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# **Random Walk, Adaptive Behaviour and Dynamic Relationship between Stock and Forex Markets: An Evidence from India**

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and  
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## **ABSTRACT**

This study explores the random walk behaviour of Indian stock and forex markets and also uncovers the fact that both markets are adaptive to different market conditions as per proposition of 'Adaptive Market Hypothesis' (AMH). This is followed by a comparison of efficiency and detection of the nature of relationship between markets. For empirical verification, the study uses various econometric tests viz., unit root test, variance ratio tests, Engle-Granger cointegration test, ordinary least square regression and quantile regression. The overall findings of the study report that Indian stock market is more weak-form of efficient in comparison to the Forex market and adaptive power of stock market is quicker than that of the Forex market. The paper also evidences absence of long-run relationship and presence of short-run relationship between stock and Forex market.

**Key words:** Stock market, Foreign exchange market, Adaptive Market Hypothesis, Random walk, Quantile regressions.

## **I. INTRODUCTION**

The "random walk hypothesis" (RMH) is a preponderance area in the field of asset pricing. A market where random walk persists is classified as an efficient market. According to economic theories, a stable efficient market always helps effective allocation of funds to productive sector. In reality, the financial market undergoes numerous chapters of economic development and witnesses various events that disrupt market efficiency. The formation of such

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episodes exhibits changes in the pattern of market efficiency and dynamic relationship or integration among different classes of the financial market. Notably, disruptions in market efficiency create opportunities for traders to exploit the market economically. In a seminal work, Fama (1970) advocates theoretical description to random walk through efficient market hypothesis (EMH).

Consequent to the seminal work of Fama (1970), a group of researchers believes that the market is efficient (Azad and Tabak, 2004; Al-Khazali *et al.*, 2007; Lean and Smyth, 2007; Kim and Shamsuddin, 2008). Against the conviction of EMH, another body of researchers identifies the inefficiency in market movements (Greene and Fielitz, 1977; Ma, 2004; Squalli, 2006). This contradiction has created a scope for researchers in behavioural economics to reconcile EMH with the adaptive behaviour of market participants. In behavioural economics, the process of incorporating information into market dynamics is non-instantaneous and complex. Various studies have revealed that the irrational behaviour of market participants (such as overconfidence and overreaction) and the occurrence of different events affect market efficiency. Lo (2004) observed that perfect information processing does not exist and the markets are considered to be adaptive. Citing the time-varying nature of the market, Lo (2004, 2005) further proposes the 'adaptive market hypotheses', based on evolutionary principles. According to Lo (2005), the extent of market efficiency is associated with environmental factors, such as, number of competitors, profit opportunity and adaptability of market players. This observation has increased interest from the investment perspective in exploring whether the dynamic relationship or integration between different classes of financial markets varies during different time periods or not. Although there is a lack of fundamental or theoretical unanimity on the interaction between stock prices and exchange rates, certain intermediating variables (e.g. interest rate, demand for money, inflation, and wealth) and the existence of different market events (e.g. financial crises and major central bank interventions) play a crucial role in establishing the relationship between them.

Given the substantial importance of EMH and AMH, the present study deals with further investigation to them under different market conditions of Indian stock and Forex market. Subsequently, an attempt has been made to compare the efficiency of these two markets. India, one of the emergent countries with a floating rate exchange rate regime, attracts a large proportion of foreign direct investment (FDI) in due course. This results in an increase in the market's turnover and an increase in export trade and business. The Indian foreign exchange market (FEM) ranked 20<sup>th</sup> in the world in April 2013.<sup>1</sup> In this vein, our survey noted a comprehensive piece of research on EMH carried out at stock and forex markets of India.<sup>2</sup>

## II. LITERATURE SURVEY

Previous studies on this aspect generally focused on developed economies (Cross, 1973; Rogalski, 1984; French and Roll, 1986; Fama and French, 1988;

Liu and He, 1991) rather than emergent economies. However, post 1990s witnessed a change in the focus, where a substantial part of the research on EMH dealt with emergent economies (Butler and Malaikah, 1992; Ajayi and Karamera, 1996; Belaire-Franch and Opong, 2005; Azad, 2009; Vats and Kamaiah, 2011; Hiremath and Kamaiah, 2010; Nwachukwu and Shitta, 2015).

By focusing on the stock market, Butler and Malaikah (1992) investigated random walk patterns in Kuwait and Saudi Arabia markets and conclude with acceptance of RWH in Kuwait market and a rejection of the RWH in Saudi Arabia market. By examining some Latin American countries, Urrutia (1995) exposed evidence of serial dependence in monthly stock returns. Greib and Reyes (1999) explored Brazilian market in terms of random walk patterns and Mexican market in terms of autocorrelations. In the same vein, research conducted on the emergent Asian market supported the results of earlier studies conducted on other emergent markets (Huang, 1995; Poshakwale, 1996; Lee *et al.*, 2001; Lock, 2007; Mobarek and Fiorante, 2014). Huang (1995) explored serial dependence in the Singaporean, Hong Kong and Thai markets using the variance ratio (VR) test. The study of Poshakwale (1996) conducted on Indian capital market reveals issues of significant day of week effect and evidence absence of weak-form EMH during 1987-1994. Lee *et al.* (2001) with an enquiry to Chinese stock market observed independence in returns series and the same has been endorsed by Lock in 2007. Nevertheless, contradicting results have also been evidenced from the same market by Lima and Tabak in 2004. In a recent study to emerging market of BRICS (Brazil, Russia, India, China and South Africa) countries, Mobarek and Fiorante (2014) observed that these emerging countries are moving towards efficiency and major economic events like financial crisis affect these economies to a great extent. In Indian context, the study of Rao and Mukherjee (1971) is considered to be the first study. Subsequently, Sharma and Kennedy (1977) investigated random walk in Bombay stock exchanges using run test and spectral technique and reported existence of random walk. In a similar way, the studies of Barua (1981) and Gupta (1985) evidenced similar results. However, Poshakwale (1996) registered a contradict result and evidence against RWH. In a recent study, with battery of VR tests, Mobarek and Fiorante (2014) observed RWH in Indian equity market. Whereas Hiremath and Kumari (2015) observe long memory in mean returns for small sized firms.

Similar to equity market, it is observed that existing literature on market efficiency of forex markets are also abundant and unsettled (Liu and He, 1991; Ajayi and Karemera, 1996; Wright, 2000; Chen, 2008; Azad, 2009; Charles *et al.*, 2012; Katusiime *et al.*, 2015). Preceding studies exhibit striking evidence of randomness (Ajayi and Karemera, 1996; Belaire-Franch and Opong, 2005; Chen, 2008) and serial autocorrelations (Ajayi and Karemera, 1996; Wright, 2000; Lobato *et al.*, 2001) in exchange rate series using different density of data. In a convincing work Liu and He (1991) applied VR test as proposed by Lo and MacKinlay (1988) and reported rejection of random walk phenomenon in forex rate of five major developed countries with weekly data (British pound, Canadian dollar, French franc, German mark and Japanese yen). Subsequently,

Belaire-Franch and Opong (2005) and Chen (2008) using daily data, reported mixed results on EMH by rejecting it for Canadian and Singaporean dollar and accepting it for US dollar, Australian dollar, New Zealand dollar, Japanese yen, British pound, Norwegian kroner, Swedish krona and Swiss franc. Ajayi and Karemera (1996) made attempt to enquire the existence of weak-form efficiency in emerging countries (Hong Kong, Indonesia, Korea, Singapore, Thailand, Taiwan and Malaysia) and reported the existence of RWH in Hong Kong, Indonesia, Korea, Philippines and Singapore. At the same time, the study explored serial dependence in exchange rate of Thailand, Taiwan and Malaysia. It is surprising to note that study of EMH on Indian FEM is limited to the research studies undertaken by Kohli, (2002), Inoue and Hamori (2009), Vats and Kamaiah (2011). The study by Vats and Kamaiah (2011) is the only study that directly links EMH with foreign exchange return predictability. The period of the study is from 1991 to 2010 and it reports serial dependence in exchange rate between USD and INR.

From the studied literature it is widely evidenced that authors have used different tests and different periods resulting in different conclusions. It is also noticed from the erstwhile studies that market efficiency mostly explained for a particular time horizon without considering the time-varying behaviour of the market. However, an important fallacy has been identified from the studied literature in Indian context that previous studies lack in considering the time-varying parameters while investigating EMH and the same is also endorsed by Ito and Sugiyama (2009).

Investigation of EMH without time-varying parameter explain it as zero-or-one condition (either efficient or inefficient) for particular time period. So, in a significant note, behavioural economists oppose this zero-or-one notion of EMH. They advocate that change in regulatory frameworks, economic cycle and heterogeneous behaviour of the market can cause change in degree of market efficiency for a particular time period. This urges for a reconciliation between EMH and AMH, which is expected to co-exist. Since the conception of AMH from the seminal work of Lo (2004), only a few studies have been under taken at both stock and Forex markets. Smith (2012), Alvarez-Ramirez *et al.* (2012), Urquhart and Hudson, (2013) and Hiremath and Kumari (2014) undertook studies in the context of stock markets and observed results adhering to AMH. However, in the context of FEM, the studies, exclusively dealing with AMH and EMH, are limited to three available literature viz., Neely *et al.* (2009), Charles *et al.* (2012) and Katusiime *et al.* (2015) to the best of our knowledge. It is also observed from the studies concerning AMH that market efficiency is not constant; it varies over the period and also gets affected by different market events. It is noteworthy to mention here that, besides market efficiency and adaptive behaviour, there is a requirement to study whether the relationship between stock and forex markets gets changed or not over the time period.

The relationship between two can be established through flow-oriented models and stock-oriented models. Flow-oriented model of exchange rate determination postulates that fluctuation in currency rate affects balance-of-trade and competitiveness of the firm. Subsequently, it affects future cash flows

of firms and their stock prices (Dornbusch and Fischer, 1980). According to stock-oriented model, it is assumed that investors park their total wealth in both domestic and foreign assets including currencies. This model further explains that if there is increase in domestic asset price then it attracts more investment and generates more demand for money which in turn increases the interest rate. An increased interest rate invites foreign investors and leads to appreciation in domestic currency. Besides this theoretical explanation, an enormous base of literature evidenced empirical relation existing between stock and forex markets and most of them can be evidenced in developed markets (Jorion, 1990; Lima, 1994; Bartov and Bodnar, 1994; Qiao, 1996).

From the above literature survey, three points can justify our approach behind selecting Indian stock and forex market for the present study. Firstly, despite of large study on EMH for financial markets across the globe and a sound base of study in India, it is evidenced that existing literature is silent about time-varying movement of the market. Secondly, no literature has been found on exclusive description to AMH in stock and Forex markets except the study of Hiremath and Kumari (2014). Thirdly, no such studies have been found in Indian context which can explain the relationship between stock and forex market in different market conditions. To the best of our knowledge, we contribute to the existing literature in three different ways. First, this is a first study in Indian Forex market which exclusively discusses EMH with AMH and relationship between stock and Forex markets under different market conditions and make comparison thereof. Second, the study addresses dynamic relationship between stock and Forex markets with quantile regression, which is unique in Indian context. Finally, the study extends literature in AMH which is quite scant in international context.

The structure of remainder of this paper includes section III for data and methodology, section IV for results and analysis, and section V for further discussions followed by conclusion in section VI.

### **III. DATA AND METHODOLOGY**

#### **3.1 Data**

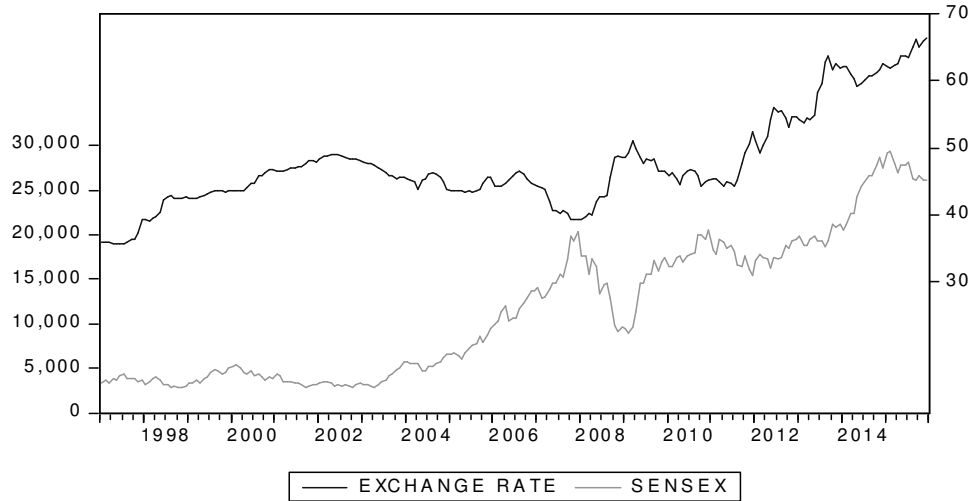
For empirical verification, the present study uses monthly data of Bombay Stock Exchange's major index, SENSEX, as a proxy of stock market, and nominal bilateral exchange rate between Indian national rupee (INR) and United States dollar (USD), as a proxy for movements in Indian FEM. The study period ranges from January 1997 to December 2015. The rationale behind preference of such period is that it witnessed numerous economical (crises, financial scam, macroeconomic instability and etc.) and noneconomic (political instability, natural calamities, terrorist attack, etc.) events which have potentiality to influence the financial market movements. The source for SENSEX data is official website of BSE and for exchange rates, it is the database of Federal Reserve Bank of St. Louis. Final sample size consists of 228 observations.



Figure-1 shows the trend of stock and Forex markets with raw data which evidences opposite trends. For analysis, both SENSEX and exchange rates data are converted into natural logarithmic returns.

FIGURE 1

### Trend of Sensex and Exchange rates



## 3.2 Methodology

We use several econometric tests which includes unit root, battery of VR, Engle-Granger cointegration, ordinary least square (OLS) and quantile regression test. Each technique used in the study supplements each other and drives for a systematic and robust conclusion.

### 3.2.1 Unit root test

It is normally meant to test stationarity issue of data set used with an objective to avert the issue of erroneous regression result. For the said purpose, we have used both conventional and structural break unit root tests. In conventional form, we use Augmented Dickey-Fuller (Said and Dickey, 1984) test and Phillips-Perron (1988) test. The null hypothesis under this test has been set as, the asset returns series is unit root or non-stationary. Rejection of null hypothesis confirms the data series as stationary. We use both the tests using intercept as well as trend and intercept with level and log differenced data. The test equation for Augmented Dickey-Fuller and Phillips-Perron has been defined as:

$$\Delta A_t = \mu + \Phi_{t-1} \sum_{t=1}^P \Delta A_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta A_t = \mu + \beta_1 t + \beta_2 A_{t-1} + \sum_{i=1}^p \Delta A_{t-i} + \varepsilon_t \quad (2)$$

$$\Delta A_t = \beta_1 A_{t-1} + X_t Y + \varepsilon_t \quad (3)$$

Where Eq. (1) is the model with only intercept  $\mu$  and the Eq. (2) is the model with both intercept  $\mu$  and trend  $\beta_1$ .  $\Delta A_t$  . Indicates change in asset rate where

$\Delta A_t = A_t - A_{t-1}$ ,  $t$  is a time trend  $p$  indicates number of lagged variable and  $\varepsilon_t$  is the white noise term at time  $t$ . Eq. (3) used for Phillips-Perron test.

It is evident from the study of Perron (1989) that the strength of conventional unit root test decreases to reject the null hypothesis when the extant structural break is neglected. Hence, to avoid such structural break problem, we employ Zivot Andrews (1992) structural break test which allow for one endogenous structural break and Lee Strazicich (2003) multiple structural break test based on principles of Lagrangian multiplier (LM).<sup>3</sup> This test can detect the mean reverting tendency data series due to existence of different potential events.

### 3.2.2 Battery of variance ratio tests

We employ the VR statistics proposed by Lo and MacKinlay (1988) in which null hypothesis of a random walk infers that there is linearity of association between variance of a sample with sampling interval. Assuming random walk in the asset returns  $r_t$ , the variance of  $r_t + r_{t-1}$  needs to be double of the variance of  $r_t$  (Hiremath and Kumari, 2014). If the ratio of the variance of two period returns is  $r_t(2)$  then to double the variance of one period returns  $r_t$ , VR(2) is:

$$VR(2) = 1 + \rho(1) \quad (4)$$

Where in Eq. (4)  $\rho(1)$  is the first order autocorrelation coefficient of returns  $r_t$  and  $\sigma^2$  indicates variance. As per random walk hypothesis, there should be zero autocorrelation in the series data and it is validated if  $VR(2) = 1$ . VR can be calculated for any number of period, considering  $r_t$  as the stock or exchange rate returns in time period  $t$  the VR coined by Lo and MacKinlay (1988) with holding period  $q$  can be expressed as:

$$VR(q) = \frac{\sigma^2[r_t(q)]}{q \cdot \sigma^2[r_t]} = 1 + 2 \sum_{k=1}^{q-1} \left(1 - \frac{k}{q}\right) \rho^k \quad (5)$$

Where  $\rho^k$  is the  $k^{\text{th}}$  order autocorrelation coefficient of exchange rate returns. Eq. (5) depicts at all  $q$ , the VR should be equal to unity to hold the existence of random walk. Mentioning homoscedasticity and heteroscedasticity as a feature of returns series data Lo-MacKinlay proposes a standard normal test statistics  $Z(q)$  and  $Z^*(q)$  to address both the feature of data. Lo-MacKinlay  $Z^*(q)$ , which addresses heteroscedasticity is considered as most robust and has practical implication (Hiremath and Kumari, 2014). Following asymptotically standard normal distribution the  $Z^*(q)$  test statistic can be defined as:

$$Z^*(q) = \frac{VR(q) - 1}{\Phi^*(q)^{1/2}} \quad (6)$$

Where in Eq. (6)  $\Phi^*$  refers heteroscedasticity of VRs. Thus, it can be inferred that VRs greater than one show positive autocorrelation and less than one signal negative autocorrelation in forex returns.

To overcome the problem of size distortions and joint nature of testing for random walk, Chow and Denning (1993) propose multiple variance ratio (MVR) test, wherein a combination of MVRs are tested for multiple holding periods to test whether the MVRs are jointly equal to one. The null of MVR tests set as,  $M_v(q_i) = 0$  and the alternative hypothesis set as,  $M_v(q_i) \neq 0$ . Where  $i = 1, 2, 3, \dots, m$ . The test statistic of Chow-Denning MVR is:

$$CD = \sqrt{T} \max_{1 \leq i \leq m} |Z^*(q_i)| \quad (7)$$

The Chow-Denning statistics follows studentized maximum modulus (SMM) distribution with  $m$  parameters and  $T$  degrees of freedom.  $Z^*(q_i)$  explains heteroscedasticity statistics of VR tests. Use of this method is also evidenced from the study of (Belaire-Franch and Opong, 2005; Chen, 2008; Katusiime, 2015).

Finally, we use Wright (2000)'s rank and sign variance ratio test (WRSVR) which has superior power than single and MVR tests when the distribution is not normal (Hung *et al.*, 2009; Mobarek and Fiorante, 2014). To explain the methods let assume that  $T$  observations of returns  $(y_1, y_2, \dots, y_T)$ . Wright (2000) defines  $R_1$  and  $R_2$  statistics as follows:

$$R_1(k) = \left( \frac{(Tk)^{-1} \sum_{t=k}^T (r_{1t} + \dots + r_{1t-k+1})^2}{T^{-1} \sum_{t=k}^T r_{1t}^2} - 1 \right) \left( \frac{2(2k-1)(k-1)}{3kt} \right)^{-\frac{1}{2}} \quad (8)$$

$$R_2(k) = \left( \frac{(Tk)^{-1} \sum_{t=k}^T (r_{2t} + \dots + r_{2t-k+1})^2}{T^{-1} \sum_{t=k}^T r_{2t}^2} - 1 \right) \left( \frac{2(2k-1)(k-1)}{3kt} \right)^{-\frac{1}{2}} \quad (9)$$

Here  $r_{1t}$  and  $r_{2t}$  are as follows:

$$r_{1t} = \frac{(r(y_t) - (T+1/2))}{\sqrt{\frac{(T-1)(T+1)}{12}}} \quad (10)$$

$$r_{2t} = \frac{\sigma^{-1} r(y_t)}{T+1} \quad (11)$$

Where  $r(y_t)$  is the rank of returns series  $y_t$ . R1 and R2 shares the same sampling distributions. In a similar way the sign based VR test can be expressed as:

(12)

Where in Eq. (12)  $S_1$  is an independent identical distribution sequence with constant variance of 1 and mean zero, which takes the value of 1 and -1 with similar probability of 0.5. It assume a zero drift value.

The null hypothesis of WRSVR test consider returns series  $y_t$  follow martingale difference process with unconditional mean of zero.  $S_t$  follows independent and identical distribution (iid) with constant variance (1 and -1) and equal probability of 0.5. We use the WRSVR test for full and sub-samples with  $k$  values of 2, 4, 8 and 16 which represent different time horizons.

### 3.2.3 Engle-Granger cointegration test

The Engle-Granger cointegration test proposed by Engle and Granger (1987) can be used to check the linear long-run relationship between stock and forex markets if the data series are non-stationary. Two time series data integrated of order  $q$ ,  $I(q)$ , are cointegrated if two series depicts linear relationship through least square regression. The residuals generated from least square regressions is need to be stationary in less than order  $q$ . If both the variables are cointegrated, then their relationship can be measured through an error correction model. If the variables are not cointegrated or long-run relationship does not exist, then the short-run relationship can be measured through estimation of ordinary least square (OLS) regression and quantile regression. Because, acceptance of no cointegration can be biased if the two market adjustment process is asymmetric (Enders and Siklos, 2001).

### 3.2.4 Ordinary least square regression and quantile regression

To estimate the short-run relationship between stock and forex market, we have used both OLS and quantile regression. To measure this natural logarithmic differenced data are taken. The OLS regression equation is as follows:

$$\Delta \ln EX_t = \alpha + \beta \Delta \ln SI_t + e_t \quad (13)$$

$$\Delta \ln SI_t = \alpha + \beta \Delta \ln EX_t + e_t \quad (14)$$

Where in Eq. (13) and (14) represents change in exchange rates returns and indicates change stock index returns at time  $t$ .  $\alpha$  is the intercept and  $\beta$  is the coefficient of the model.  $e_t$  is the error term.

