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Editorial Note

Prime University Journal (PUJ) is an International Journal published biannually. This is a scholarly peer-reviewed journal with the prime objective to promote inquiry on education, research and development. PUJ is committed to inspire the emerging scholars and academicians globally to disseminate their professional knowledge, innovative ideas and research in the fields of life, literature, culture, business, arts, social science, law, technology, and science and engineering and allied disciplines.

The current volume of PUJ contains eight research papers on different disciplines.

The *first paper* is an attempt to evaluate the financial soundness of banking industry in Bangladesh using Altman's Z score model. It also tried to make a comparison of Z score between state-owned and private commercial banks. The *second one* focuses on the weaknesses lying inside the society and in Okonkwo and the outside forces like Christian missionaries and colonial forces in the novel *Things Fall Apart* for which the central character of the novel Okonkwo and the Igbo society face a terrible downfall.

The *third paper* is a study which solely analyses the causes and consequences of environmental degradation at Lama Upazila of Bandarban district, taking the measures of existing deterioration into consideration. The *next paper* is a qualitative analysis which explores whether the superheroes of different films serve the good will of the technologized phenomena or they merely lead the audiences towards more consumption serving consumerist bonanza.

In *paper five* Bayesian approach is used for estimating the parameter of Maxwell distribution. The *sixth paper* tries to explore the inter-link among economic development with good governance which is closely related to the employability of graduates.

The *paper seven* analyses motivational parameters present among the sub-dominated women in Jean Rhys' *Wide Sargasso Sea* and other literary works. It advocates human rights in general in order to contribute significantly for the betterment of the world by showing how both male and female characters achieve emancipation at the end of the novel. The *last paper* focuses on how technology can be a supplement as teaching

tool for teaching English to the ESL learners at tertiary level in Bangladesh and also on the effectiveness and limitations of using technology in ESL classrooms.

The Prime University Journal aims to bridge the research community in humanities, social science and technology developers from academia and industry through submitting/publishing their research-based papers, articles, case studies, reviews on various topics of current concerns in different disciplines, and book review on a single platform. The PUJ has an international editorial board consisting of scholars of different disciplines of the eastern and western origins that facilitates the mitigation of cross-cultural issues over the globe.

I would like to take the opportunity to pay my deepest gratitude towards the Patrons of the journal, Managing Editor, Members of the Editorial Board, the distinguished reviewers and the contributors for their effort in publishing the journal.

Prof Dr M Abdus Sobhan

Editor

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A Comparative Analysis of Financial Soundness between State-owned and Private Commercial Banks: An Emphasis on Altman's Z Score

Afroza Parvin¹, Benazir Rahman² and Alrafa Akter Nitu³

Abstract: Banks are the most promising and contributing sector towards the development of any country. Banks deal with others money-dependent mostly on deposit. For this reason banks should be concerned about the soundness of their financial health. The study aims to evaluate the financial soundness of banking industry in Bangladesh using Altman's Z score model. It has also tried to make a comparison of Z score between state-owned and private commercial banks. The analysis reveals state owned banks possess better financial health than their counter parts. The study finds no significant relationship between ROE and variables of Altman's Z score model for both the sector. From independent sample t test of selected 12 banks (six banks from each sector) it can be inferred that Z score of state owned banks significantly differ from the Z score of private banks.

Keywords: Financial health, Z-score, banking, Bangladesh.

Introduction

Bank is an intermediary institution that makes relationship between the owner of surplus savings and the investor of deficit capital. In this process, banks earn profit by receiving interest from the borrowers who want to take short term and/or long term loans and making relatively lower interest payment to the depositors for providing their funds for use by the bank (Khan, 2005). According to Rose (2005) bank is a financial intermediary accepting deposits and granting loans; offers the widest menu of services of any financial institutions. This study focuses on the prediction of financial health of banking industry in Bangladesh. It has given special emphasis on the comparison between state-owned commercial banks and private commercial banks. Total 12 banks were selected for this study. Among those 6 were private commercial banks and 6 were state owned banks. This paper reveals the financial health by determining

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the Z score of these two types of banks. There are several papers on financial health of banking industry but the comparison of financial health between state-owned commercial banks and privately-owned commercial banks are rarely seen. That's why an attempt has been taken to show the differences. The second section focuses on relevant research questions. The following section deals with reviewing literature. The fourth session focuses on objectives of the study following the methodology. The sixth section focuses on analysis and finding of the study. The final section focuses on conclusion.

