do however is to incorporate the motivational dynamics of entrepreneurs as an explanatory category within the space of *homo economicus*. Once they succeed in doing so, there will be a fundamental difference in terms of what constitutes an effective explanatory schema in economics making it unnecessary to specify a particular strain as behavioral. The first part of this book is about the behavior of a large number of economic agents that make the economy work. It spells out their stake in the economy, the forms of discourse that they collectively construct, the constraints under which they work, the agency problem, the need for effective regulation, and so on. The second part of the book is about the 'discontents' that plague finance as a system even more than as a profession. This approach is based on the Freudian model of civilization and its discontents. The question here is whether the discontent is structural and within our ability to repair through forms of financial reengineering, or whether they have an existential dimension like Freudian psychoanalysis where the notion of discontent is about the human psyche being fundamentally 'out of joint' with civilization. The existential dimensions of finance then have important implications for what can emerge in the locus of the Good Society.

The first part then can be understood as offering a list of not only economic agents, but more importantly their function as stakeholders within the financial system. Each of these stakeholders warrants a chapter that sets out a systemic aspect of finance. It is not necessarily Shiller's case that any of the stakeholders has a comprehensive view of the financial system as whole, but is constrained by the conventions of the profession to which they belong. It is only when a problem emerges as endemic or systemic that attempts are made to understand how the different parts of the system are related to each other. It is therefore important in projects of financial literacy to get laypeople to understand the forms of causal over-determination in the system as a whole in order to prevent reductive approaches to understanding the behavior of economic agents or financiers as a profession. These chapters will also make it easier for policy makers to look at the system from the point of view of a range of stakeholders and pick up a more nuanced notion of stake-holding.

The second part of the book is an examination of the traditional policy ideals of economics albeit in the context of the financial system. This serves to not only de-familiarize economic goals, but also approaches the question of affordability. The main justification for doing finance is that socio-economic ideals will remain only ideals, and remain beyond our reach, unless we are able to think of them as being enabled in the first instance by the social architecture of finance. So, for instance, the range of products that everybody buys in the contexts of banking, insurance, mortgages, mutual funds, and so on can either be looked at separately as technical constructs and/or services between sellers and buyers, or collectively as constituting a set of services that will serve the long term macroeconomic goals of a society. Considered separately, these financial constructs are goods/services. But considered as a system, they constitute the 'conditions of possibility' of economic life itself. The discontents of finance then pertain to society's inability to prevent the forms of psychic repetition that Freud identified under the aegis of the repetition compulsion. A whole range of speculative bubbles, and the symptoms associated with them constitute the fact that each society has to learn through trial and error rather through the elegance of formal economic or financial theory on the modalities that constitute the acceptable range of approaches to the Good Society.

Pritam Singh, Asha Bhandarker, and Sumita Rai. (2012). *Millennials and the Workplace: Challenges for Architecting the Organizations of Tomorrow* (New Delhi: Sage), pp. 233, (paperback), ISBN 978-81-321-0898-6, Rs. 425.

Reviewed by
Venkat R. Krishnan, Great Lakes Institute of Management, Chennai.

The book starts emphatically with the blueprint that only species, institutions, and organizations that had capability to appropriately adapt to the changing environment could survive, grow, and excel. Sensitivity to the contextual challenges becomes an essential requirement for even mere survival of individuals and institutions. The book presents two anecdotes narrated by two Indian CEOs to illustrate and capture changing individual expectations and mindsets in the last 60 years. Contemporary organizations have to be well equipped and prepared to handle the complex challenge which is being thrown by the young generation of Millennials. This will be possible when organizations develop greater understanding, sensitivity, and appreciation about this generation and their aspirations, expectations, and mindsets. It is in this perspective that the unprecedented and remarkable project described in this book was undertaken to map out the expectations and profiles of the Millennials. The exclusive focus of the project was to explore the expectations and aspirations of people with a view to creating organizations that match those so that they can contribute their best to institution and nation building.