Further to make the result unbiased and conclusive, we have followed quantile regression method. The power of quantile regression method is superior to traditional OLS regression method. Because in a conditional distribution, it allows estimation of different quantile functions. The results of

OLS regression may produce biased result when the conditional distribution is heterogeneous (Tsai, 2012). Peculiarity of the quantile regression is that it provides the estimation of median function (0.5<sup>th</sup> quantile). The primary objective of the quantile regression model is to estimate the coefficient ( $\beta$ ) for multiple conditional quantile functions. In line with the study of Tsai (2012), we use the linear specification for the conditional quantiles of exchange rate to observe the relationship between stock and FEM in India. The specification is as follows.

$$EX_t = \beta SI_t + u_t \quad (15)$$

Where in Eq. (15)  $EX_t$  is the exchange rates and  $SI_t$  is the  $k \times 1$  regressors i.e. stock index which is treated as constant.  $\beta$  is the coefficient of the model and need to be estimated.<sup>4</sup>

#### IV. RESULTS AND ANALYSIS

Descriptive statistics of the data are shown in Table 1. With the use of monthly data of stock price index and forex rate the present study got 227 observations in each segment. It is observed from descriptive statistics that during the study period maximum returns from stock market is 24.9 % and from forex market it is only 6.6 %. Minimum returns are also higher in stock market (-27.2 %) rather than forex market (-4.1 %). Standard deviation of stock market shows more volatile nature of the market. The skewness value indicates stock returns are negatively skewed and forex market returns are positively skewed. Statistical significant values of excess kurtosis and Jarque-Bera statistics for stock and forex markets reveal non-normal distributions of the data set.

TABLE 1

##### Descriptive statistics

Descriptive statistics	Stock returns	Forex returns
Maximum	0.249	0.066
Minimum	-0.272	-0.041
Sample mean	0.009	0.002
Standard deviations	0.072	0.016
Skewness	-0.401	0.854
Kurtosis(excess)	1.006(0.000)	2.604(0.000)
Jarque-Bera	15.723(0.000)	92.102 (0.000)
Observations	227	227

Note: Number in parenthesis denotes p-value.

To avoid the spurious regression problem, we have considered unit root test. In the first phase, two conventional form of unit root tests, the ADF test and PP tests, are used. Results of these tests are reported in Table 2. Both ADF and PP tests are applied to level data and first differenced data and each test run with intercept and trend and intercept. Results reported in second and fourth row of Table 2 for level data of SENSEX and forex rate show the presence of unit root as nonstationary series. At any conventional level of significance, both the tests fail to turn down the null of nonstationarity. Whereas the results of ADF and PP test presented in third and fifth row of the Table 2 indicate stationary nature first differenced data. The overall findings of ADF and PP tests conclude that at level all variables are nonstationary and at first difference all variables are stationary and I(1) and after obtaining first difference variables are I(0).

In the second phase, considering fluctuation of SENSEX and Forex from Figure 1, unit root test with structural breaks are tested. Existence of structural break can cause biased result for conventional unit root tests. In order to avoid this biasness, we have applied Zivot-Andrews Unit root test (for one structural break) and Lee-Strazicich LM unit root test (for two structural break). Results reported in Table 3 for structural break test show acceptance of null of nonstationarity even after allowing one and two structural break. On the other hand, for differenced variables both the structural break test reject null of unit root or nonstationarity at 5% level of significance. Unanimously, both the tests detect a break in January and February 2008 for SENSEX and forex respectively. Vital reason for this common break can be attributed to the sub-prime crises. Figure 2 shows the break date as per Zivot-Andrews Unit root test with their maximum absolute  $t$ -statistics.

TABLE 2

**Conventional unit root test results**

Variables	ADF		PP	
	Intercept	Trend and intercept	Intercept	Trend and intercept
SENSEX (level)	-0.043(0)	-2.427(0)	-0.181	-2.701
SENSEX (log difference)	-14.436(0) <sup>a</sup>	-14.409(0) <sup>a</sup>	-14.479 <sup>a</sup>	-14.452
Forex (level)	-0.285(1)	-1.244(1)	0.396	-0.540
Forex (log difference)	-10.674(0) <sup>a</sup>	-10.658(0) <sup>a</sup>	-10.693 <sup>a</sup>	-10.675 <sup>a</sup>

Note: The superscript letter 'a' denotes significance at 1% level.

TABLE 3

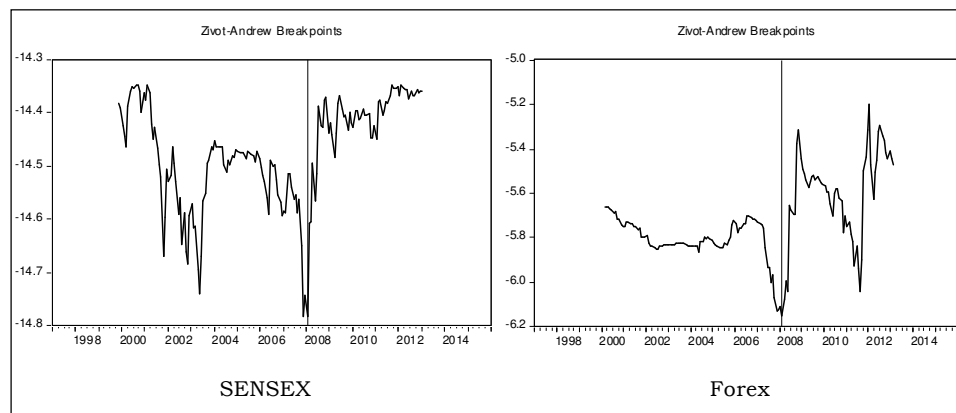
**Unit root test with structural break**

Variables	Zivot-Andrews Unit root test (one structural break)		Lee-Strazicich LM unit root test (two structural break)				
	Break date	Minimum T statistics	LM statistics	Trend	Break date	Trend	Break date
SI	May, 2005	-4.037	-3.970	0.080	Apr, 2005	-0.580	Nov, 2011
FX	Apr, 2009	-3.925	-4.175	-4.042	Mar, 2003	4.814	Jan, 2012
$\Delta SI (ln)$	Jan, 2008	-14.784 <sup>a</sup>	-10.344 <sup>b</sup>	8.395 <sup>b</sup>	Aug, 2001	-8.317 <sup>b</sup>	Jan, 2008
$\Delta FX (ln)$	Feb, 2008	-6.151 <sup>b</sup>	-10.476 <sup>b</sup>	-6.917 <sup>b</sup>	Apr, 2008	6.280 <sup>b</sup>	Nov, 2010

Note: The superscript letter ‘a’, ‘b’ and ‘c’ denotes significance at 1%, 5% and 10% level respectively. In this table, SI stands stock index ‘SENSEX’ and FX represents foreign exchange rate.

FIGURE 2

**Zivot-Andrews structural break graph**



Subsequently, we have used the battery of VR test with an intention to detect market inefficiency and the adaptive behaviour of the market. For this, we have segregated the whole sample into two subsamples on the basis of results from structural unit root test. The break identified through applied Zivot-Andrews Unit root test is more or less common for both SENSEX and Forex, i.e. January 2008 and February 2008, respectively. The first sub-sample ranges from January 1997 to January 2008 and the second sub-sample ranges from February 2008 to December 2015 for SENSEX. On the other hand, the first sub-sample for forex counted from January 1997 to February 2008 and the second sub-sample includes observations from March 2008 to December 2015. The Lo-MacKinlay VR test results evidenced from Table 4 reveal that the Indian stock market is following random walk pattern for both full samples

and sub-samples at different time horizons. It indicates that the stock market is efficient over the period of time. Whereas, interestingly, the result reported for forex market in Table 4 for the same period reveals rejection of random walk in all forms of sample (except two longer time horizon of second sub-sample 'T2') which classifies the market as an inefficient market. Furthermore, to avoid the shortcomings of size distortions in Lo-MacKinlay VR tests, we have used MVR tests. The outcomes of the tests for stock and forex market statistically support the results of Lo-MacKinlay VR test. In a nutshell, this single and multiple VRs concluded that both the stock as well as forex markets are not adaptive, there is continuation of either market efficiency or inefficiency.

TABLE 4

**Results of Lo-MacKinlay VR and MVR tests**

Sample	Stock market					Forex market				
	q(2)	q(4)	q(8)	q(16)	MVR	q(2)	q(4)	q(8)	q(16)	MVR
Full sample	1.04 (0.54)	1.12 (1.01)	1.22 (1.11)	1.11 (0.36)	1.11	1.33 <sup>a</sup> (4.90)	1.51 <sup>a</sup> (4.13)	1.74 <sup>a</sup> (3.75)	1.72 <sup>a</sup> (2.47)	4.90 <sup>a</sup>
T1	0.96 (-0.40)	1.05 (0.33)	1.07 (0.26)	1.16 (0.40)	0.40	1.38 <sup>a</sup> (4.40)	1.74 <sup>a</sup> (4.53)	2.18 <sup>a</sup> (4.61)	2.38 <sup>a</sup> (3.62)	4.61 <sup>a</sup>
T2	1.14 (1.32)	1.20 (1.05)	1.41 (1.37)	0.99 (-0.02)	1.37	1.28 <sup>a</sup> (2.73)	1.35 <sup>c</sup> (1.81)	1.41 (1.33)	1.27 (0.59)	2.72 <sup>b</sup>

Note: VR and MVR test statistics are reported in main row and  $[Z^*(q)]$  statistics are reported in the parenthesis. The superscript letters 'a', 'b' and 'c' denote significance at 1%, 5% and 10% level respectively.

However, in order to avoid the problem of heteroscedasticity and problems inherent to single and MVR test<sup>5</sup>, we have used WRSVR test taking the value of R1, R2 and S1. Findings of this test are presented in Table V for stock market as well as for forex market. It is indicated from the first part of Table V concerning stock market that Indian stock market behaves randomly as per the value of R1, R2 and S1 (except a longer horizon value of S1, where K = 16) for full sample. On the other hand, for sub-sample one (T1) the value of R1 and R2 agrees to RWH, but, surprisingly, the values of S1 exhibit periods of predictability in stock returns in both short and long horizons. In case of second sub-sample, the R1, R2 and S1 values unanimously support RWH and fail to reject the null of random walk at any conventional level of significance.

From the second part of the Table 5 and for the whole sample of forex market, it is observed that market is predictable at short horizon, and when the level of horizon increases, the market becomes more weak-form efficient as per the value of R1 and R2. Whereas for same sample S1 values indicate that market is efficient both at short and long period, the result from sub-sample one (T1) shows remarkable difference to the results of whole sample. It is evidenced that all the three values (R1, R2 and S1) unanimously reject



the null of random walk which in turn suggest possibility of prediction and speculation to book abnormal gains. The values of R1, R2 and S1 reported in final rows of the Table 5 for second sub-sample (T2) of forex market reveal more chances of prediction in short horizon rather than long horizon (according to R1 and R2 values). It indicates that forex market witnesses more weak-form of efficiency when the horizon increases. Whereas the values of S1 discards the chances of predictability for any time horizons.

Further, the study witnesses the changing degrees of weak-form market efficiency between stock and forex markets during different market conditions. From our full sample, it is clearly evident that stock market in India is more efficient than that of Forex market. Forex market shows episode of serial dependence for short horizon and becomes efficient in longer time horizon. It indicates that for full sample period, forex market is more adaptive to different market conditions rather than stock market. In case of sub-sample one, which is a period for post Asian financial crisis, it is identified that stock market is little predictive during medium and long horizon (as per S1 values). During the same period, the forex market identifies the existence of serial auto-correlations in exchange rate movements and accord the market as an inefficient market. So, it can be said here that stock market is bit adaptive than forex market for sub-sample one. Findings from the second sub-sample, which comprises the period following sub-prime financial crises, have contradictions with each other. In case of stock market, it is found that weak-form efficiency persists over the period and there are no chances of predictability. Whereas in case of forex market, the values of R1 and R2 indicate short run predictability and long run randomness. Overall, it can be concluded here that in the period of Asian currency crises, the stock market is considered to be more adaptive as per AMH, as suggested by Lo (2004), and forex market is inefficient, as per EMH as suggested by Fama (1970). During the period of subprime financial crises and the period following, it reveals adaptive behaviour of Forex market as per AMH whereas the stock market remained efficient.

TABLE 5

**Results of WRSVR tests**

Sample and variable	R1				R2				S1			
	K=2	K=4	K=8	K=16	K=2	K=4	K=8	K=16	K=2	K=4	K=8	K=16
<b>Stock market</b>												
FS	0.99	1.05	1.11	1.13	1.01	1.11	1.17	1.08	1.00	1.07	1.32	1.76 <sup>b</sup>
T1	1.00	1.11	1.10	1.17	0.97	1.08	1.08	1.09	1.06	1.29 <sup>c</sup>	1.60 <sup>b</sup>	2.30 <sup>a</sup>
T2	0.92	0.82	0.93	0.74	1.02	0.99	1.13	0.81	0.91	0.77	0.93	1.02

TABLE 5 (Contd.)

<b>Foreign exchange market</b>												
FS	1.20 <sup>b</sup>	1.22	1.27	1.09	1.24 <sup>a</sup>	1.28	1.32	1.19	1.09	1.11	1.08	1.12
T1	1.48 <sup>a</sup>	2.09 <sup>a</sup>	2.69 <sup>a</sup>	3.34 <sup>a</sup>	1.46 <sup>a</sup>	2.02 <sup>a</sup>	2.58 <sup>a</sup>	3.08 <sup>a</sup>	1.40 <sup>a</sup>	1.77 <sup>a</sup>	2.04 <sup>a</sup>	2.54 <sup>a</sup>
T2	1.20 <sup>b</sup>	1.23	1.25	1.02	1.24 <sup>a</sup>	1.28	1.31	1.13	1.11	1.12	1.09	1.09

*Note:* This table shows R1 and R2 statistics for independent and identical distributions (iid) in the second and third column respectively. S1 statistics in the final column shows the martingale difference sequence. The superscript letters 'a', 'b' and 'c' denote significance at 1%, 5% and 10% level respectively. FS signifies full sample.

Finally, to measure the long-run equilibrium relationship existing between stock and forex markets, we have used Engle and Granger (1987) cointegration test. Results shown in Table 6 provide no evidence of long-run relationship or cointegration between stock and forex market. Outcomes from the whole sample and all sub-samples under different market conditions reveal no cointegration between stock and forex markets. Engle and Granger cointegration test fails to reject the null of no cointegration at any conventional level of significance which indicates that movements of one market cannot help in predicting the movement of other market.

TABLE 6

**Results of Engle-Granger cointegration tests.**

Variable	Full sample		T1		T2	
	value	p-value	value	p-value	value	p-value
<b>Dependent variable: Sensex</b>						
Engle-Granger tau-statistic	-1.956	0.551	0.761	0.998	-2.076	0.491
Engle-Granger z-statistic	-7.706	0.513	1.153	0.997	-8.057	0.476
<b>Dependent variable: Exchange rates</b>						
Engle-Granger tau-statistic	-1.981	0.539	-2.585	0.250	-2.085	0.487
Engle-Granger z-statistic	-8.946	0.424	-6.089	0.638	-7.537	0.516

Acceptance of no cointegration from Engle and Granger test can be biased if two markets' adjustment process is asymmetric (Enders and Siklos, 2001). So, it cannot be concluded here that there will be no short-run relationship existing between stock and forex markets. Further, to identify the short-run equilibrium relationship between stock and forex markets, we have used

traditional OLS regression model and quantile regression model. As per theoretical explanation regarding nexus between stock and forex markets under flow-oriented model and stock-oriented model, we have used two OLS regression equations to identify the relationship. According to stock-oriented model stock price movements drive the exchange rate. So, in first equation we used change in exchange rate as dependent variable and stock price index as independent variable. According to flow-oriented model, currency movements drive the change in stock movement. So, in our second equation we used stock price index as dependent variable and exchange rate movement as independent variable. The results reported for first equation in Table 7 indicate significant effect of changes in stock price index on exchange rate. The coefficient of the model is found negative which indicates that the increase in stock returns negatively affect the exchange rates. It means that increase in stock returns leads to appreciation of domestic currency. The same kind of relation is observed from all forms of sample and the results are not significantly varied. In the second model, it is found from second column of Table 7 that depreciation in the value of domestic currency, or increase in returns from FEM, leads to significant decline in stock returns. From both the models, it is observed that variation of coefficient is more in second model. It indicates that the degree of impact is more when exchange rate drives stock market. The results agree to both the models and are not surprising. But with the problem of serial autocorrelations in first equation and low adjusted R<sup>2</sup> in both, the equation may change the coefficients with different quantile regressions.

TABLE 7

**Results of OLS regression**

Explanatory variables	Model 1			Model 2		
	Full sample	T1	T2	Full sample	T1	T2
Constant	0.003 <sup>a</sup>	0.001	0.006 <sup>a</sup>	0.013 <sup>a</sup>	0.013 <sup>b</sup>	0.012 <sup>c</sup>
Sensex	-0.086 <sup>a</sup>	-0.046 <sup>a</sup>	0.029 <sup>a</sup>			
Exchange rates				-1.579 <sup>a</sup>	-1.783 <sup>a</sup>	-1.489 <sup>a</sup>
R-square	0.136	0.082	0.217	0.136	0.082	0.217
Adjusted R-square	0.132	0.075	0.208	0.132	0.075	0.208
Q-statistics(10)	25.527 <sup>a</sup>	31.629 <sup>a</sup>	8.519	7.237	8.664	12.380
Observations	227	133	94	227	132	95

Note: The superscript letters 'a', 'b' and 'c' denote significance at 1 %, 5 % and 10 % level respectively.

Table 8 shows the results of quantile regression models. This can help in establishing relationship between stock and forex markets when conditional distribution is heterogeneous. We perform quantile regression taking the exchange rate as dependent variable and the stock price index as independent variable in one case and the stock price index as dependent variable and the exchange rate as independent variable in the other case. The result reported for the first case reveals similar pattern of coefficients for different sample period. When the exchange rates are extremely high (0.90<sup>th</sup> quantile), or extremely low (0.10<sup>th</sup> quantile), the values of coefficients are inclined to be more negative. In a deviation from total results, the results observed from sub-sample one provides evidence of some medium range quantiles coefficients which are statistically insignificant and they rule out the existence of any short-run relationship. The second case, where we took stock price index as dependent variable, provides remarkable difference results in comparison to first case as observed from Table 8. It is found that when the stock price index is extremely low (0.10<sup>th</sup> quantile), the value of coefficient inclined to be more negative and the degree of sensitivity is more (from full sample it is evident 1% change in exchange rate leads to -2.77% change in stock returns). This pattern is similar in our different samples except sub-sample one where after 0.50<sup>th</sup> quantile no significant relationship is observed. The reason for the same can be attributed to the Asian currency crises, low trading, changes in regulatory norms and existence of policy interventions by the government. Similarly, the result of quantile regression presented in Figure 3, shows precise relationship existing between stock and forex market movements under different market conditions as per flow-oriented model and stock-oriented model. Graph presented in first vertices of Figure 3 depicts the relationship existing between stock and forex markets as per flow-oriented model and in other vertices the relationships between stock and forex markets are shown as per stock-oriented model. The middle line with fitted squares shows nineteen point quantile estimates over the distribution of five percentile. The upper and lower lines indicate 95% confidence interval.

TABLE 8

**Results of quantile regression**

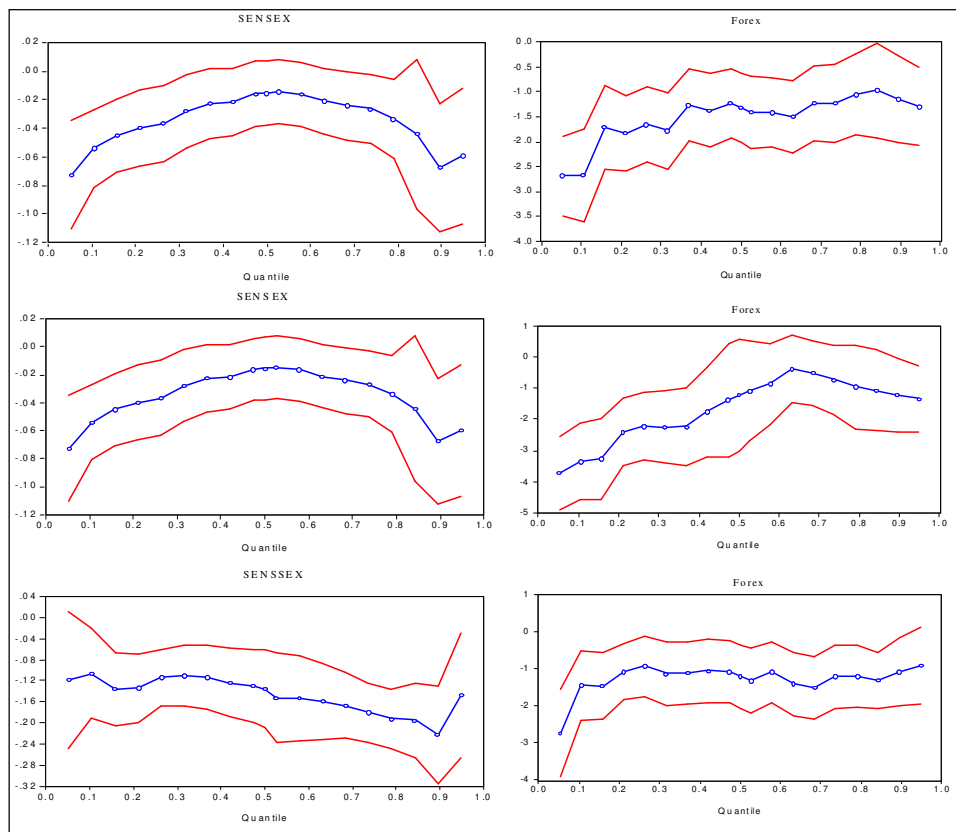
Sample	Dependent variable: exchange rate			Dependent Variable: SENSEX		
	Quantile	Coefficients( $\beta$ )	t-statistic	Quantile	Coefficients( $\beta$ )	t-statistic
Full sample	0.10	-0.0765	-5.641 <sup>a</sup>	0.10	-2.7722	-6.265 <sup>a</sup>
	0.20	-0.0623	-3.916 <sup>a</sup>	0.20	-1.8964	-4.891 <sup>a</sup>
	0.30	-0.0665	-4.246 <sup>a</sup>	0.30	-1.6971	-4.400 <sup>a</sup>
	0.40	-0.0545	-3.605 <sup>a</sup>	0.40	-1.3154	-3.538 <sup>a</sup>

TABLE 8 (Contd.)