Research Questions

The following research questions have been driven for the study:

RQ1: How is the financial health of each of the sectors of banking industry?

RQ2: Is there any significant difference between the Z-scores of state-owned and private commercial banks?

Literature Review

Financial health is defined as a description of the state of a person or company's finances. Someone with good financial health usually deals well with their finances, makes their payments on time, and knows how to manage their money. Someone in poor financial health usually owes a lot of money and is not making their payments on time (investorwords.com). To run business smoothly financial health maintenance is important because it reflects a sound financial system and reinforces trust and prevents phenomena such as a run on banks, which can destabilize an economy. Additionally, a sound financial system signals to the public that their money is handled in a way which will not unduly jeopardize it. This is especially important for savings, including pension saving (bon.com). Altman (1968) have done an important research on financial ratios, discriminant analysis and the prediction of corporate bankruptcy and suggested to combine a set of financial ratios in a discriminant analysis approach to predict corporate bankruptcy. The unhealthy financial situation can be a massive and can cause long-term distress which can result to the restriction of investments activities, capital flows and

performance of firms. Thus it is vital for organizations to identify the reasons that may lead to a corporate failure and take measures accordingly to refrain from such condition. Financial distress is the situation when a company cannot meet; or face difficulty to pay off its financial obligations to the creditors (Khaliq et.al., 2014). Measuring the financial soundness of a firm has become an imperative and imminent need in the context of emerging hyper competition at almost every sector of the business. Financial soundness of a firm is reflected through various financial parameters, which are closely associated with each other (Lahiri, 2013). Kivuvo and Olweny (2014) have made Z score calculation of Kenya's SACCO Sector and found twenty four SACCO's have a positive slope, a trajectory if sustained enhance sector financial stability with only six SACCOs having a negative slope. The study concludes that regulatory agency is correct in advocating for additional capital base as such will improve individual Z scores and recommends model application in finance analysis. Duvvuri (2012) has made an attempt to measure the financial health of Nagarjuna Fertilizers and Chemicals Ltd. by using the Z-Model based on the past 10 years' financial statements and found the Z score of NFCL based on modified Altman's model which has been ranging from 0.53 to 1.93 during the period (i.e. 2001-02 to 2010-11) under the study which is a welcoming feature of the samples. Mukherjee (2015) has evaluated financial health of selected Indian companies through Z score model of Prof. K.B. Mehta (modified version of Altman's Z score) and found bankruptcy prediction is uncertain for Andrew Yule & Co. Limited but India Glycols Limited has the probability of bankruptcy in near future and it has also been observed that Usha Martin Limited company belongs to bankruptcy zone. Gupta (2014) has attempted to evaluate the predictive ability of two default prediction models for listed companies in India: a Z-score model using discriminant analysis and logistic regressions. Ilahi et. al. (2015) have tried to explore if commercial banks have financial difficulties. The results illustrate that all commercial banks in this model are in monetary troubles but in fact, those commercial banks are operating successfully. So, the Z score model is unable to predict bankruptcy (pecuniary Performance) of financial institutions (Commercial Banks). Hayes et.al. (2010) have endeavored to show the efficacy of the Altman's Z Score in predicting financial distress in retail firms and found that all but two of the bankruptcies (94 percent) would have been accurately predicted. Anjum (2012) summarized the research of Altman that have been made to develop the Altman Z score model and concluded that Altman's Z score Model can be