This book has been organized in five chapters. Chapter 1 ("Meaning of work and workplace: A panoramic view") provides an excellent review of the literature on the significance of work in human life and human nature, and the meaning of workplace. The factors leading to greater meaning of work and workplace are brilliantly summarized. Age, gender, education, work experience, family background, place of upbringing, parental occupation, and parental styles are the demographic factors that affect meaning of workplace. Locus of control, achievement motivation, and personal values are the personality variables that predict meaning of workplace. The chapter also discusses the research design and framework utilized in this project. The key thrust of this research is on the Millennial generation which comprises people born after 1977. Understanding their expectations and meaning of workplace will be immensely useful to create the desired organization of the future. The project was carried out during 2007-2010, using both quantitative and qualitative research. The data for the project were gathered from 2170 respondents from leading engineering and management schools, with a final usable sample of 2158.

Chapter 2 ("Who are the Millennials?") characterizes the Millennials in terms of their demographic and psychographic background profiles as well as selected personality factors such as achievement motivation, work locus of control, and personal values. The four personal values—personal growth, self-fulfillment, progressive orientation, and community development—are highly valued by the Millennials group. Millennials are highly achievement-oriented and also have high internal control beliefs. These characterizations are of immense value since they will help organizations to develop appropriate ways to build person-organization fit. The findings on personality have been examined across various demographic and psychographic variables.

Chapter 3 ("Meaning of workplace: Millennials' valence") describes the expectations of Millennials and examines them across various demographic and personality factors. Understanding the meaning of workplace from Millennials' lens is the core around which new forms of organization need to be architected. Understanding Millenials' expectations becomes much more critical in the coming decades as the war for talent becomes more severe on a global scale. Millennials crave for a workplace that provides freedom for experimentation, offers

opportunities to take initiatives, and encourages idea generation and innovation. The authors have looked at an excellent set of demographic factors including age, gender, nature of education, prior work experience, family type, parents' occupations and employment status, place of upbringing, and parental styles. They also studied selected personality factors and found that people with high self-fulfillment value, high personal growth value, high progressive value, high community value, and high achievement orientation have greater meaning of workplace expectations.

Chapter 4 ("Meaning of workplace: Expectations vs. reality of workplace attributes") brings out the gap between what Millennials expect from the workplace and what they get. On the one hand, Millennials have many higher order self-related developmental expectations like "Look for opportunities to actualize experiment and express their creativity," "be meaningfully engaged," and "become part of the community and contribute to society." On the other hand, Millennials are faced with the workplace realities that are anathema for self-development and creative self-expression, viz., they are bogged down by work culture characterized by hierarchical and top-down approach, drive for conformity, less attention to unleash human potential, and less sensitivity to people development. This chapter also examines the Millennials' expectations from their immediate superior as well as factors triggering the intention to leave the organization. Millennials prefer to work with an immediate supervisor whose style is more nurturing, who is open to meet people, who brings people together, who is empowering in his approach, who is fair, who is a good role model, and who inspires others. Perceptions of HR professionals regarding the Millennials have also been examined in this chapter. The authors have done a remarkable job in gathering these data, because HR professionals are key actors at the workplace in influencing policies related to employees at the workplace.

Chapter 5 ("Architecting the organization of tomorrow") attempts to sketch the contours of the new workplace that would create alignment between the individual's expectations and the organizational offerings. The chapter begins with an exciting and meaningful story that wonderfully highlights the essential wisdom that the world can be built by building the Millennials and the youth.

The book has successfully and convincingly established that organizations and leaders must map out the Millennials' dreams and aspirations and appropriately architect organizations and leadership styles. Organizations and leaders need to shift their mindsets from the shackles of the past and present to proactively respond to the emerging realities of the future. The authors have been very benevolent in creating checklists that will enable organizations and organizational members to build organizations of tomorrow responsive enough to meet Millennials' expectations, desires, and aspirations. The book concludes with an organizational DNA and a leadership code for meeting Millennials' expectations. The book should be read by everyone interested in developing appropriate organizations that would get Millennials excited about work.