Sample	Dependent variable: exchange rate			Dependent Variable: SENSEX		
	Quantile	Coefficients( $\beta$ )	t-statistic	Quantile	Coefficients( $\beta$ )	t-statistic
	0.50	-0.0498	-3.342 <sup>a</sup>	0.50	-1.3177	-3.661 <sup>a</sup>
	0.60	-0.0574	-3.653 <sup>a</sup>	0.60	-1.4300	-3.961 <sup>a</sup>
	0.70	-0.0647	-3.192 <sup>a</sup>	0.70	-1.2128	-3.146 <sup>a</sup>
	0.80	-0.0954	-3.978 <sup>a</sup>	0.80	-1.2854	-3.074 <sup>a</sup>
	0.90	-0.1536	-7.112 <sup>a</sup>	0.90	-1.2182	-2.684 <sup>a</sup>
T1	0.10	-0.0540	-4.024 <sup>a</sup>	0.10	-3.3804	-5.419 <sup>a</sup>
	0.20	-0.0393	-2.970 <sup>a</sup>	0.20	-2.5157	-4.473 <sup>a</sup>
	0.30	-0.0295	-2.253 <sup>b</sup>	0.30	-2.1727	-3.728 <sup>a</sup>
	0.40	-0.0204	-1.662	0.40	-2.0477	-3.097 <sup>a</sup>
	0.50	-0.0154	-1.358	0.50	-1.2215	-1.341
	0.60	-0.0196	-1.678	0.60	-0.6507	-1.098
	0.70	-0.0243	-1.995	0.70	-0.5462	-1.029
	0.80	-0.0362	-2.300 <sup>b</sup>	0.80	-0.9685	-1.419
	0.90	-0.0698	-3.197 <sup>a</sup>	0.90	-1.2279	-2.107 <sup>b</sup>
T2	0.10	-0.1057	-2.528 <sup>a</sup>	0.10	-1.5780	-3.049 <sup>a</sup>
	0.20	-0.1337	-4.088 <sup>a</sup>	0.20	-1.2725	-3.020 <sup>a</sup>
	0.30	-0.1087	-3.726 <sup>a</sup>	0.30	-1.0784	-2.504 <sup>a</sup>
	0.40	-0.1202	-3.704 <sup>a</sup>	0.40	-1.1250	-2.585 <sup>a</sup>
	0.50	-0.1356	-3.621 <sup>a</sup>	0.50	-1.1976	-2.736 <sup>a</sup>
	0.60	-0.1545	-3.916 <sup>a</sup>	0.60	-1.3019	-3.024 <sup>a</sup>
	0.70	-0.1713	-5.600 <sup>a</sup>	0.70	-1.5206	-3.695 <sup>a</sup>
	0.80	-0.1984	-6.207 <sup>a</sup>	0.80	-1.2228	-2.926 <sup>a</sup>
	0.90	-0.1668	-1.592	0.90	-1.0784	-2.357 <sup>b</sup>

Note: The superscript letters 'a', 'b' and 'c' denote significance at 1%, 5% and 10% level respectively.

FIGURE 3

**Quantile plots for Sensex and Exchange rates****V. DISCUSSIONS**

Following the work of Narayan and Smyth (2005), Lean and Smyth (2007) and Hiremath (2014), our core estimation starts with conventional ADF and PP unit root test followed by structural break unit root test. Allowing possibility of structural break with one break test, the study discovers significant break point in January 2008 for stock market and February 2008 for forex market. Further, allowing multiple break test, it detects break with the year 2001, 2008 and 2010 which are associated with major economic events (post Asian currency crisis, internet bubble). This finding goes in line with the studies undertaken by Narayan and Smyth (2005), Lean and Smyth (2007) and Hiremath (2014), which have also identified that major structural breaks are associated with global economic depression. Moreover, with the use of recent and updated data from January 1997 to December 2015, we have investigated EMH and AMH in Indian stock and FEM applying battery of VR test. It has been observed that Indian stock market is weak-form efficient for whole sample period and little predictive during the first sub-sample. Similar findings have

been observed from the studies undertaken by Butler and Malaikah (1992) for Kuwait and Saudi Arabia markets, Greib and Reyes (1999) for Brazilian market and Barua (1981), Gupta (1985) Mobarek and Fiorante (2014) for Indian market. On the other hand, our study contradicts the study of Urrutia (1995) for Latin American countries, Grieb and Reyes (1999) for Mexican market, Huang (1995) for Singaporean, Hong Kong and Thai markets and Poshakwale (1996) for Indian capital market. The primary reason for such contradiction can be use of different density of data and statistical methods. Apart from it, the reason can be attributed to reforms measure, financial crisis and low trading in an emerging countries.

By testing weak-form of efficiency in Indian FEM, it is observed that the overall sample shows inefficiency in terms of EMH. While studying the same with sub-samples which are characterized by different economic events, it is found that the period of Asian currency crisis in 1997, internet bubble in 2000, terrorist attack in the World Trade Organization in 2005 affected the Indian forex market, thereby making it inefficient, which exhibited possibility of speculative gains. This finding is in consonance with the earlier studies of Vats and Kamaiah (2011) for Indian forex market and Lo and MacKinlay (1988) and Liu and He (1991) who rejects random walk phenomenon in forex rate of five major developed countries (British pound, Canadian dollar, French franc, German mark and Japanese yen). The second, sub-sample which is portrayed by subprime crisis, Indo-US nuclear deal, Rupee/dollar rate hit in 2012, euro zone crisis in 2013 and China slowdown and stock crash in 2015 reveals forex market efficiency except for a short horizon. This goes with the study of Chen (2008) for United States Ajayi and Karemera (1996) for emergent countries (Hong Kong, Indonesia, Korea, Singapore, Thailand, Taiwan and Malaysia). In a comparison note, it can be said that Indian stock and forex markets are predictable in short horizon for overall study period and for sub-sample period both the stock and forex markets is weak-form inefficient in short-run and weak-form efficient in long-run. In sub-sample two, the stock market shows no serial dependence whereas in forex market short-run dependence is detected. However, the episodes of efficiency and inefficiency are in consonance with the propositions of AMH as provided by Lo (2004). This also substantiates the similar kind of studies undertaken by Smith (2012), Alvarez-Ramirez *et al.* (2012), Urquhart and Hudson, (2013), Urquhart and McGroarty (2014) and Hiremath and Kumari (2014) in the context of stock markets; Neely *et al.* (2009), Charles *et al.* (2012) and Katusiime *et al.* (2015) in the context of Forex market. In sub-sample one, the stock market shows adaptive behaviour but the forex market does not. In sub-sample two, the forex market depicts adaptive behaviour but stock market does not.

By investigating the existence of dynamic relationship between stock and forex markets under different market conditions, it is observed that there is no long-run equilibrium relationship or cointegration between stock and forex market in India. At the same time, OLS and quantile regression reveal short-run relationship existing between the two studied financial markets. During sub period one, there is lack of short-run relationship between the markets.

It is observed that exchange rate negatively react to stock price movements as per stock-oriented model. This outcome is in consonance with the findings of Tsai (2012) for six emergent economies (Singapore, Thailand, Malaysia, Philippines, South Korea and Taiwan) and Noman *et al.* (2012) for Bangladesh.

## VI. CONCLUSION

The empirical findings of the study reveal that Indian stock market shows more weak-form of efficiency in comparison to Indian forex market. As far as adaptive behaviour of the market is concerned, both the markets show their compliance to the proposition of AMH. Comparatively, adaptive behaviour of Indian stock market to market information is quicker than that of the forex market. Forex market evidences a long period serial dependence and creates scope for speculative trading to gain more than average market returns. Indian stock market shows period of predictability following Asian currency crises but not in subprime crises. In contrast, Indian forex market reveals period of predictability following both Asian financial crises and subprime crises. It is evident that during Asian currency crises, the Indian forex market was more predictive. The study also evidences non-existence of long-run equilibrium relationship between stock and forex markets during the study period. It detects a short-run relationship between two markets where the effect of currency rate movement on stock return is more sensitive than stock price movement on exchange rate. Post Asian financial crises period shows deviation from short-run relationship between stock and forex markets. Although, previous studies have investigated EMH in extensive form, they lack in addressing the time-varying nature of market movements along with the description to AMH. In addition, the study also uncovers the relationship existing between stock and forex markets with application of quantile regression which is of its kind for the first time in Indian context. These findings have suitable implications for both investors and policy makers. From investors' perspective, it would be beneficial for investors to speculate more money with forex market rather than stock market with advanced technical analysis. Prudent foreign investors need to take into account the fluctuation of exchange rate in order to determine their rate of returns in actual term in accordance with their domestic currencies. From policy makers' perspective, the study suggests that more interventions should be avoided and the policy makers can use the short-run relationship between two studied financial markets along with other monetary policy tools to stabilize exchange rates.

## Endnotes

<sup>1</sup>BIS Triennial Central Bank Survey 2013 present a detailed report regarding the turnover and volume of trading in FEM of different countries and ranked them accordingly.



<sup>2</sup>A review based study by Yen and Lee (2008) provides a detailed survey of scientific study on EMH across the stock market including India.

<sup>3</sup>For detail regarding Zivot-Andrews structural break test and Lee-Strazicich multiple structural break test, refer to Hiremath (2014) who present a brief description to it.

<sup>4</sup>For detail clarification regarding quantile regression readers may follow the work of Chen (2001) and Tsai (2012) who presented detailed description and derivation to it.

<sup>5</sup>See for detail discussion in the study of Azad (2009) and Hung *et al.* (2009).

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## **Cost to Serve and Cross-Subsidy in Power Sector: Some Observations\***

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### **ABSTRACT**

The Electricity Act, 2003 proposes that the consumers should be charged only for the electricity consumed by them and the tariff should be determined by the Commission without showing any undue preference to any consumer. The Act also obligates the State Government to bear subsidy which it requires to be given to any consumer or any class of consumers. The paper examines in detail the concept of the cost to serve based tariff. One of the models suggested by the National Association of Regulatory Utility Commissioners (NARUC) has been used for determining the cost of service of one of the power distribution companies of Odisha. The paper also makes an effort to determine the amount of cross-subsidy.

**Key words:** Annual Revenue Requirement, Rate Design, Cost to Serve, Rate Base, Demand Related Cost, Energy Related Cost, Allocation Using Peak Method.

### **I. INTRODUCTION**

Control of entry, price fixing, prescription of quality and conditions of service, and the imposed obligation to serve all stakeholders under reasonable conditions are the four principal components of public utility regulation that distinguishes it from the regulation of other sectors of the economy (Kahn, 1988). In the process of regulating the sector, the regulatory bodies, primarily do two important things: *determining the rate level (cost)* and the *structure of rates (price)*. The visible manifestation of *rate level* is the total allowable cost or total revenue. This process of determining rate level is also known as the

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determination of the annual revenue requirement (ARR). Whereas, the second aspect of regulation, *i.e. rate structure or rate design*, deals with specific charges for different categories of customers. In this paper, the focus is only on the rate level and rate design of distribution tariff for the ultimate consumer.

The main objective of the paper is to examine the literature on the cost to serve and its application in the Indian Power Sector and then the author uses the available data for calculating the cost to serve and the magnitude of cross-subsidy prevalent in one of the power distribution companies of Odisha.

### **Determination of Rate Level**

The ARR is determined by the regulators on the basis of the revenue and expense estimate provided by the distribution companies (DISTCO). The overall approach for ARR determination can be summed up in the following equation:

$$\mathbf{ARR}_t = PP_t + O\&M_t + Int_t + Dep_t + Tax_t + (ROR \times RB)_t$$

where, PP stands for Power Purchase Expenses; O&M stands for Operation and Maintenance Expenses; Int stands for Interest and Finance Expenses; Dep stands for Depreciation; ROR stands for Rate of Return; RB stands for Rate Base; and  $t$  stands for test year.

The regulator follows an elaborate process while determining the ARR of a licensee. The licensee has to file a petition before the regulator along with the details of proposed tariff, expected revenue and expenses, capital expenditure plan and all other relevant information. The regulator conducts public hearing and depending on the information gathered, responses of the licensee and considering the political, social and economic implications the final ARR is approved.

### **Determination of Rate Design or Cost Allocation**

After approving the ARR, the regulator allocates the total revenue required by a DISTCO over different consumer categories and determines the category-wise tariff so that the DISTCO can recover the already approved ARR from its consumers. The rate design is aimed at recovering the costs of the electric service in a manner such that the risk is balanced not only between utility and customer but also among customers themselves. While cost recovery is a crucial function of electricity pricing, there are other factors that also need equal consideration. Such factors are simplicity, revenue and rate stability, fair cost apportionment, avoidance of undue discrimination, efficiency, and conservation etc. (Bonbright, 1961). In fact, the debate around electricity rate-making began as early as late 1800's with the pioneering work of John Hopkinson (1892) and Arthur Wright (1896) on the cost of supplying electricity. Both Hopkinson and Wright differentiated between the standing and running costs of a utility and strongly argued for two part tariff against the flat rate prevailing at that point of time. Hopkinson advocated a two part tariff where the first part is based on usage and the second part is based on connected load, whereas, Wright suggested that the second part of tariff must be based on the actual maximum demand in lieu of the connected load.

In the Indian context, the Electricity Act 2003 has laid down the principles which guide the formulation of tariff design. These principles which are in line with the Bonbright principles are summarized below:

- Operate generation, transmission, distribution and supply of electricity on commercial principles;
- Encourage competition, efficiency, economical use of the resources, good performance and optimum return on investments;
- Safeguard the interest of consumers and investors; and
- Implement cost reflective tariff to reduce cross subsidies over a period of time.

The rest of the paper deals with the last principle which talks about the cost reflective tariff and cross-subsidies. The paper is divided into four sections. Following Section I, which introduces the topic, Section II explains the concept of the Cost to Serve (CTS) and Section III presents a case study on CTS and the prevalence of cross-subsidy. The final section contains suggestions, based on the observations from the case-study, with a view to bridging the gap between the tariff setting principles and the prevalent practices.

## II. UNDERSTANDING COST TO SERVE

The term CTS has not been defined explicitly in any law. However, several researchers made attempt to define CTS using different assumptions. CTS is an analytical approach that provides an activity driven view about the ways in which the specific dimensions such as product, customer, and channel consume resources and incur costs while fulfilling the customer demand. Braithwaite and Samakh (1998) initially defined CTS as a highly quantitative and financially driven diagnostic tool for analyzing the costs incurred in a supply chain and for estimating profitability with respect to products, customers, and marketing channels. Guerreiro *et al.* (2008) defined CTS as a tool to calculate the cost required for generating total pre-sale numbers, and other figures regarding orders, distribution points and channels, and after-sale services in order to efficiently manage the distributor-customer relationship.

In the regulations pertaining to the electricity sector, a fundamental tenet has been accepted that the tariffs irrespective of the categories of customers must be as far as possible equal to the costs that the system incurs because of the different categories of customers.

This is what is currently understood as CTS. With the focus shifting to cost-reflective tariffs, it has now become necessary to compute the CTS for each consumer category and make an effort towards gradual reduction of the gap between CTS and revenue realization. The difference between the amount of revenue realized and CTS presents a clear view of the amount that has to be subsidized by the Government or cross-subsidized by other customers.

In order to calculate the cross-subsidy, it is necessary to compute the CTS for different categories of consumers. The framework of power sector, i.e., the regulatory, legal and policy framework guide the reduction of cross-subsidy.

According to the Electricity Act 2003, the Distribution Licensee is required to reduce cross-subsidy to a certain level and in case the State Government requires further tariff reduction of any consumer category then it is imperative that it has to come up with an advance subsidy that is equivalent to the subsidized amount.

Several studies (Desai, 2013; Faruqui, 2012; Hyland, 2013; Kirshen, 2003; Goutam 2015) have shown that CTS based tariff provides economic signals for both demand side and supply side management of electricity.

### **Determination of Cost to Serve**

There are two approaches for calculating the CTS of various consumer categories, one is the embedded cost (historical) and the other is the marginal cost (Turvey, 2000). Both the methods of computing CTS use information differently, historical accounting data is required in the cost-based methodology, whereas, future cost is used in calculating marginal cost-based methodology. In the first methodology, all the prudent costs related to the licensees are allocated; however, it lacks any information about the future costs which can be provided to the customers. In the second methodology, information is provided regarding the efficient utilization of investments and electricity in an economical manner; however, it provides no guarantee about recovering the entire cost incurred particularly if the future costs are lower than the past costs and it may become necessary to make certain modifications in the tariffs for recovering the actual cost incurred.

CTS is estimated using the cost causality principle. According to the principle, consumer or class of consumers causing a particular cost should bear that cost. This principle ensures that consumers have access to the correct price signals while making a purchase decision which would lead to allocative efficiency. Apart from the efficient allocation of society's resources, there is a need to fairly price electricity on a non-discriminatory basis by allocating cost across consumer classes and minimizing cross subsidies between the groups of consumers (Bonbright, 1961; Breyer, 1982; Bonbright *et al.* 1988).

In an attempt to understand the cost causality principle, it is important to identify the various drivers of cost in an electricity network and how they vary across different class of consumers. Distribution companies usually have a wide range of consumers, such as, agricultural consumers, residential consumers, commercial consumers, industrial consumers, etc. who have different needs to fulfill and hence differ in the way they avail the services and cause cost in the supply chain. Usage or service characteristics that may vary across different class of customers include delivery voltage, maximum demand, peak day use, load factor, time of use, metering requirements, etc., thereby resulting into different CTS (Lowell, 2006; Vogt, 2009).

### **Cost to Serve Model**

There are several models to determine the CTS. In this paper, the focus will be on one of the popular methods suggested by the National Association

of Regulatory Utility Commissioners<sup>1</sup> (NARUC). According to the Electricity Utility Cost Allocation Manual of NARUC, determination of CTS involves the following steps:

***i. Direct Assignment of Expenses***

The preferred approach for the allocation of expenses related to customer tariff classes is the direct assignment of costs. This approach is viable only in the presence of direct link between costs and services provided to customers. Nevertheless, in this manner it is possible to dispense only a small percentage of costs, as most costs incurred by a distribution company jointly serve various groups of customers.

***ii. Functionalization of Costs***

Functionalization is the organization of costs on the basis of the key operating functions of utility, which include production, transmission or distribution for facilitating the fortitude behind understanding the particular customer groups that are accountable for such costs. The production function includes all the costs involved in power generation or its purchase at wholesale and the delivery of such power into the bulk power transmission system. The transmission function includes all costs associated with power transfer from one geographical location to another within a system as well as the power transfer to or from other utilities. The distribution function includes all costs associated with power transfer from the transmission system through the distribution system to the ultimate consumer.

***iii. Classification of Costs***

The purpose of cost classification is to arrange costs into groups that bear a relationship to a measurable cost-defining characteristic of the service being rendered. Functionalized costs are classified as:

- Energy related: The energy related classification consists of those expenses that generally vary with changes in the unit consumption of kilowatt-hours, such as energy charges, and distribution losses.
- Customer related. The customer related classification is related directly to each electric user and varies by the number and type of customers served.
- Demand related: The demand classification relates to providing capacity to serve portions or all of system load requirements.

***iv. Allocation of Costs***

The final step in determining the CTS is to allocate the expenses, post classification, over different classes of customers on an equitable and fairly apportioned basis. There are different methods for allocating the costs across different consumer class. The important ones are provided below:

- Energy Related Costs: The energy related cost can be allocated on the basis of energy consumed by different class of consumers. The distribution loss has to be further allocated across different class of consumers while allocating the energy related costs.



- **Customer Related Cost:** The customer related cost can be allocated on the basis of number of the consumers in different class of consumers.
- **Demand Related Costs:** The demand related cost can be allocated on the basis of coincident peak method, weighted average coincident peak method, or average excess method. Some regulators have even used non-coincident peak as the basis for allocation of demand related costs.

The choices for allocation criteria for demand related costs presents a number of options that may have significant impact on the cost allocation to various classes.

**Coincident Peak (CP) Method:** The coincident peak method is also known as peak responsibility method that allocates demand related costs to each consumer class in proportion to the contribution to the system peak made by that class at the time the system peak occurs. It is based on the rationale that the electrical system has to be designed and built to cater to the peak demand. Therefore, the capacity related costs should be allocated to each class of consumers based on their contribution to the system peak demand. This method assumes that costs should be divided among the customer classes creating the peak demand regardless of the magnitude of their demands at other times of the year or the time period of the demand created.

**Non-coincident Peak (NCP) Method:** The non-coincident peak method (NCP) allocates costs to each consumer class based on the maximum demand imposed by that class at any time during the period under study regardless of the fact of considering the coinciding of the customers' demand with the system peak demand. The base on which the allocation factors are computed is the sum of the non-coincident class peaks which is the arithmetic total of the class maximum values.

**Coincident and Non-coincident Peak (CP & NCP) Method:** As the name suggests, this method combines both coincident and non-coincident peak method for the allocation of the demand related costs to different consumer classes. The coincident peak method is used for allocation of power purchase costs, transmission charges and distribution costs incurred at EHT<sup>2</sup> and HT voltage level whereas the non-coincident peak method is used for allocation of the distribution costs incurred at LT level.

For all above methods (CP and NCP), the existing demand metering usually captures the required data for larger customers, such as EHT and HT consumers. For all other customers, the data have to be gathered through a comprehensive load research. The CP & NCP methods are also further divided into 1 CP & NCP, 3 CP & NCP, and 12 CP & NCP methods depending on the number of peaks considered for allocating the cost.

**Average and Excess (A&E) Method:** The average and excess method allocates demand-related costs to consumer classes using factors that combine the average demands and excess demands of different classes. The excess demand for a consumer class is the demand that exceeds the average non-coincident demand of a class. The A&E method uses two factors for allocation.

The first component of the system load factor is the contribution to average, which is the ratio of consumer class's average demand to the system's average demand. The second component is the contribution to excess demand, which is the proportion of consumer class's excess demand to the sum of excess demand of all categories. The A&E method does not require the information about the coincident peak; therefore, shift in the system peak does not greatly affect the allocation of demand related costs.

### III. COST TO SERVE AND CROSS-SUBSIDY: A CASE STUDY

To explain the concept of CTS, we have used the financial information of one of the power distribution companies of Odisha carrying out the business of distribution and retail supply of electricity in the five districts of Odisha with an aggregate population of around 98.61 lakh. Table 1 gives a bird's eye view of the revenue realization for different customer categories. Customers are broadly divided into three categories: LT, HT, and EHT based on the voltage level of supply.