applied to modern economy to predict distress and bankruptcy one, two & three years in advance. Kumari (2013) tried to evaluate the financial health of MMTC of India by using Altman's Z score model and concluded that profit earning capacity and short term investing capacity of MMTC is quite good, but its financing position of assets is comparatively poor. Bal (2015) has calculated Altman's Z-score of all FMCG companies and found the companies are financially sound and there is less chances of bankruptcy in near future. Further the study suggested that the companies should regularly estimate Z-score for making strategies to improve their financial position. Ramana et.al. (2012) have assessed the financial performance and bankruptcy chance of cement companies in India by using Altman's Z score model and shown that KCP Ltd and Kesoram Industries Ltd. have poor financial performance and Dalmia Bharat Limited is at the edge of bankruptcy. Chouhan et.al. (2014) have done a research on predicting financial stability of selected BSE companies revisiting Altman Z score. Vaziri et. al.(2012) have made a Comparative prediction of failure of financial institutions using multiple models such as Moody's financial ratios, Standard and Poor's financial ratio, Vaziri's financial ratio, Altman's Z score, logit model and discriminant analysis. The authors tested each of these models's predictive ability for future use. Chotalia (2014) has made an evaluation of financial health of sampled private sector banks with Altman Z-score Model and concluded that the private sector banks which are under the study falls in Grey Zone as per Z-score criteria and there is possibility of financial distress in some private sector banks. Pradhan (2014) has made Z score estimation for Indian public sector banks and found the scenario has been progressive and stable. Jan and Marimuthu (2015) examined the bankruptcy profile of Islamic banking industry and perform a comparative analysis of their financial characteristics with regards to bankruptcy. Soon (2014) has used Altman's Z-Score Model to predict the financial hardship of companies listed in the trading services sector of Malaysian stock exchange. In Bangladesh, some important researches have been conducted to predict the financial health of different banking and non banking financial institutions. Mizan and Hossain (2014) have done an empirical examination of financial soundness of cement industry in Bangladesh by Using Altman's Z-score and revealed that two firms, Heidelberg Cement and Confidence Cement, are financially sound whereas other three are not in the good position. Ahmed and Alam (2015) have highlighted the financial health of fifteen commercial, publicly traded banking companies of Bangladesh over five years based on the results of Altman Z" Score model. The results revealed

that most of the banks belong to 'Distress' zone; calling for strict regulation by the Central Bank, and stringent monitoring by the newly formed Financial Reporting Council (FRC) through Financial Reporting Act, 2015. Mahtab (2015) has done a financial analysis of Lafarge Surma Cement in Bangladesh using Altman's Z-scoring model. Abdullah (2015) has made an empirical analysis of liquidity, profitability and solvency of Bangladeshi banks and found that 7 banks are in healthy financial position and 22 banks are insolvent during the time period of FY 2009-2014 as well as Islamic or Shariah follower banks are doing better than conventional banks. He has also mentioned that state owned banks are doing better than before. Mostofa et.al.(2016) have predicted the financial distress of private sector banking industry of Bangladesh using Z score model of Altman and concluded that this model was found to be 72% accurate in predicting bankruptcy two years before the event. All the above literatures have been made either from the viewpoint of manufacturing firm or banks. But research on comparison of financial health prediction between state owned banks and private banks in Bangladesh are not available and for this reason this paper has taken an attempt to predict the financial health of banking sector of Bangladesh using Altman's Z score as well as compare between state owned banks and private banks so that a clear picture about the two banking sectors can be depicted. This will give an insight for the bankers which may help them for taking necessary managerial actions for their better financial performance.