TABLE 1

#### Revenue Realisation for Different Categories

Consumer Categories	No. of Consumers		Energy Consumption (MUs)		Revenue Billed		Per Unit Revenue Realized
		%	Rs. In cr	%	Rs. In cr	%	
Low Tension (LT)	985,645	99.96%	1,218	37%	481	30%	3.95
High Tension (HT)	400	0.04%	452	14%	274	17%	6.05
Extra High Tension (EHT)	32	0.003%	1,612	49%	859	53%	5.33
<b>Total</b>	<b>986,077</b>		<b>3,283</b>		<b>1,614</b>		<b>4.92</b>

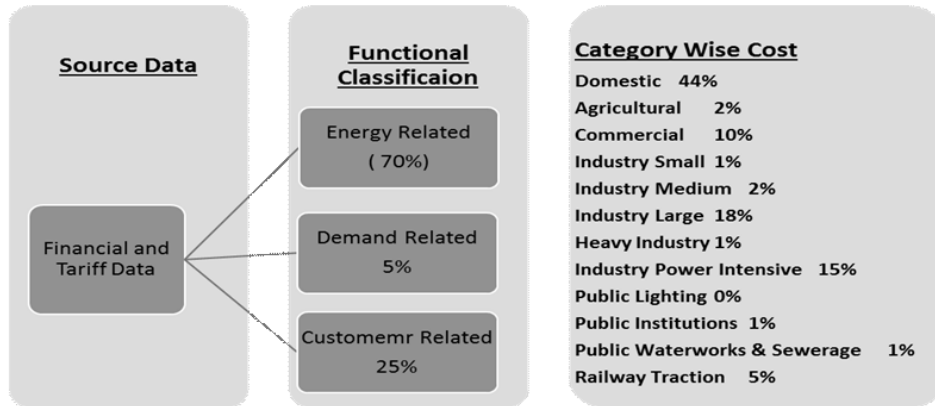
Source : Compiled from different tariff filings: <http://www.orierc.org/>

Table 1 shows that 70% of the revenue is contributed by the HT and EHT customers. Whereas the LT customers though account for more than 90% of the total customer base, its contribution to the revenue is only 30%. Moreover, it is relevant to observe that the average revenue realization is also different for these categories. The average revenue per unit is the least in case of LT consumers. The wide difference in the revenue per unit has motivated us to determine the CTS of different customers.

For the purpose of the present study, the financial accounting data and the relevant information from the tariff filings were categorized into demand related, energy related and customer related expenses as shown in the Figure 1.

FIGURE 1

**Mapping Expenses to Different Categories**

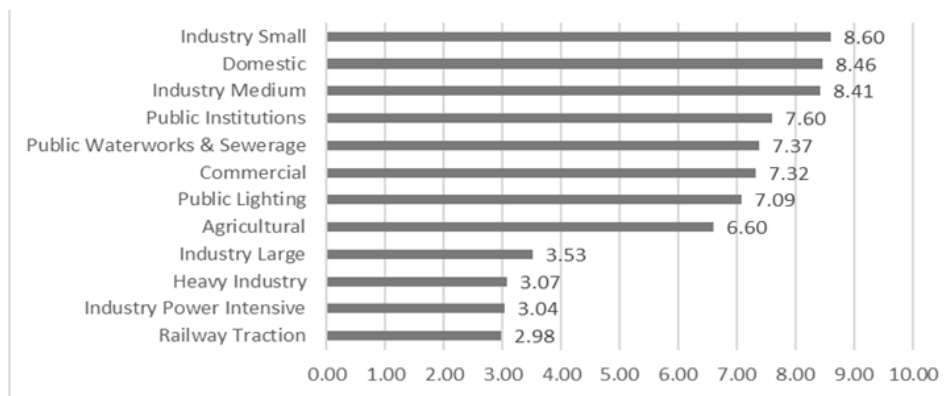


Source: Computed based on the data given in Appendix 1.

The data from the financial reports and the tariff reports were first classified into energy related, demand related and customer related expenses and then on the basis of the input from interviews with the relevant persons both technical and commercial. We distributed each group of expense over different categories of customers. Figure 1 shows the behaviour of average cost of the five years of the study period: from 2009 to 2014. It can be seen from Figure 1 that a significant part (47%) of the total cost is consumed by the domestic consumers. Figure 2 shows the average of five years CTS of different categories. Though there are different methods of determining CTS, we used the single peak coincident (I CP) method to determine CTS.

FIGURE 2

**5 years (2009-14) Average Cost to Serve (In INR)**



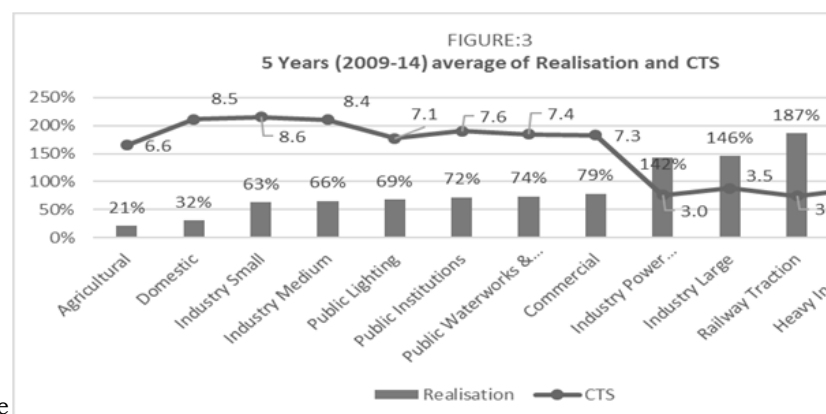
Source: Computed on the basis of the information given in Appendix 1.

We found that CTS is not same for all the categories. CTS of the domestic customers is approximately two and half times the CTS of the heavy industry. The high cost is attributed to the high distribution losses. The total CTS, as mentioned in the previous section, consists of three components : energy related, demand related and customer related expenses. A significant part of the energy related cost is power purchase cost. The average loss for the LT customers in the year 2014<sup>3</sup> is 51%, that is, if company buys 204 units of power it is able to bill 100 units to the customers and balance is lost due to technical and commercial reasons, popularly known as the distribution losses. Appendix 1 gives details of the year-wise CTS.

We compared the CTS with the average revenue per unit for each category and found (Figure 3) that the revenue is not able to recover the CTS in eight out of twelve customer categories.

FIGURE 3

### 5 Years (2009-14) Average of Realisation and CTS

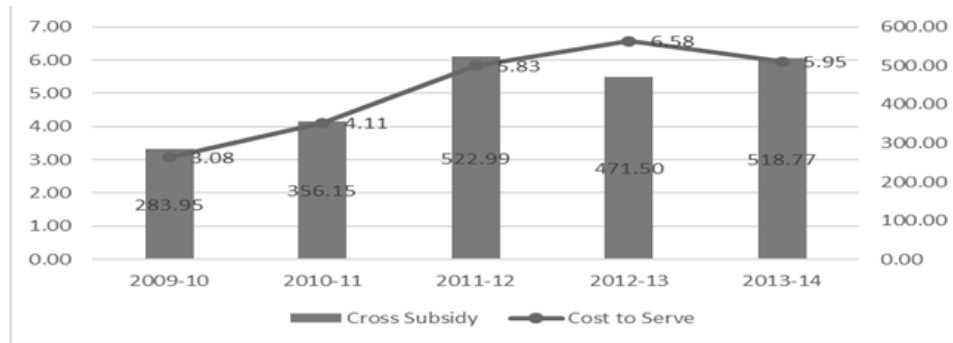


Source: Data given in Appendix 1.

Since the tariff is not cost reflective than the CTS. The difference between the CTS and revenue has to be borne by someone — government or other consumers. If it is not borne by the government, it is generally recovered by charging higher tariff to other customers. Such process is called cross-subsidization. The excess money paid by a customer(s) over the CTS is the amount of cross-subsidy. In our case study, the heavy and large industry and railways are cross-subsidizing the other consumers. Moreover, it has been observed that such cross-subsidy has increased during the last five years as shown in Figure 4 despite the fact that reforms were started in the State with an objective of reducing such imbalances in the tariff.

FIGURE 4

**Cost to serve (in Crore) and Cross-subsidy (INR)**

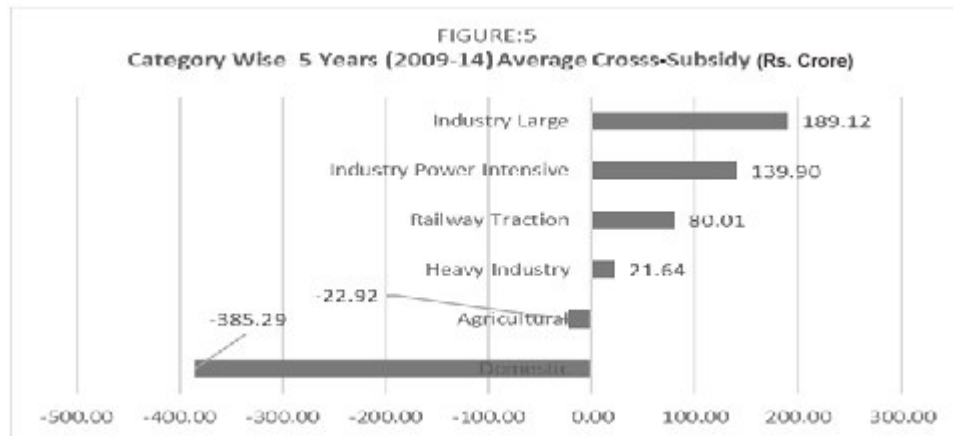


Source: Data given in Appendix 1.

Industrial and commercial consumers have been paying a higher tariff for the electricity they consume in order to ensure that domestic and agricultural consumers receive power at a more affordable rate. This additional amount, known as *cross-subsidy*, becomes more visible if we compare the total revenue with total CTS. Figure 5 shows the average cross-subsidy for the last five years.

FIGURE 5

**Category-wise 5 Years (2009-14) Average Cross-subsidy (Rs. Cr.)**



Source: Based on the data given in Appendix 1.

The presence of cross-subsidy motivates industrial or commercial consumers to purchase electricity from the independent power producers (IPP) and not from the distribution licensee of that area or sometimes they may decide to opt for producing their own power. Such migration of large players makes the distribution licensee to lose the cross-subsidy amount. Therefore, the

cross-subsidy surcharge is imposed by regulators on the large consumers for ensuring that the additional tariff is not imposed on the domestic and agricultural consumers and, in the process, avoid high tariff. This is also in line with the Electricity Act 2003 which provides that the state regulatory commissions should allow open access<sup>4</sup> subject to the payment of cross-subsidy surcharge. The Act further states that the cross-subsidy surcharge shall be progressively reduced and eliminated. However, if the government does not meet the gap through subsidy, then the question related to the person (customers) bearing the difference between the CTS and revenue continues to linger.

#### IV. THE WAY FORWARD

The paper reiterates the relevance of CTS-based electricity tariff and its effects on cross-subsidy. However, to undertake a comprehensive study on CTS, a reliable and accurate metering is of prime importance. It is not enough that all customers are metered. The meter, particularly for the LT consumers, should record the actual energy consumed (KwH) as well as the maximum demand (KW). The present meters for the LT consumer categories, as observed through our case study, are not capable of recording the maximum demand. Moreover, the statutory accounting system does not require information based on customer category or voltage level consumption. Present classification of cost or expenses as shown in the financial statements and the tariff filings are not very relevant for the determination of CTS. Therefore, for the implementation of CTS-based pricing, the regulators should stress on developing the relevant data-base which will show the causal link between expenses, incomes, assets, and liabilities and customer categories. Knowledge about the CTS will help in undertaking proper cost management and in implementing cost reflective tariff and in the process help in managing the gap between the CTS and the revenue realisation. Though, the paper has the *limitation* of being based on the observation of tariff of one distribution company, it gives an indication about the existing pricing anomalies in the country. Since the overarching principles of pricing is being given by the Electricity Act 2003, the observations given in the paper are equally relevant for other power distribution companies. Such research if extended to the distribution companies of other States will provide a stronger evidence of tariff not being cost reflective. The paper also makes a humble effort in the direction of creating awareness about the existing anomalies in the principles and practice of tariff setting by the power distribution companies of India.

## APPENDIX 1

**Cost to Serve and Cross-subsidy**

	Cost Allocation					Per Unit Cost				
	2009-10	2010-11	2011-12	2012-13	2013-14	2009-10	2010-11	2011-12	2012-13	2013-14
Domestic	409	561	846	962	926	5.57	7.05	9.93	10.72	9.01
Agricultural	21	39	36	42	41	4.12	5.41	7.73	8.45	7.30
Commercial	89	136	198	228	209	4.96	6.17	8.53	9.11	7.85
Industry Small	13	16	22	24	21	5.27	6.97	10.16	10.95	9.64
Industry Medium	20	28	35	36	32	5.20	6.64	9.87	10.86	9.50
Industry Large	201	265	327	392	367	2.15	2.96	4.01	4.46	4.05
Heavy Industry	3	42	34	14	10	1.72	2.49	3.34	4.03	3.76
Industry Power Intensive	168	240	298	303	223	1.77	2.54	3.38	3.90	3.60
Public Lighting	3	5	7	8	7	4.45	5.92	8.16	9.05	7.85
Public Institutions	6	9	12	15	14	5.05	6.28	8.92	9.58	8.20
Public Waterworks & Sewerage	9	13	19	23	21	4.69	6.04	8.60	9.29	8.24
Railway Traction	36	56	90	112	116	1.72	2.49	3.33	3.84	3.52
<b>Total</b>	<b>979</b>	<b>1411</b>	<b>1926</b>	<b>2159</b>	<b>1986</b>	<b>3.08</b>	<b>4.11</b>	<b>5.83</b>	<b>6.58</b>	<b>5.95</b>

	Revenue Realization as % of CTS					Cross Subsidies				
	2009-10	2010-11	2011-12	2012-13	2013-14	2009-10	2010-11	2011-12	2012-13	2013-14
Domestic	34%	31%	23%	31%	38%	-245.48	-313.43	-473.21	-421.71	-472.62
Agricultural	31%	23%	18%	15%	19%	-13.11	-25.28	-22.35	-25.12	-28.72
Commercial	79%	84%	75%	70%	86%	-13.76	-4.56	-7.84	-10.12	-7.82
Industry Small	72%	69%	53%	56%	68%	-3.05	-3.00	-5.85	-4.37	-4.51
Industry Medium	69%	67%	54%	60%	80%	-5.18	-5.83	-8.61	-5.45	-3.05
Industry Large	160%	143%	141%	131%	156%	131.21	146.44	202.42	219.34	246.18
Heavy Industry	237%	166%	178%	224%	260%	3.73	33.05	33.93	20.30	17.20
Industry Power Intensive	156%	138%	144%	119%	155%	103.36	120.70	195.20	133.64	146.59
Public Lighting	75%	71%	62%	61%	74%	-0.65	-0.77	-1.21	-1.07	-1.02
Public Institutions	74%	72%	63%	66%	87%	-1.17	-1.31	-1.98	-1.27	-0.37
Public Waterworks & Sewerage	77%	72%	69%	65%	86%	-1.53	-1.96	-1.94	-2.39	-0.66
Railway Traction	221%	187%	180%	163%	183%	45.65	55.95	91.43	98.22	108.80
<b>Total</b>	<b>94%</b>	<b>87%</b>	<b>79%</b>	<b>75%</b>	<b>89%</b>	<b>283.95</b>	<b>356.15</b>	<b>522.99</b>	<b>471.50</b>	<b>518.77</b>

Source: Calculated on the basis of the published data and other relevant data collected from the company.

## Endnotes

<sup>1</sup>NARUC: Founded in 1889, the National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization dedicated to representing the State Public Service Commissions who regulate the utilities that provide essential services, such as, energy, telecommunications, power, water, and transportation.

<sup>2</sup>EHT: It's a high voltage power supply, with a low current and high resistance. HT means high tension or high voltage, wherein a small current is used with a very high voltage (for creating plasma). LT means low tension wherein a low voltage is used with very high current.

<sup>3</sup>Performance Review of NESCO: [http://www.oriarc.org/Record\\_note\\_NESCO\\_Performance\\_Review.pdf](http://www.oriarc.org/Record_note_NESCO_Performance_Review.pdf)

<sup>4</sup>Open Access: As per Electricity Act 2003 Open Access is “Non-discriminatory provision for the use of transmission lines or distribution system or associated facilities with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the Appropriate Commission”. The idea is that the customers should be able to choose among a large number of competing power companies instead of being forced to buy electricity from their existing electric utility monopoly.

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## **A Comparative Assessment of Financial Soundness of the State Bank of India and ICICI Bank during 2008-09 to 2014-15**

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### **ABSTRACT**

Sustainable growth and development of any economy is largely dependent on the performance of its banking sector since this sector is one of the important pillars of the economy. So, soundness of banking system is important. Financial soundness implies absence of instability – representing a situation in which economic performance is not undermined by the price fluctuations of financial assets or because of the inability of the financial institutions to meet contractual obligations. The present study aims at comparing the soundness of the two largest commercial banks, one in the public sector, State Bank of India (SBI), and the other in the private sector, ICICI bank, during the period 2008-09 – 2014-15 and to ascertain whether these two banks are significantly different in respect of soundness.

**Key words:** Financial soundness, Basel III, Capital Adequacy Ratio, Non-Performing Assets, Provision Coverage Ratio, Liquidity Ratio.

### **I. INTRODUCTION**

Growth and development of any economy is largely dependent on the performance of its banking sector. Since, banking sector constitutes a major component of the financial service sector, its soundness is essential for a healthy and vibrant economy (Khatik and Nag, 2014). The efficient, productive, profitable, stable and shock-free economy is possible only when a country is having a sound and healthy banking sector. A financially sound banking system offers many benefits and gives guarantee to not only its depositors but also to its shareholders, employees and to the economy as a whole. In this context, it can be said that the Indian Banking Sector has been the backbone of the economy over the past few decades, helping it survive various national and worldwide economic shocks and meltdowns. It is one of the healthiest

performers in the world banking industry having tremendous competitiveness, growth, efficiency, profitability and soundness, especially in the recent years.

The banking space in India has witnessed significant changes in the last two decades or so. The process of liberalization has made ingress of new private sector banks possible in the banking sector. As a result, the Public Sector Banks (PSBs) were forced to face a cut-throat competition in the market. The private banks are coming up with their attractive policies and providing the customer with better services by leveraging on technology and new ways of providing convenience to customers. Influenced by the new found technology and increased thrust on product innovation, the PSBs in the country also witnessed a phenomenal growth in the last two decades. It is widely believed that financial soundness of Indian banking system has a direct bearing on the overall progress of economy because growth backed by adequate financial soundness is a sign of sustainable growth. In this backdrop, a comparative study on the soundness of the two largest commercial banks in terms of asset size – one in the public sector, State Bank India and the other in the private sector, ICICI bank – is a necessity to ascertain whether these two banks are significantly different in respect of soundness especially after the ‘Global Financial Crisis’. The study will also be important in view of the fact that these are the two largest players in the Indian banking space: one in the domain of Public sector and the other in the private sector. The study is organised as follows. Section II gives literature review. This is followed by concept of soundness and methodology in section III and IV, respectively. Section V details the results and discussions and the last section contains findings and conclusion.

## **II. BRIEF LITERATURE REVIEW**

Internationally, soundness of banking system and its relation with the banking and systemic crisis has been an important area of research. Demirgüç-Kunt and Detragiache (1998) used a multivariate logit model to explore which macroeconomic indicators are associated with the emergence of banking crises. Their results suggested that crises tend to occur in an environment of low growth, high inflation, and high real interest rates.

The first study on the use of Financial Soundness Indicators (FSIs) as indicators of potential banking sector crises was provided by Čihák and Schaeck (2007). They run the first tests on the ability of FSIs to explain the emergence of banking crises. However, they used FSIs that were not compiled under a commonly accepted international methodology. They found that the CRAR and the NPA ratio provide signals for systemic banking problems, and that ROE of banks served as an indicator for the timing of a crisis.

Following the pioneering work of Čihák and Schaeck (2007), Babihuga (2007) tested FSIs against a number of macroeconomic indicators and found that FSIs fluctuate strongly with the business cycle and the inflation rate. Sun (2011) investigated FSIs at the individual bank level for a list of global financial institutions, and found that leverage indicators are the most reliable.

Morgan and Pointes (2014) in their work addressed the issue: Does the move toward greater financial inclusion tend to increase or decrease financial stability? This study contributed on this subject by estimating the effects of various measures of financial inclusion (together with some control variables) on some measures of financial stability, including bank non-performing loans and bank Z-scores. They found some evidence that an increased share of lending to small and medium-sized enterprises (SMEs) aids financial stability, mainly by reducing non-performing loans (NPLs) and the probability of default by financial institutions. This suggests that policy measures to increase financial inclusion, at least by SMEs, would have the side-benefit of contributing to financial stability as well.

Vaithilingm, Nair and Samudram (2006) empirically examine the impact of key factors such as Infrastructure (ICT infrastructure), Intellectual Capital, Institutions, Integrity (Governance), Interaction (Strategic Partnership) and Innovation on the soundness of the banks in developed, developing and underdeveloped countries. The study was conducted for the year 2004. The empirical results showed the developments of the key factors in developing and underdeveloped countries were significantly lower than that in developed countries. The study also showed that well developed institutions, good integrity system and high innovative capacity contribute positively to the soundness of the banks.

Coming to *Indian perspective*, several studies have been undertaken to explore the importance, measurement and improvement of soundness of banking system and related issues especially for the post-reform era. The following studies are worth mentioning in this regard.

Kumar (2009), in his study examines how the financial performance of SBI group, nationalized bank group, private banks group and foreign banks group has been affected by the financial deregulation of the economy. The main objective of this empirical study was to assess the financial performance of Scheduled Commercial Banks (SCBs) through CAMEL model.

Khatik and Nag (2014) analyzed the soundness of five nationalized banks in India. In order to measure the performances of these banks, CAMEL model was applied, incorporating important parameters like Capital Adequacy, Assets Quality, Management Efficiency, Earnings Quality and Liquidity. The finding of the study shows that Bank of Baroda has been ranked at the top, the Union Bank of India and Dena Bank secured the 2nd position, SBI secured the 4th position and in the last position was occupied by the UCO bank.

Gadhia (2015) studied liquidity management of 5 public and private sector banks over the period of 2007-08 to 2011-12 in the context of recent fall in rupee, volatility in oil prices, instability in bullion and security markets in India, Sub-prime crisis in the United States, instability of euro in the European market and failure of the Government to manage the monetary and fiscal policies. The study concluded that liquidity to total assets of each selected banks is having an equal management during the research period while liquidity to deposit of selected banks is not having an equal management during the same period.

Bhowmik (2014) studied the safety and soundness of Indian banking in the context of adoption of Basel III norm. He concluded that safety and soundness has always been associated with costs. Naturally, the adoption of Basel III will adversely affect some crucial variables like profitability, growth and existing business model of Indian banks. The study recommended for proactive approach in devising appropriate and credible policies for effective mitigation of the challenges emanating from the adoption of Basel III.

Gokhale (2009) elaborately dealt with the subject of capital adequacy in banks. There is a shift from the qualitative risk assessment to the quantitative risk management. In tune with the regulatory insistence on capturing risks for the purpose of capital charge, sophisticated risk models were developed. These models help banks to quantify accurately the potential losses arising from different risks viz., credit risk, market risk and operations risk.

Srinivas and Saroja (2013) analyzed and compared the financial performance of HDFC and ICICI bank and offered suggestions for the improvement of efficiency by using CAMEL model with t-test. They concluded that there was no significant difference between the ICICI and HDFC bank's financial performance but the ICICI bank performance was slightly less compared to HDFC bank.

Parmar (2014) studied various dimensions of NPAs among SBI and ICICI bank over the years 2011 - 2013. During these three years, total advances and net profit have shown growing trend in both the banks but compared to SBI, NPA of ICICI bank showed downward trend because of effective NPA management. It also highlighted the relationship between Net Profit and Net NPA – while SBI showed positive relationship between Net Profit and Net NPA, negative relationship was found in case of ICICI bank between Net Profit and Net NPA.

Veena and Prasad (2014) studied the quality of assets by analysing the trends of assets, liabilities and, finally, the analysis of provision adequacy. The primary focus of this paper is to compare and contrast the asset quality and management by the banks belonging to public sector and private sector, viz. SBI and ICICI bank.

Subbulaxmi and Abraham (2006) discussed the common causes of crises and their impact on the economic conditions. Banking crises may lead to rapid change in the environment in which the banks operate. Sooner the restructuring programme is initiated, the faster is the recovery and the lower is the cost of recovery. The authors discussed the various options of resolution available depending on the intensity and the cause of the crises. As there is no single medicine that would cure the problem, an analytical approach was suggested to deal with the crisis situations.

Several other studies, such as, Prasuna (2003), Bodla and Verma (2006), Ghosh (2010), Sen Gupta (2011), Chaudhary and Singh (2012) can also be referred. But no study has been made to compare and contrast the soundness of SBI (the largest bank under Public Sector in terms of asset size) and ICICI Bank (the largest bank under Private Sector in terms of asset size) in statistical terms. The present paper aims to fulfill this research gap.

### III. CONCEPT OF SOUNDNESS AND ITS INDICATORS

Financial soundness is a difficult concept to explain because there is no widely acceptable definition of the term. Some authors explained the concept of soundness in terms of what financial soundness is not. Simply speaking, financial soundness implies absence of instability – representing a situation in which economic performance is not undermined (weak) by the price fluctuations of financial assets or because of the inability of the financial institutions to meet contractual obligations. Broadly speaking, financial soundness implies the followings:

- a) Monetary stability
- b) Confidence in financial institutions and the functioning of financial markets in the economy
- c) Absence of relative motion of asset prices (real or financial) in the economy that would undermine items (a) and (b) above.

Viewed from positive perspective, we can define the term financial soundness as a situation in which the financial system is capable to: (a) allocate resources efficiently between its activities over time, (2) access and manage financial risk, and (3) absorb shocks arising from both endogenous and exogenous factors.

From the perspective of banking, the presence of above three elements is necessary for financial soundness. The first involves the formation of an individual assessment policy and procedure for efficient allocation of resources in cost effective manner. The second involves identifying the main sources of risk and vulnerability that could pose challenges for the future stability of the bank and the broad policy measures to manage those challenges. The third and last step is an assessment of the capacity of the bank to cope with the systemic crisis arising from both endogenous and exogenous factors. In the banking parlance, some broad areas are being considered for understanding of financial soundness of banking institutions. Such parameters that are used to judge the financial soundness of bank are shown in Table 1.

TABLE 1

#### Financial Soundness Indicators and their Measures

Broad Soundness Indicator	Measures
<b>Capital Adequacy</b>	Tier I Capital to Risk Weighted Assets
	Tier II Capital to Risk Weighted Assets
	Total Regulatory Capital to Risk Weighted Assets (CRAR)
<b>Quality of Asset Portfolio</b>	Gross Non-Performing Assets to Gross Advances (GNPA Ratio)
	Net Non-Performing Assets to Net Advances (NNPA Ratio)
	Provision Coverage Ratio (PCR)
<b>Liquidity</b>	Liquid Asset to Total Asset (Liquid Ratio)
<b>Earnings and Profitability</b>	Return on Asset (ROA)
	Return on Equity (ROE)

#### IV. METHODOLOGY

The study is both descriptive and analytical in nature. It aims at describing the essence of soundness and the measurement tools used to judge the soundness of banking institutions. The study also attempted to compare and contrast the progress or otherwise of the soundness indicators between SBI and ICICI bank over the period 2008-09 to 2014-15. The rationale of the selection of the study period 2008-09 to 2014-15 lies in the fact that in India the effect of 'Global Financial Crisis' was started to be felt from the year 2008 onwards and we all are aware of the fact that the effect of the crisis was more prominent in the areas of safety and soundness of banking system at large. As our stated objective is to assess the soundness of the two banks in the post crisis period, the study period could not be advanced before 2008-09. The close-end of the study period (i.e. 2014-15) coincides with the latest financial year end and therefore enables us to make an up to date assessment. This, however, limits our sample size but if we assume that the soundness indicators follow a normal distributive pattern (which in most of the cases is true), we can use inferential statistics for analysis.

The study uses secondary data collected mostly from the annual reports of the banks, Report on Trend and Progress of Banking in India, published reports, published articles and online sources. Simple statistical tools like mean, S.D, etc. are used for the analysis. For further analysis the following hypotheses are formed:

- $H_0$  : There is no significant difference in capital adequacy position of SBI and ICICI bank.
- $H_0$  : There is no significant difference in Gross NPA position of SBI and ICICI bank
- $H_0$  : There is no significant difference in Net NPA position of SBI and ICICI bank
- $H_0$  : There is no significant difference in Provision Coverage Ratio of SBI and ICICI bank
- $H_0$  : There is no significant difference in Return on Equity (ROE) of SBI and ICICI bank
- $H_0$  : There is no significant difference in Return of Asset (ROA) of SBI and ICICI bank
- $H_0$  : There is no significant difference in Liquid Asset to Total Asset Ratio of SBI and ICICI bank.

These hypotheses are tested by applying two tail independent  $t$  test (students  $t$  test). In the process of performing the  $t$  test, we implicitly assume that the variance of the two population is equal (variance of soundness indicators of SBI = variance soundness indicators of ICICI Bank).

## **V. ASSESSMENT OF SOUNDNESS OF SBI AND ICICI BANK: DISCUSSIONS AND RESULTS**

In section III, we have pointed out that soundness of banking institutions can be analyzed broadly on the areas of capital adequacy position, asset quality and its management and earning efficiency. In the following sub-sections, we will first analyze the trend of the parameters over the study period and then test the statistical significance of the parameters between SBI and ICICI bank.

### **1. Comparison of Capital Adequacy Position**

In banking business, capital is seen as cushion to protect the depositors and promote the stability and efficiency of financial systems. Capital adequacy reflects the overall financial soundness of the banks and also the ability to absorb unforeseen shocks/losses. Overall capital adequacy Ratio or Capital to Risk Weighted Asset Ratio (CRAR) is a measure of the amount of a bank's core capital expressed as a percentage of its risk-weighted asset. Mathematically, CRAR is expressed as follows:

$$\text{CRAR} = (\text{Tier I capital} + \text{Tier II capital}) / \text{Risk weighted assets}$$

where, Tier I capital = (paid up capital + statutory reserves + disclosed free reserves) - (equity investments in subsidiary + intangible assets + current and brought forward losses). Tier I capital can absorb losses without a bank being required to cease trading.

Tier II capital comprises undisclosed reserves, general loss reserves, hybrid debt capital instruments and subordinated debts where risk can either be weighted assets or the respective national regulator's minimum total capital requirement. Tier II capital can absorb losses in the event of a winding-up and so provides a lesser degree of protection to depositors.

Apart from the overall CRAR, two other types of capital adequacy ratios are also being used for assessing the soundness of the bank. These are – Tier I capital adequacy ratio and Tier II capital adequacy ratio. Banks in India are required to maintain minimum CRAR, Tier I and Tier II capital adequacy ratio as prescribed by the RBI from time to time. As per the recent guidelines issued by RBI on the adoption of Basel III accord, banks in India are to maintain effective CRAR, Tier I and Tier II capital ratio of 11.5%, 7% and 2% respectively. All these three types of capital adequacy ratios of SBI and ICICI bank during the study period are presented in table 2.

TABLE 2

**Capital Adequacy Position of SBI and ICICI Bank**

Financial Year End	State Bank of India (SBI)			ICICI Bank		
	Tier I CRAR	Tier II CRAR	Overall CRAR	Tier I CRAR	Tier II CRAR	Overall CRAR
2008-09	9.38	4.87	14.24	11.84	3.69	15.53
2009-10	9.45	3.94	13.39	14.0	5.4	19.4
2010-11	7.77	4.21	11.98	13.2	6.3	19.5
2011-12	9.79	4.07	13.86	12.68	5.84	18.52
2012-13	9.49	3.43	12.92	12.8	5.94	18.74
2013-14	9.98	2.98	12.96	12.78	4.92	17.70
2014- 15	10.10	2.69	12.70	12.78	4.24	17.02
<b>Mean</b>	<b>9.42</b>	<b>3.74</b>	<b>13.15</b>	<b>12.99</b>	<b>5.26</b>	<b>18.26</b>
<b>S.D</b>	<b>0.779</b>	<b>0.76</b>	<b>0.75</b>	<b>0.71</b>	<b>0.95</b>	<b>1.46</b>

Source: Annual Reports of SBI and ICICI Bank.

From Table 2, it is found that the overall capital adequacy of SBI and ICICI bank has been, on an average, 13.15% and 18.26% respectively over the period under consideration with more variations being noticed in case of ICICI bank (1.46 > 0.75). A capital adequacy in this range seems to be a safe and optimum bet, neither being so low that there is a problem in case of a recession, and not being so high as to hamper growth. This range of overall CRAR is also very healthy considering the regulatory minimum prescription of 9% as per Basel- III norm<sup>1</sup>.

In case of Tier I capital adequacy ratio, it was found that the mean stood at 9.42% and 12.99% for the period under consideration for SBI and ICICI bank respectively, which was much higher than the minimum regulatory requirement of 7% under Basel III with almost similar variability in the ratio for both the banks. Similar observation can also be made in case of Tier II capital adequacy ratio for both the banks over the period under study but the variability in the ratio is more in case of ICICI bank as compared to SBI.

These are the generalised observations that we can make about the capital adequacy position of the banks. But as we are interested to see whether there is any significant difference between the capital adequacy position of the SBI and ICICI Bank during the period of study, we are to test the first hypothesis formed in the methodology section. Since capital adequacy is measured in terms of three ratios – Tier I capital adequacy, Tier II capital adequacy and overall capital adequacy, we have to form three separate Null Hypotheses for the three measures ( $H_{01}$  -  $H_{03}$ ) of capital adequacy. Let us check the results of the t test as presented in Table 3. The result of the statistical test as presented in Table 3 points out that capital adequacy position of the SBI and ICICI bank in terms of Tier I CRAR and Tier II CRAR do not differ at least



for the period under consideration in case of two tails test both at 5% and 1% LoC. But the result is different in case of overall CRAR. In that case, we found that the difference between overall CRAR between ICICI bank and SBI is statistically significant at 5% LoC.

## 2. Comparison of Asset Quality and its Management

The quality of loan and advances portfolio (technically known as asset quality) has important significance for general health and soundness of banking system. The occurrence of NPAs may have serious consequential adverse effects on the profitability, liquidity and hence competitive functioning of the banking sector in general. It is because of these adverse effects, M. Narendra, CMD of Indian Overseas Bank, rightly attributed NPAs as a double-edged sword for banks (The Management Accountant, 2014).

Quality of asset in banking perspective means the soundness of loan and advances portfolio in terms of generating regular flow of income and return of principal amount. This quality is affected by the generation of Non-Performing Assets (NPAs). In simple term, what we call 'bad and doubtful debts' in trading and manufacturing concerns is known as NPAs in case of a banking institution with the only difference that advances granted as per contract become bad or doubtful rather than the usual debts arising out of sales. From banking point of view, a contract of lending generally includes a binding regarding the payment of interest and principal by the borrower. If any one of them is not performed duly, then the advance should be termed as NPA. Internationally as well as in India, 90 days overdue norm is followed to identify a loan facility as NPA.

TABLE 3

### Results of Statistical Tests of Hypotheses ( $H_{01} - H_{09}$ ) for Capital Adequacy, Asset Quality, Earning and Liquidity Management of SBI and ICICI Bank

Hypothesis/ Critical Region	Observed t-value	Decision	Conclusion
$H_{01}$ = No significant difference in Tier I CRAR of SBI and ICICI Bank.	1.13	$H_{01}$ is accepted both at 5% and 1% LoC.	We can conclude that there is no significant difference between SBI and ICICI Bank w.r.t. Tier I CRAR
$H_{02}$ = No significant difference in Tier II CRAR of SBI and ICICI Bank.	0.006	$H_{02}$ is accepted both at 5% and 1% LoC.	We can conclude that there is no significant difference between SBI and ICICI Bank w.r.t. Tier II CRAR
$H_{03}$ = No significant difference in overall CRAR of SBI and ICICI Bank	2.85*	$H_{03}$ is rejected at 5% LoC	There is significant difference between SBI and ICICI Bank w.r.t. overall CRAR at 5% LoC

<b>Hypothesis/ Critical Region</b>	<b>Observed t-value</b>	<b>Decision</b>	<b>Conclusion</b>
H <sub>04</sub> = There is no significant difference in Gross NPA position	0.32	H <sub>04</sub> is accepted both at 5% and 1% LoC.	GNPA Ratio does not significantly differ in case of SBI and ICICI Bank.
H <sub>05</sub> = There is no significant difference in Net NPA position of SBI and ICICI Bank	0.04	H <sub>05</sub> is accepted both at 5% and 1% LoC.	There is no significant difference between SBI and ICICI Bank w.r.t Net NPA ratio.
H <sub>06</sub> = There is no significant difference in PCR of SBI and ICICI Bank	0.42	H <sub>06</sub> is accepted both at 5% and 1% LoC.	We can conclude that there is no significant difference between SBI and ICICI Bank with respect to Provision Coverage Ratio.
H <sub>07</sub> = There is no significant difference in Return on Equity (ROE) of SBI and ICICI Bank	0.38	H <sub>07</sub> is accepted both at 5% and 1% LoC.	Difference in ROE of SBI and ICICI Bank is not statistically significant during the period under review.
H <sub>08</sub> = There is no significant difference in Return of Asset (ROA) of SBI and ICICI Bank	0.0004	H <sub>08</sub> is accepted both at 5% and 1% LoC.	Difference in ROA of SBI and ICICI Bank is not statistically significant.
H <sub>09</sub> = There is no significant difference in Liquid Asset to Total Asset Ratio of SBI and ICICI Bank	0.26	H <sub>09</sub> is accepted both at 5% and 1% LoC.	We can conclude that Liquid Ratio do not significantly differ between SBI and ICICI Bank. during the period under consideration
<b>Area under Critical Region</b>			
<b>At 5% Level of Confidence</b>		t ≥ 2.18   at 12 degree of freedom	
<b>At 1% Level of Confidence</b>		t ≥ 3.06   at 12 degree of freedom	

Source: Constructed and Calculated on the basis of Annual Reports of SBI and ICICI Bank.

Naturally, the quality of asset portfolio of banks is inversely related to the NPAs. NPAs can be measured in two ways – Gross NPA and Net NPA<sup>2</sup>. For our study, we will use the Gross NPA ratio as a percentage of Total Advances and Net NPA Ratio as a percentage of Net Advances. The trend and progress of asset quality of SBI and ICICI bank over the years 2008-09 to 2014-15 are presented in Table 4 along with Provision Coverage Ratio (PCR)<sup>3</sup> which is considered to be a very significant soundness indicator in relation to quality of asset portfolio.

TABLE 4

**Asset Quality and Provision Coverage Ratio of SBI and ICICI Bank**

Financial Year End	Gross NPA Ratio		Net NPA Ratio		Provision Coverage Ratio	
	SBI	ICICI Bank	SBI	ICICI Bank	SBI	ICICI Bank
2008-09	2.5	4.32	1.79	1.96	56.98	53.5
2009-10	3.05	6.52	1.72	1.87	59.23	59.5
2010-11	3.28	5.8	1.63	0.94	64.95	76.0
2011-12	4.44	4.83	1.82	0.62	68.1	80.4
2012-13	4.75	3.22	2.10	0.64	66.58	76.8
2013-14	4.95	3.03	2.57	0.82	62.86	68.6
2014-15	4.25	3.93	1.12	1.4	69.13	58.6
Mean	3.89	4.52	1.82	1.18	63.98	67.63
<b>SD</b>	<b>0.94</b>	<b>1.29</b>	<b>0.44</b>	<b>0.57</b>	<b>4.55</b>	<b>10.53</b>

Source: Annual Reports of SBI and ICICI Bank, and Economic Times, 26<sup>th</sup> April 2014.

It can be seen that both the Gross NPA ratio and Net NPA ratio of SBI and ICICI bank showed a mixed trend during the period 2008-09 to 2014-15 with more variations being noticed in case of ICICI bank. While the mean GNPA ratio of SBI (3.89%) is lower than that of ICICI Bank (4.52%) during the period, the Net NPA position is just the reverse. In respect of PCR, ICICI bank showed more robustness as compared to SBI as both the mean PCR and its variability during the period is comparatively higher.

Now, we are interested to know whether the ratios between the SBI and ICICI bank are different in statistical terms. In order to understand the relation, we performed independent t test with equal variance and the results are presented in Table 3 ( $H_{04} - H_{06}$ ). From the table, it is seen that neither the asset quality (measured by Gross NPA as a percentage of gross advances and Net NPA as a percentage of net advances) nor its broad management measure (PCR) differ significantly between the banks during the period under consideration. So, we can say that the quality of asset portfolio and the protective cushion available on deterioration of quality is alike in both the banks.

### 5.3. Comparison of Profitability of ICICI Bank and SBI

There are various measures available in order to judge the efficiency of earning or profitability. Among them, Return on Assets (ROA), Return on Equity (ROE), Profit per Employee, Interest Margin to Gross Income are important. As mentioned earlier, we would use ROA and ROE of ICICI bank and SBI over the period 2008-09 to 2014-15 for comparison and apply statistical tests. The data over the study period is presented in Table 5 below.

In case of banks, ROA is an indicator of how profitable a bank is relative to its total assets. ROA gives an idea as to how efficient management is using its assets to generate earning and it tells us the extent of earning generated from its assets. ROA is calculated by dividing a bank's annual earning by its total assets, as a percentage. Sometimes, this is referred to as "Return on Investment".

$$\text{ROA} = \text{Net income} / \text{Total assets}$$

Return on Equity (ROE), on the other hand, measures the extent of return generated by the bank on shareholders' equity. It measures bank's profitability by revealing how much profit a company generates with the money shareholders have invested in it.

$$\text{ROE} = \text{Net Income} / \text{Shareholder's Equity}$$

TABLE 5

**Profitability Ratios (ROE and ROA) and  
Liquid Ratio of SBI and ICICI Bank**

Financial Year End	ROE		ROA		Liquid Ratio <sup>4</sup>	
	SBI	ICICI Bank	SBI	ICICI Bank	SBI	ICICI Bank
2008-09	15.07	7.7	1.04	1	5.76	4.62
2009-10	14.04	7.9	0.88	1.1	5.82	7.57
2010-11	12.84	11.6	0.71	1.34	7.71	5.15
2011-12	14.36	13	0.88	1.5	6.97	6.65
2012-13	15.94	14.7	0.97	1.65	6.81	7.32
2013-14	10.49	14.9	0.65	1.64	6.98	6.45
2014-15	11.17	15	0.68	1.74	7.73	5.77
Mean	13.4157143	12.1142857	0.83	1.42428571	6.82571429	6.21857143
<b>SD</b>	<b>2.01347839</b>	<b>3.19031272</b>	<b>0.15165751</b>	<b>0.28727786</b>	<b>0.79496032</b>	<b>1.09374629</b>

Source: Annual Reports of SBI and ICICI Bank, and Gadhia (2015).

From Table 5, we can observe that SBI's ROA has come down from 1.04 to 0.68 and ICICI's ROA gone up from 1.00 to 1.74 during the period 2008-09 to 2014-15. The average ROA during the period is much higher in case of ICICI bank (1.42%) as compared to SBI (0.83%) with comparatively more variations is being attached with ICICI bank. Apparently, the trend and progress of ROA indicate that ICICI bank performed better than SBI during the period under review. On the other side, ROE of SBI showed overall declining trend over the years under consideration. ROE of SBI decreased from 15.07% to 11.17% during the period 2008-09 to 2012-13. In case of ICICI bank, ROE showed overall increasing trend in which the ratio being doubled during the period from 7.7% in 2008-09 to 15% in 2014-15. But if we look at the average

during the period, we found that average ROE of SBI (13.42%) is better than that of ICICI bank (12.11%) because of the higher variations being attached with ICICI bank. Let us now statistically investigate these generalised observations which are presented in table 3.

The statistical tests of hypotheses ( $H_{07} - H_{08}$ ) do not confirm the generalised observations for profitability of the two banks. Accordingly, we can conclude that the profitability of ICICI bank and SBI in terms of ROE and ROA does not differ significantly at least for the period under consideration.

#### **5.4. Comparison of Liquidity Management in ICICI Bank and SBI**

Liquidity of a bank represents its ability to meet its financial responsibilities. Maintaining correct level of liquidity is important for ensured growth and earning. Banks have to be more careful in investments in order to create more profit on investment as well as to provide liquidity to the depositors. High liquidity ratio shows the efficiency of bank in managing liquidity. The Liquid Ratio as measured by liquid assets to total assets is an important liquidity management tool to assess, ongoing basis, the extent liquid assets can support bank's asset base especially in case of financial crisis. Liquidity is essential for emergency pay out. Generally, banks prefer to hold little cash, preferring to put liquid assets to productive use. This approach can yield low liquid assets to total assets ratio. While asset productivity is important, in a liquidity crisis, low liquid assets to total assets ratio can be hazardous for the financial health and survival of the organizations like banks. In case of a bank, apart from cash and cash equivalent, other items like investments and advances are excluded since it may become encumbered, and therefore unavailable as a liquid asset. As noted above, a committed credit line may become unavailable in a financial stress scenario. Liquid ratio as measured by liquid assets of bank (it include cash and balance with RBI and balance with banks and money at call and short notice) to total assets is one of the most important criteria to evaluate the liquidity management of banks. For the present study, liquid asset to total asset ratio is calculated from the Annual Reports of SBI and ICICI bank over the period of study as shown in Table 5 above. Both the banks have the liquid ratio within 7% on an average with comparatively more variations noticed in case of ICICI bank as compared to SBI. The generalised observation with regard to the liquid asset to total asset ratio is confirmed by the result of the statistical test of hypothesis ( $H_{09}$ ) as shown in Table 3. So we can conclude that liquidity management in terms of liquid ratio does not differ significantly between ICICI bank and SBI over the years under consideration.

## **VI. FINDINGS AND CONCLUSION**

Based on the above analysis, the following are the summary of observations that can be made about the Soundness of the SBI and ICICI bank:

1. Overall Capital adequacy of SBI and ICICI bank has been, on an average, 13.15% and 18.26% over the period 2008-09 to 2014-15 with more variations being noticed in case of ICICI bank.

2. Mean Tier I CRAR stood at 9.42% and 12.99% for the period for SBI and ICICI bank respectively, which is much higher than the minimum regulatory requirement of 7% under Basel III. The variability in Tier II CRAR is, however, more in case of ICICI bank as compared to SBI.
3. Two tails statistical tests revealed that capital adequacy position of the SBI and ICICI bank in terms of Tier I CRAR and Tier II CRAR do not differ significantly. But the result is different in case of overall CRAR. In that case, we found that the difference in overall CRAR over the years between ICICI bank and SBI is statistically significant at 5% LoC.
4. It can be seen that both the Gross NPA ratio and Net NPA ratio of SBI and ICICI bank showed a mixed trend during the period 2008-09 to 2014-15 with more variations being noticed in case of ICICI bank.
5. The average GNPA ratio of SBI (3.89%) is lower than that of ICICI bank (4.52%) during the period but the Net NPA ratio position is just the reverse.
6. In respect of PCR, ICICI bank has shown more robustness as compared to SBI as both the mean PCR and its variability during the period is comparatively higher.
7. Statistical tests confirmed that neither the asset quality (measured by GNPA ratio and NNPA ratio) nor provision coverage differ significantly between the banks during the period under consideration. So, we can say that the quality of asset portfolio and the protective cushion available on deterioration of quality is alike in both the banks.
8. The average ROA during the period is much higher in case of ICICI bank (1.42%) as compared to SBI (0.83%) with comparatively more variations is being attached with ICICI bank.
9. ROE of SBI showed overall declining trend over the years under consideration as it decreased from 15.07% to 11.17% during the period 2008-09 to 2012-13. In case of ICICI bank, ROE ratio showed overall increasing trend in which the ratio being doubled during the period from 7.7% in 2008-09 to 15% in 2014-15.
10. The statistical tests do not confirm the generalised observations about ROA and ROE and it is found that the profitability of ICICI bank and SBI in terms of ROE and ROA does not differ significantly at least for the period under consideration.
11. Both SBI and ICICI bank have the liquid ratio within 7% on an average with comparatively more variations have been noticed in case of ICICI bank as compared to SBI.
12. Statistical test confirmed that liquidity management in terms of liquid ratio does not differ significantly between ICICI bank and SBI over the years under consideration.

The above findings help us to conclude that the soundness of SBI and ICICI bank in respect of quality of asset portfolio, liquidity management and quality of earnings have shown no significant evidence of difference at least

during the study period. But in case of overall CRAR, we found that the difference in overall CRAR over the study period between ICICI bank and SBI is statistically significant at 5% LoC. It can, therefore, be safely said that the largest bank under the public sector (i.e. SBI) and the largest bank in the private sector (i.e. ICICI) have similar trend in soundness indicators during the period 2008-09 – 2014-15 except overall capital adequacy position. So, there is not much substance that ICICI bank, being a private bank, has been doing better than that of SBI, at least in respect of financial soundness. However, the study period is only for seven years; an increase of the same may produce different results. Secondly, the underlying assumption that the soundness indicators follow a normal distributive pattern may not always hold good. In spite of these, the study has its usefulness in policy decisions at the level of both RBI and other regulating bodies.

### Endnotes

<sup>1</sup>As per Basel III norm, Indian banks are required to take further steps for strengthening the capital adequacy position by building Capital Conservation Buffer (CCB) at 2.5% and it would be taken into consideration for Effective CRAR. The RBI has provided for a broad transitional arrangement for the same by 2018 [for more details refer to Bhowmik (2014). *The Management Accountant*, October]. Here, although the average takes into account the CRAR calculated on the basis of Basel II norm yet the higher margin than the minimum can withstand the dilution in the ratio under Basel III very safely.

<sup>2</sup>The sum total of the sub-standard advances, doubtful advances and loss advances is known as Gross NPAs. Net NPAs are obtained from Gross NPAs after deducting the interest due but not received, claims received from credit guarantors and pending final settlement, part payment received and kept in suspense account and total provisions made up to date.

<sup>3</sup>PCR refers to the cumulative provision held for NPAs as a percentage of Gross NPAs. It measures the extent of provisional back up for the existing NPAs.

<sup>4</sup>Liquid Ratio, as measured by liquid assets to total assets over the period of study, has been calculated on the basis of consolidated Balance Sheet data of ICICI bank and SBI. Liquid assets include cash and balance with RBI and balance with banks and money at call and short notice.

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## **Empowering Women through Investment: A Case Study of Imphal City**

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### **ABSTRACT**

This study attempted to determine the investment pattern of woman investor and to explore ways for sustainable and safe strategies of savings for women in Imphal City. The study was conducted using a survey instrument on a sample of randomly selected 200 women. The analysis showed no significant relationships between personal factors and the forms of investment, nonetheless, the income level had some effect on the amount saved. The research while providing new evidence for promoting women empowerment, financial inclusion and contributing to investment and growth, presents areas of further research.

**Key words:** Formal, Informal, Semi-formal, Post-hoc analysis, Financial Inclusion, Markup.

### **I. INTRODUCTION**

Women in India now participate in all activities such as education, politics, media, science and technology and most important of all they are home makers too. With the changing scenario, women have started participating actively in investing their surplus money in various forms. They have become more empowered and also started dominating financial decision-making. Nevertheless, studies show women lack confidence when it comes to investing and financial literacy, and, at the same time, they also need to pay greater attention to retirement saving and financial planning. Investment depends upon many parameters, such as degree of their risk taking, capability, knowledge, skills

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and influence of others in decision making. In today's scenario, where there are many modern and innovative investment avenues, it becomes difficult to select the best mode or avenue of savings. Women need to be better educated in financial planning and exposed to development in the financial field. With financial inclusion as one of the prime objectives of India and to encourage saving or investment in the formal sector entailing women empowerment, it is important to study the pattern of investment of women in Manipur. Moreover, increase in the population of salaried women, women entrepreneurs and younger generation women, their role as financial decision maker in the family has increased. So, it is important to study investors' mind and experience the upheavals going on in their mind. At the same time, findings in such study will be helpful in devising ways and means to attract investors to march ahead towards capital formation and women empowerment.

## II. REVIEW OF LITERATURE

Many research scholars have conducted several studies on the various aspects of the investment behaviour and related topics in the past. However, not much research on investment pattern of woman entailing empowerment with special emphasis on Imphal City was done. Karl (1995) pointed out that goals of equality development and peace cannot be achieved if women do not actively participate at all levels of decision making. In the Scottish Widows Savings and Investment Report (2013), experts suggested that improving our population awareness and knowledge of financial product is the key to increasing savings and the same is true for women. Studies show that willingness to take risk is highly associated with investment. Dohmen *et al.* (2006) detected willingness to take risk in relation to increase in investment corresponding to younger age level (although Dwyer *et al.*, 2002, did not find this effect). Graham (1999) found that risk aversion decreases with experience of analysts (Clement and Tse, 2005), which is tentatively confirmed by Menkhoff *et al.* (2006) for fund managers and by Dhar and Zhu (2007) for individual investors. Moreover, Dwyer *et al.* (2002) found that more educated investors tend to take more risk than their less educated counterparts. Fellner and Maciejovsky (2007) revealed that women prefer less volatile investments and exhibit lower market activity, e.g. they submit fewer offers and engage less often in trades.

In Manipur, women are very active in all spheres of life and they take active part in saving and investment. However, their saving and investment are more in the informal sector and many factors may be responsible for it. Sawani and Patterson (2010) evidenced that developing countries are beset by insufficient savings because of low income and formal financial intermediaries are scarce; saving is accomplished through formal and informal intermediaries. Studies conducted by SEBI also revealed that gold still remain the second most preferred option after the deposit in bank.

There may be many factors contributing to the pattern of investment. Verma (2008) identified that demographic profile and investor personality can

lead to two factors for making perception about the psychology of investor. Shanmugasundaram and Balakrishnan (2011) analysed the factors influencing the behaviour of investors in capital market and concluded that demographic factors influence the investors' investment decisions. Pestonjee and Balsara (2000) concluded that cultural and demographic pattern are not associated with decision making by working women. SEBI (1998) survey revealed that risk appetite, investment objective of the investor, income of the investor, funds available for investment, greatly influence the behaviour of the investor in corporate securities at various levels. And from the study of Turner and Manturuk (2012), it was found that individual, institutional and structural determinants give an impact in the decision making processes. Again, it revealed that individual factors, such as obligation to family, upbringing and employment experiences affect investors' attitude towards savings and their confidence level.

Some studies indicate that marital status and wealth play bigger roles in taking risk in investment (Collard, 2009). Women's attitude towards investment in less risky asset classes appeared to be attributable to differences in wealth and is measured by net worth and expectation of an inheritance (Embry and Fox, 1997). We know that women play a major role in managing the household activities. After they are exposed to education system they become very active in almost every field. As women gain education, the effects of women's growing power can be seen in household decisions on spendings, savings, education, health and time allocation (Sandra and Douglas, 2009). Many researchers are of the opinion that women are more risk adverse than men in their attitudes and behaviour towards investment decision. Women in today's scenario started investing in securities where men invest. Many women entrepreneurs have come up with varied business dealings. For some, even if they are aware of the various financial investment avenues, they are not investing. The present study is focussed to find out their awareness level, pattern of their investment and suggests strategies to increase women participation in productive investment thus leading to socio-economic development and financial empowerment.

### **III. OBJECTIVES AND METHODOLOGY**

#### **Objectives**

The main objective of the study is to determine the investment pattern of woman investor and to explore ways for sustainable and safe strategies of savings for women in Imphal City entailing financial empowerment.

To meet the main objectives, the study considers the following specific objectives:

1. Examine the socio-economic characteristics of women investor in Imphal city.
2. Understand the saving options and practices of the women investors in the city, and
3. Analyse factors influencing investment of women.

### Methodology

The study was conducted using a survey instrument which was pilot tested. The sampling frame of the study consisted of households located within a radius of approximately two kilometres from the heart of Imphal city. This was done as households located within the specified radius comprised a good mix of the socio-economic characteristics of women investors and could represent the urban population. Then, using simple random sampling method, a sample of 250 women was selected and the survey instrument served. Of the 250 survey instruments served, 200 completed survey instruments were returned comprising a response rate of 80 percent which may be considered good in Indian perspective. Statistical analysis and inferences were drawn from the completed questionnaires.

## IV. ANALYSIS AND FINDINGS

### Socio-economic Characteristics

The socio-economic characteristics of a region have defined cultures and practices that in many ways can affect the savings practices of the people. Table 1 shows the socio-economic profile of the sample studied. Majority of the respondents were from the age group of 35 - 45 years (38.5 percent) and 21 - 34 years (35 percent) comprising a class of women investors in the prime time of their career life with potential to save. 76.5 percent of the sample units were married, 45 percent unmarried. The sample showed that size of family for most of the women investors (67.5 percent) was large with more than 5 members in the family, 23 percent with 4 family members. All the women in the sample were literate with education level starting from X standard to post-graduation and professional education. The sample studied consisted of women with different occupations, the highest being government employee (45 percent), followed by business women (28 percent), working with private organizations (23 percent) and wage earner and housewife (4 percent). The annual income level ranged from less than Rs. 1 lakh to more than Rs.4 lakh, with majority falling in the more than Rs. 4 lakh.

TABLE 1

#### Socio-economic profile of the women investors in Imphal

Variables		Responses		Percent of cases
		N	Percent	
Age Level (years)	21-34	70	35.0%	35.0%
	35-45	77	38.5%	38.5%
	46-55	22	11.0%	11.0%
	55 & above	31	15.5%	15.5%
	<b>Total</b>	<b>200</b>	<b>100.0%</b>	<b>100.0%</b>

TABLE 1 (Contd.)

Variables		Responses		Percent of cases
		N	Percent	
<b>Marital Status</b>	Married	153	76.5%	76.5%
	Single	45	22.5%	22.5%
	Others	2	1.0%	1.0%
	<b>Total</b>	<b>200</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Number of family members</b>	1-2	6	3.0%	3.0%
	3	14	7.0%	7.0%
	4	46	22.9%	23.0%
	5 or more	135	67.2%	67.5%
	<b>Total</b>	<b>201</b>	<b>100.0%</b>	<b>100.5%</b>
<b>Educational Level</b>	Matric	12	6.0%	6.0%
	Secondary	12	6.0%	6.0%
	Graduate	87	43.5%	43.5%
	Post-graduate	69	34.5%	34.5%
	Professional	20	10.0%	10.0%
	<b>Total</b>	<b>200</b>	<b>100.0%</b>	<b>100.0%</b>
<b>Occupation</b>	Government salaried	90	45.0	45.0
	Non-Government Salaried	46	23.0	23.0
	Business	56	28.0	28.0
	Wage Earner & housewife	8	4.0	4.0
	<b>Total</b>	<b>200</b>	<b>100.0</b>	<b>100.0</b>
<b>Income Level (per annum)</b>	< 1lakh	40	20.0	20.0
	1-2 lakh	43	21.5	21.5
	2-3lakh	34	17.0	17.0
	3-4lakh	38	19.0	19.0
	> 4lakh	45	22.5	22.5
	<b>Total</b>	<b>200</b>	<b>100.0</b>	<b>100.0</b>

Source: Survey data.

### Saving Objective

The survey asked respondents to specify the objective or purpose for which they saved. This information was used to categorise savers according to whether they were saving for investment or consumption purposes. Reasons to save were classified as investment reasons if they could contribute to increasing the income of the household in the future through human or capital accumulation. Where the objective of investment could be seen as either investment or

consumption, it has been classified according to what it could be considered to be the most probable use. For example, saving for personal reasons (as per interviews with the respondents) may have been to purchase vehicles or land which may have been for either personal or investment reasons (or indeed for both). The categorisation of what were deemed investment and consumption purposes are set out in Figure 1. Table 2 shows that women investors saved more for household consumption purpose when compared to investment purpose. 78.5 percent of women investors had at some point used saving for consumption purposes and 70.5 percent of the sample had at some point used savings for at least one kind of productivity-enhancing investment.

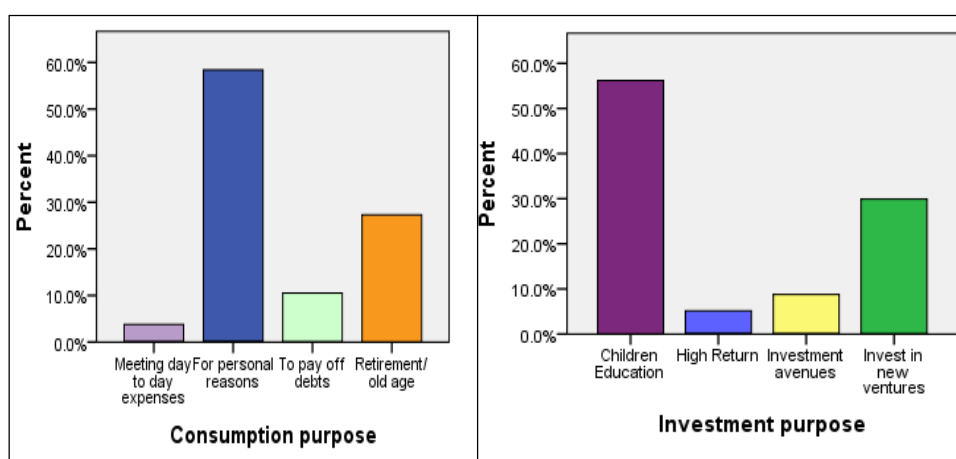
TABLE 2  
Saving objectives

Objective	Cases					
	Valid		Missing		Total	
	N	Percent	N	percent	N	percent
Consumption purpose	157	78.5%	43	21.5%	200	100%
Investment purpose	141	70.5%	59	29.5%	200	100%

Source: Survey data.

FIGURE 1

### Categories of investment and consumption objectives



Source: Table 1 and survey data.

### Types of investment avenues used

Table 3 lists the investment avenues and mechanisms used by respondents in the survey, and show how we have classified them into formal, semi-formal and informal categories. Formal financial services were defined as those provided by banks, NBFCs, insurance companies, government or employers. Semi-formal financial services were defined as those provided by organisations liked MFIs and SHGs. Informal financial services were defined as those savings at home, community institutions, religious institutions, ROSCAs/ASCAs/ Marups, jewellery and real estate.

TABLE 3

#### Investment avenues and mechanism

Formal	Banks
	Non Banking Financial Companies (NBFCs)
	Insurance companies
	Government or employers
Semi-formal	Micro finance institutions (MFIs)
	Self Help Groups (SHGs)
Informal	Savings at home
	Community institutions
	ROSCAs/ASCAs/ Marups
	Jewellery, real estate

Source: Avenues and mechanisms of investment used by respondents.

Figure 2 shows the usage of formal, semi-formal and informal financial instruments. 45.7 percent of the sample had used informal instruments, whereas only 29 percent used semiformal financial services and 25.3 percent used informal forms. The second part of Figure 2 shows that many women used more than one kind of financial instrument, with as many as 30 percent of survey respondents saying they used semi-formal, formal and informal instruments, 15 percent semi-formal and informal, 14 percent formal and informal. This suggests that the three forms are to some degree complements rather than substitutes for each other. Overall, the Figure indicates that the respondents used more of informal means of saving.

FIGURE 2

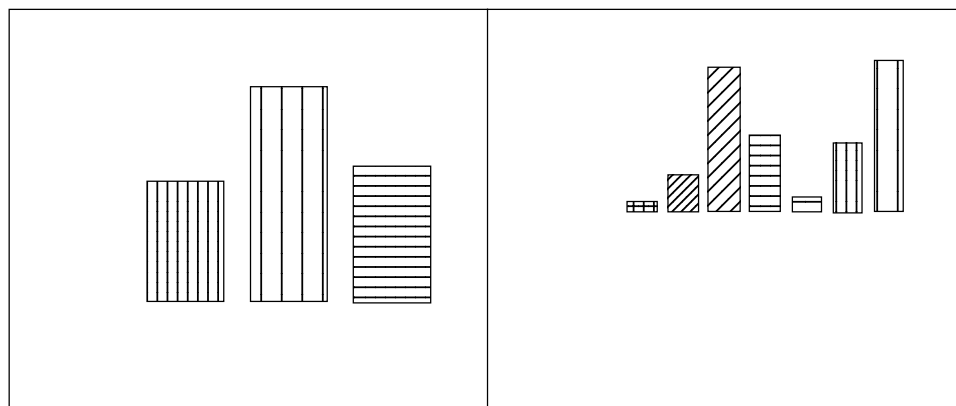
**Usage of types of investment****Awareness of common saving options**

Table 4 suggests that almost all saving options listed in the table were known by the women in the sample except Indira Vikas Patra (0.4 percent), company fixed deposit (1 percent), infrastructure bond (0.8 percent) and stock and shares (1.9 percent). Marup was the most common avenue known by the women.

TAB I  
Awareness of

Saving options	N	Percent	
		Formal	Informal
PPF	42		
Indira Vikas Patra	4		
National Savings Scheme	39		
Post Office Savings	134		
Bank Fixed Deposits	149	15.3%	74.5%
Company Fixed Deposits	10	1.0%	5.0%
Mutual Fund	58	5.9%	29.0%
Unit Linked Insurance Plan	55	5.6%	27.5%
LIC	170	17.4%	85.0%
Infrastructure Bond	8	0.8%	4.0%
Stocks & Shares	19	1.9%	9.5%
Gold	106	10.8%	53.0%
Marup	183	18.7%	91.5%
Total	977	100.0%	488.5%

Source: Survey data.



### Source of financial information

Most of the respondents relied on friends and relatives to get information about saving and investment while those who saved in banks got these from banks. Television channels and newspapers were also sources of financial information. A few of the women depended on brokers and other sources to get financial information.

TABLE 5

#### Sources of financial information

Source of information	Responses		Percent of cases
	N	Percent	
Friends/Relatives	140	56.2%	70.7%
Broker	14	5.6%	7.1%
Bank	43	17.3%	21.7%
TV/Newspaper	31	12.4%	15.7%
Other	21	8.4%	10.6%
Total	249	100.0%	125.8%

Source: Survey data.

### Financial decision making

Table 6 evidences that for making financial decision, relatives and friends had high percentages of responses, consulting the spouse and parents and own knowledge also contributed highly to financial decision making. Minimal consultation was made with financial consultants, insurance advisors and children.

TABLE 6

#### Financial decision making

Whom consulted for financial decision	Responses		Percent of cases
	N	Percent	
Spouse	62	16.4%	31.0%
Relatives	74	19.6%	37.0%
Parents	43	11.4%	21.5%
Friends	66	17.5%	33.0%
Experts	29	7.7%	14.5%
Financial Consultant	35	9.3%	17.5%
Insurance Advisors	14	3.7%	7.0%
Own Knowledge	50	13.3%	25.0%
Children	4	1.1%	2.0%
Total	377	100.0%	188.5%

Source: Survey data.

**Criteria for selection**

While selecting saving avenues, majority of the women under study considered return as an important criterion followed by interest rates and others (comprising amount invested, regularity and security) and services provided. Past performance and promotional activities were thought to be important by few of the women investors and document by least of the investors.

TABLE 7

**Criteria for selection**

	Responses		Percent of cases
	N	Percent	
Past performance	10	3.5%	5.0%
Service	27	9.4%	13.5%
Document	2	0.7%	1.0%
Promotional Activities	14	4.9%	7.0%
Return	125	43.4%	62.5%
Interest rate	65	22.6%	32.5%
Others	45	15.6%	22.5%
Total	288	100.0%	144.0%

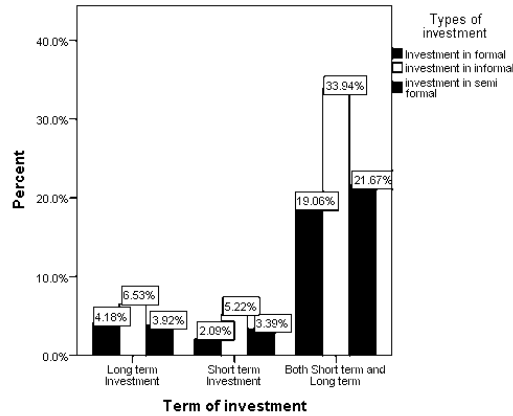
Source: Survey data.

**Term of investment**

The survey respondents invested in short-term (1 year), long-term (more than 1year) and in both short-term and long-term. Figure 3 depicts term of investment in relation to types of investment. It can be observed that the percentage of investment in formal, informal and semi-formal types with regard to short-term and long-term are lower than 10 percent whereas it is more in case of the short term and long term combined category indicating that respondents invested not only for one term but in both terms. Further, it is clear that women investors saved or invested more in informal types of investment in all the three categories.

FIGURE 3

**Term and types of investment**



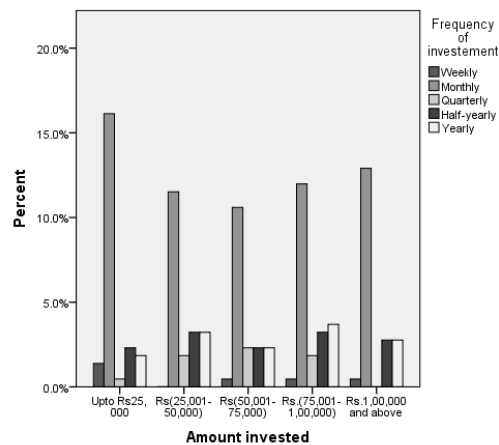
Source: Survey data.

**Amount invested and frequency of investment**

It is clear from Figure 4 that the most common frequency of investment is monthly basis while weekly, quarterly, half-yearly and yearly, the percentages are very low indicating that respondents saved more on monthly basis. Further, the most common saving amount range was up to Rs. 25,000 per year, but, of course, there are respondents who saved up to Rs. 1,00,000 and more per year. Those saving more than Rs.1,00,000 too saved more on monthly basis; however, it does not mean that they save Rs. 1,00,000 per month.

FIGURE 4

**Amount invested and frequency of investment**



Source: Survey data.

### Personal factors influencing investment

To find out if there is any influence of the personal factors on the selection of investment forms, Chi-square test of independence was used. The data used in this research were categorical and of multiple-response nature. The contingency tables formed from the data, due to multiple responses, they did not sum up to expected number of subject of the particular row/column. Simply saying, they usually exceeded the total number of respondents.

Independence hypothesis cannot be tested using the Pearson chi-square test for the  $r \times c$  table because subjects within the same row/column can be represented by more than one category of the multiple-response question. There are chances of committing Type-1 error; as such, other statistics were vital for the interpretation of findings. A post hoc chi-square test was conducted to apply correction associated with each one of cell analysis. The exact p-values for each cell were compared with the Bonferroni adjusted p-value to find the significance (Beasley, and Schumacker, 1995).

For the purpose of the study, SPSS was used to do the post-hoc analysis. The null hypothesis was that personal factors have no influence on the selection of investment.

### Income level and investment

Chi-square test of independence was performed on the income level and investment forms of the respondent. The overall Pearson chi square  $\chi^2$  (df = 8) = 13.663, p-value = .091 (>.05) shows that the null hypothesis "income level has no influence on selection of investment" is true. However, we need to look at the post hoc result of p-values of each cell. In Table 8, it is seen that there are no z-scores beyond 1.96 except in the informal investment and less than Rs. 1 lakh income level cell. This may be interpreted that it is statistically significantly different from null hypothesis but the p-value of each cell must be taken into account before making any conclusion. The Bonferroni corrected p-value for the table is 0.0033 and this has to be compared with adjusted p-values of each cell. It can be observed that the p-values of all the cells are greater than the Bonferroni corrected p-value of 0.0033. Thus, it is concluded that income level has no influence on selection of the forms of investment.

TABLE 8

#### Relationship between income level and forms of investment

Income & forms of investment	Adjusted _z_score	Chi_ square	P_value
Above Rs.4 lakh& Formal	1.28	1.64	.2005
Above Rs.4 lakh& informal	-2.03	4.12	.0424
Above Rs.4 lakh& Semiformal	1.00	1.00	.3173
Rs. 3-4lakh & Formal	.62	.38	.5353

TABLE 8 (Contd.)

Income & forms of investment	Adjusted _z_score	Chi_ square	P_value	
Rs. 3-4 lakh & Informal	-1.30	1.69	.1936	Bonferroni corrected_p_value = 0.0033  Overall Chi_square = 13.663 (df=8) P_value=.091
Rs. 3-4 lakh & Semiformal	.83	.69	.4065	
Rs. 2-3 lakh & Formal	-1.01	1.02	.3125	
Rs. 2-3 lakh & Inormal	.76	.58	.4473	
Rs. 2-3 lakh & Semiformal	.14	.02	.8887	
Rs. 1-2 lakh & Formal	-1.06	1.12	.2891	
Rs. 1-2 lakh & Informal	.66	.44	.5093	
Rs. 1-2 lakh & Semiformal	.29	.08	.7718	
< Rs. 1 lakh & Formal	-.14	.02	.8887	
< Rs. 1 lakh & Informal	2.58	6.66	.0099	
< Rs. 1 lakh & Semiormal	-2.70	7.29	.0069	

### Education level and investment

It can be understood from Table 9 that the p-values of all the cells are more than the Bonferroni corrected p-value of .0042 with the exception of the cell semi-formal and education level upto secondary class. The overall (df=6) = 13.653, p-value = .034(<.05) indicates that the null hypothesis "education level has no influence on selection of investment" should be rejected. Nonetheless, the post hoc result shows a different picture, all the actual p-values of the cells are greater than the Bonferroni corrected p-value except in the case of lowest level of education. It can thus be interpreted that, at least for investment in the informal form, lowest level of education has some influence.

TABLE 9

### Relationship between education level and forms of investment

Education level & forms of investment	Adjusted _z_score	Chi_ square	P_value	
Professional & Formal	-.30	.09	.7642	Bonferroni corrected_p_value = 0.0042  Overall Chi_square = 13.653 (df=6) P_value = .034
Professional & informal	-1.30	1.69	.1936	
Professional Semiformal	1.70	2.89	.0891	
Post graduate & Formal	.10	.01	.9203	
Post graduate & Informal	-.70	.49	.4839	
Post graduate & Semiformal	.70	.49	.4839	
Matric & Secondary & Formal	.40	.16	.6892	
Matric & Secondary & Inormal	2.70	7.29	.0069	
Matric & Secondary & Semiformal	-3.30	10.89	.0010	
Graduate & Formal	-.10	.01	.9203	
Graduate & Informal	-.10	.01	.9203	
Graduate & Semiformal	.10	.01	.9203	

### Occupation and investment

For the relationship between occupation and investment, Table 10 evidences that none of the actual p-values of the cells are less than the Bonferroni corrected p-value of 0.0042. The overall (df=6) = 8.888, p-value = .180 (>.05) also indicates no association between the variables. So, it can be interpreted that there is no relationship between occupation and forms of investment.

TABLE 10

#### Relationship between occupation and forms of investment

Occupation & forms of investment	Adjusted z_score	Chi_square	P_value	
Wage earner & Formal	.15	.02	.8808	Bonferroni corrected_p_value = 0.0042  Overall Chi_square = 8.888 (df=6) P_value = .180
Wage earner & informal	1.83	3.35	.0672	
Wage earner & Semiformal	-2.15	4.62	.0316	
Non Government & Formal	-.90	.81	.3681	
Non Government & Informal	.68	.46	.4965	
Non Government & Semiformal	.12	.01	.9045	
Government & Formal	.03	.00	.9761	
Government & Inormal	-1.68	2.82	.0930	
Government & Semiformal	1.82	3.31	.0688	
Business & Formal	.69	.48	.4902	
Business & Informal	.60	.36	.5485	
Business & Semiformal	-1.33	1.77	.1835	

### Age level and investment

The post hoc analysis showed that the actual p-values of all the cells are greater than the Bonferroni corrected p-value of 0,0042 and none of the z-scores are beyond 1.96. The (df=6)=3.611, p-value=.729(>.05) resulting in no association between the variables, thus age level has no influence on investment.

TABLE 11

#### Relationship between age level and forms of investment

Age level & forms of investment	Adjusted z_score	Chi_square	P_value	
Above 55 & Formal	.88	.77	.3789	
Above 55 & informal	.21	.04	.8337	
Above 55 & Semiformal	-1.07	1.14	.2846	
45-55 & Formal	-.70	.49	.4839	
45-55 & Informal	.44	.19	.6599	

TABLE 11 (Contd.)

Age level & forms of investment	Adjusted_z_score	Chi_square	P_value	
45-55 & Semiformal	.19	.04	.8493	Bonferroni corrected_p_value = 0.0042
35-45 & Formal	.53	.28	.5961	
35-45 & Informal	-1.40	1.96	.1615	
35-45 & Semiformal	1.03	1.06	.3030	Overall Chi_square = 3.611 <sup>a</sup> (df=6) P_value=.729
21-35 & Formal	-.80	.64	.4237	
21-35 & Informal	1.03	1.06	.3030	
21 -35 & Semiformal	-.36	.13	.7188	

### Relation between income level and amount invested

It is a well believed notion that there is a positive relationship between income level and amount invested. The overall chi-square analysis shows that there is significant relationship between income level and amount saved/ invested, (df = 8) = 54.440, p-value = .000 (<.05). The post hoc test shows cells which are statistically significantly different from the null hypothesis. Women earning income above Rs. 3 lakh has some relation with saving upto Rs. 25,000 (p-value = .000) and saving above Rs. 1 lakh (p-value = .000). The same is true for the lower income group. The Bonferroni corrected p-value is .0033, hence it can be concluded that income level has some influence on the amount saved, at least in the case of higher income group and lower income group.

TABLE 12

### Relationship between income level and amount invested

Income level & Amount Invested	Adjusted_z_score	Chi_square	P_value	
Above Rs. 3 lakh & Above Rs. 100000	4.64	21.53	.0000	Bonferroni corrected_p_value = 0.0033
Rs. 2-3 lakh & Above Rs. 100000	-.77	.59	.4413	
Less than Rs. 2 lakh & Above Rs. 100000	-4.05	16.40	.0001	
Above Rs. 3 lakh & Rs. 75001-100000	2.46	6.05	.0139	Overall Chi_square = 54.440 (df=8) P_value = .000
Rs. 2-3 lakh & Rs. 75001-100000	-.63	.40	.5287	
Less than Rs. 2 lakh & Rs. 75001-100000	-1.98	3.92	.0477	
Above Rs. 3 lakh & Rs. 50001-75000	.08	.01	.9362	
Rs. 2-3 lakh & Rs. 50001-75000	.74	.55	.4593	
Less than Rs. 2 lakh & Rs. 50001-75000	-.65	.42	.5157	
Above Rs. 3 lakh & Rs. 25001-50000	-2.73	7.45	.0063	
Rs. 2-3 lakh & Rs. 25001-50000	2.45	6.00	.0143	
Less than Rs. 2 lakh & Rs. 25001-50000	.86	.74	.3898	
Above Rs. 3 lakh & Upto Rs. 25000	-4.12	16.97	.0000	
Rs. 2-3 lakh & upto Rs. 25000	-1.71	2.92	.0873	
Less than Rs. 2 lakh & upto Rs. 25000	5.43	29.48	.0000	

### Relation between investment and financial empowerment

An attempt was made to understand the relationship between investment and financial empowerment of women. A five-point scale was used to find the opinion of the respondents related with financial empowerment. The median and the mean values in Table 13 show favourable opinion by the respondents indicating that they are financially empowered to some extent. They feel financially independent and are in a position to support their family incomes. The women under study can manage their current expenditures well, striking a balance with savings for future. They are of the opinion that they can make their own decisions and have a sense of security with their investment.

To test the null hypothesis that “the investment made is not related to financial empowerment of women”, a correlatation test was conducted with measures of investment and financial empowerment. Table 14 shows the result of the test evidencing that a strong linear relationship exists between investment and financial empowerment with Pearson correlation = .79,  $p = .006$  ( $p < .01$ ). Thus, we reject the null hypothesis and conclude that investment is related with empowerment. This finding implies that women engaged with investment activities feel a sense of financial empowerment.

TABLE 13

#### Financial empowerment

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total	Mean	Median	S.D.
I feel financially independent through my investment	f	4	8	21	123	44	200	3.98	4.00	.817
	%	2.0	4.0	10.5	61.5	22.0	100			
I can supplement my family income with the help of my investment	f	0	9	54	83	54	200	3.91	4.00	.846
	%	0.00	4.5	27.0	41.5	27.0	100			
I can balance my current spending and savings for future	f	0	5	62	93	40	200	3.84	4.00	.766
	%	0	2.5	31.0	46.5	20.0	100			



TABLE 13 (Contd.)

		<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>Total</b>	<b>Mean</b>	<b>Median</b>	<b>S.D.</b>
I am confident to work on my own idea be it family or financial matters	f	0	0	26	92	82	200	4.30	4.00	.774
	%	0.00	0.00	11.0	48.0	41.0	100			
I feel secured to work with my investment	f	2	17	29	81	71	200	4.01	4.00	.967
	%	1.0	8.5	14.5	40.5	35.5	100			

Source: Survey data.

TABLE 14

#### **Correlation between investment and financial empowerment**

		<b>Empowerment</b>	<b>Investment</b>
Empowerment	Pearson Correlation	1	.794**
	Sig. (2-tailed)		.006
	N	200	200
Investment	Pearson Correlation	.794**	1
	Sig. (2-tailed)	.006	
	N	200	200

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

## **V. DISCUSSION**

Women residing in the Imphal city consist of women employed in government, non government or private organization, business women, wage earners and housewives. The sample under study represents all these groups. Being in the urban region all the respondents are literate and represents the age groups starting from age 21 years to above 55 years. All respondents save money in some way or the other, even the wage earners and housewives who are dependent on the spouses save in some form or the other. They have held some form of savings, either through a formal or semi-formal financial institution, or through more informal mechanisms, such 'Rotating Savings and Credit Associations (ROSCAs). Women in Imphal city save for consumption as well as for investment purpose, but more so for household consumption.

Women in prime time of their career and married save to invest in education of their children and those nearing retirement age save as provision for retirement.

The types of investment used have been categorized into formal, informal and semi-formal and all these types are known by the women and they invest either in one or two or in all the three forms. Marup is so common in Manipur that there is no household that did not join the group. These groups exist in different forms dealing with cash or kind. These groups of people pool money periodically (daily, weekly, monthly) and then distribute the money pooled to members in turn. Members all typically save the same amount, though some members may have multiple 'shares' and thus receive two or three pay-outs according to their shares. The tenure depends on the number of members in the group, no new memberships are allowed during the tenure, and the group dissolves after tenure. Rate of interest is between 5 to 20 percent flat and those who received the payout pay interest along with the contribution or share.

Being in the city and all literate, the respondents are all aware of the investment avenues which consist of formal, informal and semi-formal avenues. They get investment information from electronic and print media, brokers or consultants, banks and more so from friends and relatives. This may be so as word of mouth is a strong channel of communication. For financial decision making, women investors consult friends and relatives, spouse, parents, experts, consultants and others, though a good number of them make their own decision.

The respondents invest in short-term (less than one year), long-term (more than one year) and in both the terms. If we look at the frequency of investment, it is more in monthly than weekly, daily and quarterly and the monthly seems to be more in informal type of investment.

When we look at the relationship of personal factors with the forms of investment, we could find no significant relationship through the statistical analysis conducted. The age level, education level, income level and occupation have no significant influence on the selection of the types of investment. This indicates that no matter the age level and education level, women save in some way or the other. The income level and occupation also do not influence the saving of women, no matter what income one earns or what profession one is engaged with, women save and even the poorest of the poor do save. Nevertheless, the income level has some effect on the amount saved, the higher the income the higher is the amount saved.

The positive correlation between measures of investment and financial empowerment gives a good signal that women engaged with investment activities can feel financially empowered and this can go a long way in making them economically and socially empowered.

## **VI. SUMMARY AND CONCLUSION**

The study on investment pattern of women has been undertaken with the key objectives to determine the investment pattern of woman investor and to

explore ways for sustainable and safe strategies of savings for women in Imphal leading to financial empowerment. The survey results showed that women do not always confine themselves to one form of saving, and some use a combination of formal, semi-formal and informal financial services, implying that the different types of financial services and mechanisms are to some extent complements rather than substitutes. This suggests that, while the form of formal financial services is likely to remain the ultimate goal for policy makers, efforts to promote financial access should also provide a supportive environment for the other forms to flourish.

The thriving informal mechanisms have proved beyond doubt that low-income people have the capacity to save significant amounts. Saving needs are driven by a diverse array of life events, so savings services must respond to the wide range of needs. However, all savings products must meet a specific set of common needs. They must be secure, easy to apply for, and delivered at locations conveniently accessed by clients. To respond to different needs, savings products may vary in terms of amount saved, lock-in period, returns expected, and the frequency with which investors can deposit and withdraw savings.

Formal financial services encourages or enables an individual to invest, in a way they might not otherwise be able to do because they appear to have a better credit risk, or a potentially more profitability to customer. Formal financial services are more suitable for investment purposes than other forms of provision, perhaps because of the fact that they enable people to access larger sums of money, or to save in a safer or more stable environment than semi-formal and informal mechanisms. This financial access would definitely lead to greater empowerment of women.

Thus, it seems that while the goal of financial inclusion may be promoted through semi-formal financial services and informal services, growth can best be promoted by improving access to formal financial services. Women investors should also be encouraged to avail formal services too. The strong relationship between investment and financial empowerment of women suggests that if women take active role in investment and investment related activities they may gain more confidence, feel secure and independent leading to empowerment. Women need to be trained, facilitated and exposed to investment and financial knowledge, to encourage their participation in investment.

Lastly, whilst balancing the objective of financial inclusion of women through all the forms of financial services, the need to maintain adequate levels of consumer protection from fraud and financial instability should be of utmost importance. Indeed, it seems possible that increased financial inclusion may most easily be achieved by widening access to all forms of provision. These results thus provide new evidence of promoting financial inclusion, making women more independent and empowered and ultimately contributing to investment and growth.

The study is not, however, free from *limitations*. The women studied saved according to the income earned but there may be other factors that affect saving which the study did not cover and need further investigation. Barriers and challenges to invest for productive purposes, both the supply and demand side,

have not been studied by the present study and this presents areas of further research. Satisfaction level of the women investors with their present investment strategy was not covered by the study which could be probed further. Lastly, the study concentrated on financial empowerment of women and other factors of women empowerment were not covered.

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**Financing Problems of Handloom Industry:  
A Study with Reference to  
Primary Weavers' Cooperative Societies of  
Some Select Districts in West Bengal**

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**ABSTRACT**

The handloom industry has a great contribution to nation's economy. But the industry has been facing a lot of problems and its survival is at stake. This study attempts to analyze the various problems, especially the chronic finance related problems along with a few other areas of handloom industry on the basis of the responses received through a structured questionnaire from the officials of Primary Weavers' Cooperative Societies (PWCSs) of some select districts in West Bengal. The study reveals that inadequacy of working capital has an effect on the production level as well as sales performance of the PWCSs.

**Key words:** Handloom Industry, Economic Contribution, Working Capital, Primary Weavers' Cooperative Societies (PWCSs).

**I. INTRODUCTION**

The Indian textile industry is one of the largest industries in the world with an enormous raw material and textile manufacturing base. It has a great contribution to our economy. India is well known for its textile products since age old. The traditional textile industry of India had almost perished during the colonial regime. In 1818, the modern textile industry took birth in India

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when the first textile mill in the country was established at fort Gloster near Calcutta (now Kolkata). The contribution of textile and clothing industry is about 14% to the industrial production and 3% to the gross domestic product (GDP) of the nation. This industry accounts for nearly 21% of the total employment generation and around one-third of the gross export earnings of the economy.<sup>1</sup>

India produces 85% of the handloom products of the world with different varieties<sup>2</sup>. It uses all kinds of fibres and yarns of various counts to produce the widest range of products. It constitutes around 19% of total cloth production and 30% of total export earnings of India. Around 4.3 million people directly depend on the handloom industry to earn their livelihood while many more millions of people depend upon the subsidiary occupation connected with this industry (Handloom Census of India, 2009-10). The handloom products like Saree, Gamcha, Chaddar, Sarong, Shawl, Towel, Bed Sheet, Lungi, Dhoti, Blanket, Durries, Long Cloth, Shirting, Furnishing, Dress Material, Suiting, Bandage, Duster, etc. are more or less produced in all the States of India. Despite having such splendid past and the key role in the economy of the nation, the presence of this industry is questionable with a gloomy future due to a lot of problems like finance related, production related and marketing related issues. Out of these, finance related problem is the most important one. The managers of the PWCSs are facing huge difficulties to perform the day to day activities of the society like purchases of daily input materials, payment to weavers, etc. due to problems in accessing credit primarily due to high cost of credit and debt overhang. Lack of finance has led to the forced shutdown of many PWCSs over the years in West Bengal.

The present study attempts to analyze mainly the finance related problems along with production and marketing related issues from the view point of the active PWCSs in the select districts of West Bengal.

The remainder of the study is divided as follows. The literature review is given in section II. This is followed by financing schemes of handloom industry and hypothesis, respectively in sections III and IV. Database and methodology are given in section V. Section VI contains empirical analysis and findings. Conclusion is given in the last section.

## **II. LITERATURE REVIEW**

Several studies have been conducted by the researchers on different aspects of handloom and cotton textiles. Some of them are discussed below.

Kshetrimayam (2011) has observed that the modern development of cooperatives has changed the structure of handloom weaving in the rural Manipur with ramifications spreading out from the family to the global market. Goswami and Jani (2011) have discussed the various managerial issues such as procurement of yarn, production and marketing of handloom products and the constraints encountered. Das (2012) has studied the economics of the handloom industry in relation to its production organization. Singh and Bansal (2012) have found that handloom is unparalleled in its flexibility and versatility,

permitting experimentation and encouraging innovations. Patil (2012) has observed that the handloom textiles constitute a timeless part of the rich cultural heritage of India which makes Indian handlooms a potential sector for the upper segments of domestic as well as global market. Pandit et al. (2013) have examined the ergonomic issues related to weaving practices as adopted in the North-East India at present and tried to analyze them from a design perspective. Ahmed and Nengroo (2013) have analyzed the growth and performance of handloom in the state of Jammu and Kashmir. Premsundar and Kannan (2013) have discussed the current status and livelihood problems of unorganized women handloom workers and also proposed the importance of social protection and security. Gonela et al. (2013) have examined the problems which plague the handloom industry and suggested how proper use of geographical indication as a tool can help revive and ensure the survival of the industry. Narzary (2013) has tried to find out the marketing problems and prospects of the handlooms and handicraft industry in the Bodoland Territorial Area District of Assam. Nadh et al. (2013) have analyzed the merchandising and marketing that have been recognized as being central to the growth and development of handloom sector in India.

From the above literature review, it appears that, over the years, various attempts have been made by the researchers to evaluate different aspects of handloom industry. But no significant work so far has been made on the analysis of the financial challenges including production and marketing related issues faced by handloom industry in West Bengal, especially on PWCSs. The present study is trying to highlight these unexplored areas.

### **III. FINANCING SCHEMES OF HANDLOOM INDUSTRY**

The Government of India and other state governments so far have introduced many financing and other schemes for the development of handloom industry.

#### **Financing Schemes of Handloom Industry in India**

During the 11<sup>th</sup> Five Year Plan, the Office of the Development Commissioner for Handlooms, Government of India, has implemented six schemes which are (i) Integrated Handloom Development Scheme (IHDS), (ii) Handloom Weavers' Comprehensive Welfare Scheme (HWCWC), (iii) Marketing and Export Promotion Scheme (MEPS), (iv) Mill Gate Price Scheme (MGPS), (v) Diversified Handloom Development Scheme (DHDS) and (vi) Revival, Reform and Restructuring (RRR) Package.

The following schemes have also been approved for implementation by the Central Government during 12<sup>th</sup> Five Year Plan:

#### **(i) National Handloom Development Programme (two components):**

- (a) Revival, Reform and Restructuring (RRR) Package for handloom sector: RRR package covers waiver of overdue loan (100% principal and 25% of interest) as on 31<sup>st</sup> March 2010 and recapitalization assistance to

eligible apex, PWCSs and individual weavers and also provides fresh loan at 6% interest rate along with credit guarantee for 3 years. The scheme was implemented upto 28<sup>th</sup> February, 2014.

- (b) Comprehensive Handlooms Development Scheme (CHDS): This scheme has been formulated by merging the components of Integrated Handloom Development Scheme (IHDS), Marketing and Export Promotion Scheme (MEPS) and Diversified and Handloom Development Scheme (DHDS) implemented during the 11th Plan. Sub-components of the CHDS are as follows:

- Cluster Development Programme
- Marketing Incentive
- Handloom Marketing Assistance
- Development and strengthening of the handloom institutions, including Handloom census.<sup>3</sup>

**(ii) Handloom Weavers Comprehensive Welfare Scheme (two components):**

- (a) Health Insurance Scheme for access to health care facilities to weavers, their spouse and two children.
- (b) Mahatma Gandhi Bunkar Bima Yojana for life insurance covers the handloom weavers in case of natural/ accidental death, total/partial disability due to accident.

**(iii) Yarn Supply Scheme:**

This scheme provides all types of yarns to the handloom weavers' organizations at the price at which it is available at mill gate; and

**(iv) Comprehensive Handloom Cluster Development Scheme (Mega Cluster Scheme)<sup>4</sup>**

Actual expenditure and budget allocations for the handloom industry by the Central Government for the period from 2013-14 to 2015-16 are given in table 1.

TABLE 1

**Actual expenditure and budget allocation of Central Government**

(Rs. in Crore)

Schemes of Handloom Industry	2013-14		2014-15		Budget 2015-16
	Budget Estimate	Actual	Budget Estimate	Actual	
Handloom Weavers' Comprehensive Welfare Scheme	95.00	66.00	85.00	42.25	20.00
Yarn Supply Scheme	100.00	96.86	130.00	127.81	287.00



TABLE 1 (Contd.)

(Rs. in Crore)

Schemes of Handloom Industry	2013-14		2014-15		Budget 2015-16
	Budget Estimate	Actual	Budget Estimate	Actual	
Comprehensive Handloom Development Scheme (CHDS)	117.00	117.35	Merged with NHDP		
Revival, Reforms and Restructuring Package for Handlooms (RRR)	175.00	269.79	Merged with NHDP		
National Handloom Development Programme (NHDP)		—	362.00	227.39	150.00
Trade Facilitation Center and Craft Museum		—	—	—	80.00
Comprehensive Handloom Cluster Development Scheme (Mega Clusters)	30.00	27.50	20.00	14.45	6.60
Total	517.00	577.50	597.00	411.90	543.60

Source: Ministry of Textiles, Government of India, Note on Handloom Sector, 30<sup>th</sup> December, 2015.

### Financing Schemes of Handloom Industry in West Bengal

The Directorate of Textile (Handloom, Spinning Mills, Silk Weaving and Handloom Bases Handicrafts Division), West Bengal, looks after the development of handloom sector in the State. Different development and promotional schemes or projects which are being implemented by the directorate aimed at the organization of the handloom weavers under cooperative fold, handloom cluster and formation of group approach with a view to providing them with adequate financial, technical and marketing support in time. Other organizations which support the development of handloom sector of this State include The West Bengal State Handloom Weavers' Cooperative Society Ltd. (TANTUJA) and state controlled spinning mills. The central marketing organizations procure handloom cloth from PWCSs, handloom cluster and also from weavers outside cooperative fold and sell their products through retail outlets.

Handloom industry is the largest cottage industry of the State, providing employment opportunities to a large number of people, only next to agriculture. Major development schemes/projects are:

- Integrated Handloom Development Scheme (Centrally Sponsored)
- Mega Handloom Cluster Development Project covering entire Murshidabad part of Nadia District (Centrally Sponsored)

- Comprehensive Handloom Development Programme in Dakshin Dinajpur District under BRGF (Special Central Assistance)
- Handloom Projects under Natural Fibre Mission (Special BRGF)
- Revival, Reform and Restructuring Package for Handloom Sector (Centrally Sponsored)
- Marketing and Export Promotion Schemes (Centrally Sponsored/ Central Sector)
- 10% Price Subsidy on Hank yarn under Mill Gate Price Scheme (Central Sector)
- Production of cheaper variety of cotton saree (State Sector)
- Setting up of Indian Institute of Handloom Technology at Nadia District (Central Sector)
- Setting up of Modern Dying House (State Sector)
- Geographical Indication of Goods (Registration and Protection) Act, 1999 (Centrally Sponsored)
- Handloom (Reservation of Articles for production) Act, 1985 (Centrally Sponsored)
- Equity support to the State Controlled Spinning Mills (State Sector)
- Equity support to the West Bengal State Handloom Weavers Cooperative Society Ltd.(TANTUJA) (State Sector)
- Mobilization advance to West Bengal State Handloom Cooperative Society Ltd. (TANTUJA) for wholesale business.<sup>5</sup>

Physical, financial target and achievement of the various handloom schemes of Government of West Bengal for the period from 2013-14 and 2014-15 are shown in table 2.

TABLE 2

**Financial targets and achievements of Government of West Bengal**

(Rs. in lakh)

<b>Schemes of Handloom Industry</b>	<b>2013-14</b>	<b>2014-15</b>
Handloom Cluster Development Programme and Group Approach Project	1002.69	1080
Marketing Incentive under CHDS	800	400
Mega Handloom Cluster Development Project covering entire Murshidabad and part of Nadia District	Project cost 10168.14	Project cost 9649.39
Comprehensive Handloom Development Programme in Dakshin Dinajpur District under BRGF	1180	1500
Handloom Projects under Natural Fibre Mission	180.63 (released)	1800 (sanctioned)

TABLE 2 (Contd.)

(Rs. in lakh)

Schemes of Handloom Industry	2013-14	2014-15
Revival, Reform & Restructuring Package for Handloom Sector	So far, a sum of Rs. 105.66 crore has been spent for re-capitalization of bank loan out of which State contribution is Rs. 25.98 crore	
Production of cheaper variety of cotton saree	800	840.95 (released)
West Bengal Handloom Circuit Development Scheme-2014	5.45 (released)	1597.74 (released)
Equity Support to the State Controlled Spinning Mills	450	220
Equity Support to the West Bengal State Handloom Weavers Co-operative Society Ltd.	900	500
Mobilization Advance to West Bengal State Handloom Co-op. Society Ltd. (TANTUJA) for wholesale business	200	25

Source: Department of Micro and Small Scale Enterprise and Textiles, and Economic Review (2013-14 & 2014-15), Department of Statistics and Programme Implementation, Government of West Bengal.

The PWCSs and their members are expected to know and get all the facilities available under these schemes as they are in an organized form and registered under the Handloom Development Commission.

#### IV. HYPOTHESIS

To analyze the financial and other problems of PWCSs, the following hypotheses have been formulated:

**Null hypothesis (Ho) 1:** The working capital adequacy has no effect on the production level of the societies.

**Null hypothesis (Ho) 2:** There is no impact of the competition on the sales performance of the PWCSs.

**Null hypothesis (Ho) 3:** There is no effect of the marketing incentive<sup>6</sup> on the sales performance of the PWCSs.

#### V. DATABASE AND METHODOLOGY

The study is empirical in nature. The empirical analysis has been done on the basis of the primary data collected from the officials of the active PWCSs of four select districts of West Bengal with the help of a structured

questionnaire. According to the annual reports 2013-14 of different Handloom Development Offices, Directorate of Textiles (Handloom, Spinning Mills, Silk Weaving and Handloom based Handicrafts Division), Government of West Bengal, there are 2,215 registered PWCSs in West Bengal, out of which only 453 societies are active now. 220 active PWCSs from the four districts (Purba Medinipur, Burdwan, Nadia and Cooch Behar) have been selected for the study, taking one district from each of the four administrative divisions (Kolkata, Burdwan, Presidency and North Bengal) of the state of West Bengal, on the basis of highest concentration of active PWCSs in the districts. The distribution of active PWCSs that are selected for the study is shown in table 3.

TABLE 3

**Active PWCSs in the select districts of West Bengal  
for the year 2013-2014**

<b>Kolkata Division</b>			
<b>Name of the District</b>	<b>Handloom Development Office</b>	<b>No. of Active PWCSs</b>	<b>Total no. of PWCSs</b>
Purba Medinipur	Contai	18	<b>73</b>
	Tamluk	55	
<b>Burdwan Division</b>			
Burdwan	Kalna	34	<b>62</b>
	Katwa	28	
<b>Presidency Division</b>			
Nadia	Santipur	16	<b>77</b>
	Nabadwip	61	
<b>North Bengal Division</b>			
Cooch Behar	Cooch Behar	08	<b>08</b>
Total number of selected active PWCSs in West Bengal			<b>220</b>

*Sources:* Annual Reports 2013-14 of different Handloom Development Offices, Directorate of Textiles (Handloom, Spinning Mills, Silk Weaving and Handloom based Handicrafts Division), Government of West Bengal.

All the officials of these active PWCSs of the above mentioned districts have been communicated with the structured questionnaire. Of these, only 102 PWCSs (46.36%) have responded positively.

Based on the pilot survey, three parameters, namely, finance related, production related and marketing related, have been used for analyzing the problems of the handloom industry in West Bengal from the view point of the PWCSs. The questionnaire has been designed by using a 3-point Likert Scale with "1" being "Yes", "2" being "Undecided" and "3" being "No". Questions were

asked mainly on finance related problems of the PWCSs including production and marketing related issues of the select districts in West Bengal. Based on the information on the various multi-items constructs that represent the different issues relating to finance, production and marketing, these are first tested for reliability and validity by computing Cronbach's Alpha value which is estimated at 0.791. Usually, a reliability coefficient above 0.70 is considered sufficient. Therefore, it can be said that the measures used in this study are valid and reliable.

Frequency table and Chi-Square tests (dependency analysis) have been made to present and interpret the data in order to draw logical conclusion. Primary data have been collected during the month of April to June, 2015. The SPSS package has been used to analyze and interpret the data.

## VI. EMPIRICAL ANALYSIS AND FINDINGS

The data collected from the officials of selected PWCSs through a structured questionnaire have been analyzed and results of the analyses are shown below. The surveyed PWCSs are of different sizes— large, medium and small, and the officials of the PWCSs have been selected on the basis of a number of factors, like the number of active members, number of working staffs and infrastructure.

### A. Finance Related

The PWCSs have been suffering from low working capital. NABARD Cash-Credit appears to be their main source of working capital, which they get through District Cooperative Banks. The commercial banks are not interested to grant loan to these PWCSs.

**(a) Sources of finance of PWCSs:** The surveyed PWCSs have been collecting fund from the following sources to run their operation. The responses from officials are given in table 4.

TABLE 4

#### Sources of finance of PWCSs

Sources of Finance of PWCSs	Frequency	Percent
Regional Rural Banks	18	17.6
District Co-operative Bank (NABARD Cash-Credit)	63	61.8
Mahajan	6	5.9
Money lenders	3	2.9
District Co-operative Banks (NABARD Cash-Credit), Government	10	9.8
Regional Rural Banks, District Co-operative Bank (NABARD Cash-Credit), Government	2	2.0
Total	102	100.0

Source: Field Survey.

**Observation:** 62% of the surveyed societies are depending on NABARD Cash-Credit for their working capital, whereas 2% of the societies depend on local money lenders.

**(b) Working capital of the PWCSs:** Inadequacy of the working capital of PWCSs is the most vital problem to run the process smoothly. It needs to be sorted out immediately. The responses from officials are given in table 5.

TABLE 5

**Adequacy of working capital**

Whether the working capital of the society is adequate	Frequency	Percent
Yes	19	18.6
Undecided	46	45.1
No	37	36.3
Total	102	100.0

Source: Field Survey.

**Observation:** 19% of the surveyed societies have adequate working capital, whereas 36% of the societies do not have adequate capital. They are not aware of proper management and sources of working capital also. The district cooperative banks, RRBs, commercial banks or the Government are not granting the required working capital to these PWCs. The reasons are: (1) district co-operative banks fix a predetermined credit limit while issuing NABARD cash-credit loan to the PWCSs, depending upon the asset base and infrastructural issues of the society. So, small and poor infrastructure based PWCSs always get very low amount of credit from the district co-operative banks. Until the previous loan is repaid by the PWCSs, no further credit is allowed to them, (2) due to high possibility of default risk of the PWCSs, RRBs do not show such aggressive interest to provide a large amount of loan to these PWCSs, (3) most of the surveyed PWCSs have received fund from the Government once in their life time. Due to the above mentioned causes, it has been observed that the surveyed PWCSs are suffering from inadequacy of working capital, in spite of having access to the formal sources of finance.

**(c) Granting loans to the PWCSs by commercial banks:** Commercial banks are not interested to grant loans to these PWCSs (table 6). They apprehend that the societies may not be able to repay the interest and loan amount in due time.

TABLE 6

**Granting loans to the PWCSs by commercial banks**

<b>Whether Commercial banks show interest to grant loans to the society</b>	<b>Frequency</b>	<b>Percent</b>
Yes	4	3.9
Undecided	6	5.9
No	92	90.2
Total	102	100.0

Source: Field Survey.

**Observation:** 90% of the surveyed societies have mentioned that the commercial banks do not show interest to grant loans to PWCSs due to the high possibility of PWCSs' default risk. Only 4% of the societies are of the opinion that they get loan from the commercial banks.

**(d) Financing Schemes of Government:** There are various finance related schemes provided by Central Government and State Government specially RRR package which is enjoyed by the PWCSs (table 7).

TABLE 7

**Financial assistances under government schemes specially 'RRR' package**

<b>Avail financial assistances under governments' schemes specially 'RRR' package</b>	<b>Frequency</b>	<b>Percent</b>
Yes	30	29.4
Undecided	13	12.7
No	59	57.8
Total	102	100.0

Source: Field Survey.

**Observation:** From the survey it is found that 57.8% of PWCSs do not avail of the facilities under various finance related schemes, especially RRR package, provided by Central Government and State Government. Only 29.4% of the surveyed societies have availed of financial assistances under government schemes, specially 'RRR' package. The reasons are: (1) most of the surveyed PWCSs are not aware of the various government schemes and their facilities, (2) sometimes surveyed PWCSs cannot fulfill the minimum requirement to get the facilities of the schemes and (3) due to poor infrastructure, many of surveyed PWCSs are not able to access the benefits of the schemes.

### B. Production related

Power looms and mills are the main threats to the PWCSs as they are not only producing large volume of products at a cheaper cost in a very short span of time but also producing those products which are exclusively reserved for the handloom sector. Generally, majority of the customers rush towards the low priced power loom and mill-made products. Moreover, PWCSs' productivity is low as they are using old and traditional techniques and looms.

Chi-Square test has been done to examine the effect of working capital on the production level of the PWCSs (tables 8 and 9).

#### **Hypothesis 1**

Ho: The working capital adequacy has no effect on the production level of the societies.

H1: The working capital adequacy has an effect on the production level of the societies.

TABLE 8

#### **Inadequacy of working capital and its impact on production level**

Inadequate working capital of the society		Increasing present production level			Total
		Yes	Undecided	No	
Yes	Number	4	4	11	19
	% of Total	3.9%	3.9%	10.8%	18.6%
Undecided	Number	4	26	16	46
	% of Total	3.9%	25.5%	15.7%	45.1%
No	Number	0	8	29	37
	% of Total	0.0%	7.8%	28.4%	36.3%
Total	Number	8	38	56	102
	% of Total	7.8%	37.3%	54.9%	100.0%

Source: Field Survey.

TABLE 9

#### **Chi-Square Test**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.658	4	.000
Likelihood Ratio	24.339	4	.000
Linear-by-Linear Association	8.451	1	.004
No of Valid Cases	102		



**Interpretation:** The P value of the Pearson Chi-Square test at 5% level of significance is .000 which is less than 0.05. So, the null hypothesis is rejected and alternative hypothesis is accepted. Therefore, it can be concluded that the working capital inadequacy has an effect on the production level of the societies.

From the cross tabulation (table 8), it is found that 54.9% of the respondent societies' production level is not increasing and 36.3% of the surveyed societies do not have adequate working capital.

### C. Marketing related

The main problem of marketing of the handloom societies is the competition from the power looms, mills and imported products from other states and overseas countries. These competitors are supplying a similar kind of alternative products at a cheaper price in the market. So, the customers are running after the cheaper products. It leads to fall in demand of handloom products of PWCSs. Finally, it results in a reduction in sales of the societies. On the other hand, at all-India level, the handloom industry has a great percentage of contribution in foreign export of hosiery products, but in West Bengal, foreign export is very low. The surveyed PWCSs mostly depend on private traders and do not get reasonable price of their products. There are also no such large centrally managed wholesale organization for marketing of handloom products. Exhibition sales and direct retail are not enough to solve the marketing problems of handloom industry.

Inadequacy of working capital on the sales performance of the PWCSs is shown in table 10.

TABLE 10

#### Working capital adequacy and increase in sales performance

Working capital of the society is adequate		Present sales performance of the society is increasing			Total
		Yes	Undecided	No	
Yes	Number	2	3	14	19
	% of Total	2.0%	2.9%	13.7%	18.6%
Undecided	Number	0	8	38	46
	% of Total	0.0%	7.8%	37.3%	45.1%
No	Number	0	4	33	37
	% of Total	0.0%	3.9%	32.4%	36.3%
Total	Number	2	15	85	102
	% of Total	2.0%	14.7%	83.3%	100.0%

Source: Field Survey.

**Observation:** It is observed from the cross tabulation (table 10) that 83.3% of the present sales performance of surveyed PWCSs' is not increasing and 36.3% of the interviewed PWCSs do not have adequate working capital.

Chi-Square test has been done to check the effect of competition on the sales performance of the PWCSs with mill and power loom sector.

### **Hypothesis 2**

$H_0$ : There is no impact of the competition on the sales performance of the PWCSs

$H_1$ : There is an impact of the competition on the sales performance of the PWCSs

TABLE 11

### **Competition with the mill and power loom sector and sales performance**

Competition from the mill and power loom sector		The present sales performance of the society is increasing			Total
		Yes	Undecided	No	
Yes	Number	0	10	82	92
	% of Total	0.0%	9.8%	80.4%	90.2%
Undecided	Number	1	5	3	9
	% of Total	1.0%	4.9%	2.9%	8.8%
No	Number	1	0	0	1
	% of Total	1.0%	0.0%	0.0%	1.0%
Total	Number	2	15	85	102
	% of Total	2.0%	14.7%	83.3%	100.0%

Source: Field Survey.

TABLE 12

### **Chi-Square Test**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	69.851	4	.000
Likelihood Ratio	24.110	4	.000
Linear-by-Linear Association	35.198	1	.000
Number of Valid Cases	102		

**Interpretation:** The P value of the Pearson Chi-Square test at the 5% level of significance is .000 which is less than 0.05. So, the null hypothesis is rejected and the alternative hypothesis is accepted. Therefore, it can be concluded that market competition has an impact on the sales performance of the PWCSs.

From the cross tabulation (table 11), it is found that 90.2% of the respondent societies face competition and 83.3% of the surveyed societies' sales performance is not increasing.

Accordingly, Chi-Square test has been done to check whether there is any effect of the marketing incentive on the sales performance of the PWCSs.

### **Hypothesis 3**

$H_0$ : There is no effect of the marketing incentive on the sales performance of the PWCSs.

$H_1$ : There is an effect of the marketing incentive on the sales performance of the PWCSs.

TABLE 13

### **Marketing incentive and sales performance**

The society gets marketing incentive for promoting sales		The present sales performance of the society is increasing			Total
		Yes	Undecided	No	
Yes	Number	1	0	3	4
	% of Total	1.0%	0.0%	2.9%	3.9%
Undecided	Number	1	0	6	7
	% of Total	1.0%	0.0%	5.9%	6.9%
No	Number	0	15	76	91
	% of Total	0.0%	14.7%	74.5%	89.2%
Total	Number	2	15	85	102
	% of Total	2.0%	14.7%	83.3%	100.0%

Source: Field Survey.

TABLE 14

### **Chi-Square Test**

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.887	4	.001
Likelihood Ratio	12.526	4	.014
Linear-by-Linear Association	2.565	1	.109
Number of Valid Cases	102		

**Interpretation:** The P value of the Pearson Chi-Square test at the 5% level of significance is .001 which is less than 0.05. So, the null hypothesis is rejected and the alternative hypothesis is accepted. Therefore, it can be said that the marketing incentive has an effect on the sales performance of the PWCSs.

From the cross tabulation (table 13), it is seen that 89.2% of the surveyed societies do not get marketing incentive and 83.3% of the respondent societies' sales performance is not increasing.

## VII. CONCLUSION

Study results show that most of the PWCSs in West Bengal have been suffering from various problems like inadequate working capital having its impact on the level of production and sales performance, severe competition from the cheaper power loom and mill-made domestic products as well as imported products, etc., and future of such PWCSs is very uncertain in the prevalent situation. In spite of having various government schemes for assisting the PWCSs, most of them are either unaware of such schemes or they cannot fulfill the minimum requirements to avail of the benefits of such schemes. Therefore, Government and other appropriate authorities should take proper steps, such as (i) making the people associated with the handloom industry aware of the various schemes introduced for improvement of the handloom industry and how to avail of the benefits of such schemes, (ii) help in developing the infrastructure, (iii) making arrangement for marketing the handloom products, etc.

However, the study is not free from certain *limitations*. It has considered only four districts of West Bengal. An increase in sample size may provide different results. Although, there are many important hubs of handloom industry in the country, it represents the case of West Bengal only. However, it may be expected that the problems of the handloom in general are more or less similar in nature. Therefore, the present study provides some direction to the problems of Indian handloom industry in general and West Bengal in particular, and involves some policy implications both at the Government and other levels.

## Endnotes

<sup>1</sup>Handloom Census of India, 2009-10.

<sup>2</sup>YOJANA, October 2015.

<sup>3</sup>Annual Report (2014-15), Ministry of Textiles, Government of India.

<sup>4</sup>Ministry of Textiles, Government of India, Note on Handloom Sector, 30th December, 2015.

<sup>5</sup>Economic Review (2014-15), Department of Statistics and Programme Implementation, Government of West Bengal.

<sup>6</sup>Marketing Incentive (M.I.) is such an incentive provided by the government to the PWCSs @ 10% p.a. of the total annual sales proceeds of society to promote sales and encourage more discounts for the customers.

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