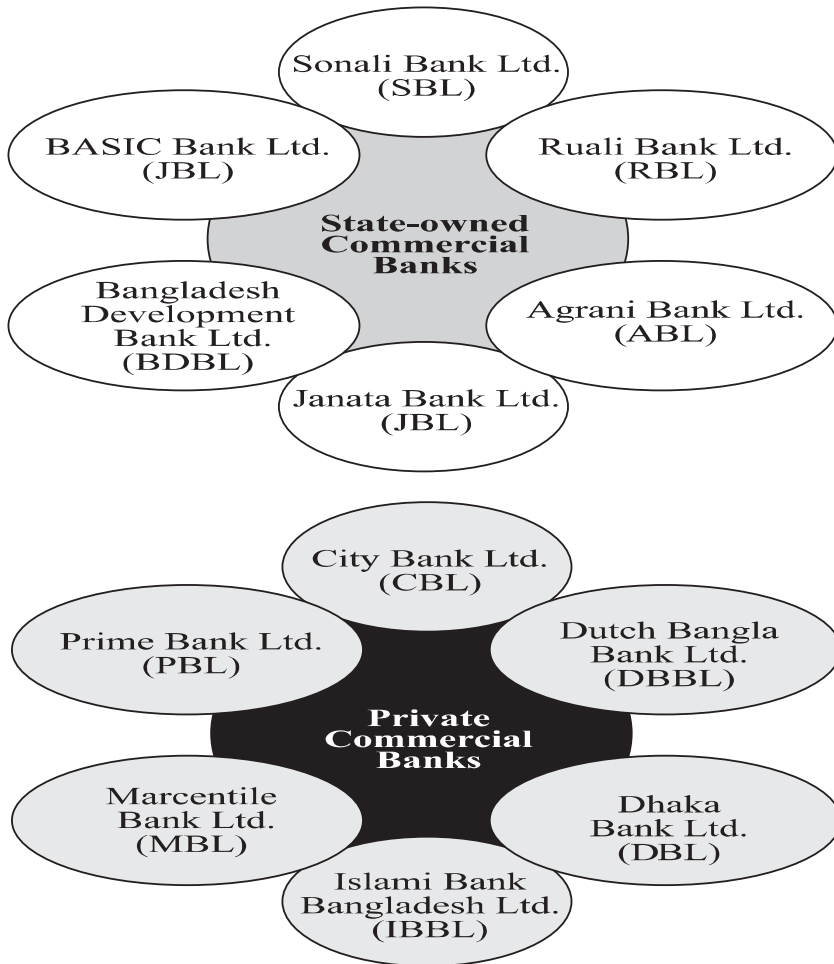
Objectives of the Research

- To examine the financial soundness of the banking sector of Bangladesh.
- To focus on the recent financial scenario of each banking sector by ranking mean values.
- To make a comparison between Z scores of state-owned bank and private banks.

Research Methodology

Sample Size

For the study we have selected all 6 state-owned banks and randomly 6 private commercial banks among 48 commercial banks including local, foreign and Islamic commercial banks (Wikipedia).



We have collected 5 years data (2010-2014) such as current assets, current liabilities, retained earnings, total assets, shareholder's equity, and total liabilities from the selected banks of each category.

Data Source and Type

The study is based on quantitative data which is collected from annual audited financial statements of the sample banks from both public and private sectors. The data type which is used in this research is a quantitative one. Different articles and websites of the selected sample banks are used as secondary source of data.

Instrumentation

This study is analytical in nature and related to the analysis of financial health or soundness of selected banks both in public and private sectors. Altman Z score model (Altman, 1968) is used to predict the financial health and also to compare between these two sectors. Altman's Z-score is a customized edition of the discriminant analysis technique of R. A. Fisher (1936). For the analysis different statistical tools like mean, standard deviation and ANOVA (one way), are also used to check consistency and stability of different variables used in calculating relevant financial ratios as well as Altman Z score. For the comparison independent sample t-test is used. MS Excel and SPSS 16.0 software is used to compute these statistical values.

For analyzing the study various financial ratios have been calculated firstly and then forecast the financially distressed and non-distressed banks using the Z-score model. Altman Z-score model (Altman, 1968) considers four independent variables and each of them represents the common financial ratios, weighted by coefficients. According to Altman Z score model (Altman, 1968) the following equation for bankruptcy or possibility of bankruptcy of the non-manufacturing or service industry has been analyzed.

Z-Score Bankruptcy Model

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

X_1 = (Current Assets – Current Liabilities) / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = Earnings before Interest and Taxes / Total Assets

X_4 = Market Value of Equity / Total Liabilities

- **X_1 Working capital / total asset**

Working capital is a common measure of a company's liquidity, efficiency, and overall health. Total assets show the overall assets of banks including both short and long-term. The WC/TA ratio is a sign of a bank's liquidity and ability to meet creditor's short term obligations.

- **X_2 Retained earnings / total assets**

Retained earnings is the amount carried out to the coming years from net earnings. Accumulated Retained Earnings

to Total Asset (TA) is the ratio that measures the accumulated profitability of the banks.

- ***X₃ Operating earnings / total assets***

Earnings before Interest and Taxes (EBIT) show the operating profit of banks. EBIT to Total Asset measures the operating efficiency of an organization. The value of this ratio indicates the capacity of the firm to generate satisfactory earnings to pay off its fixed obligation like interest.

- ***X₄ Market value of equity / total liabilities***

This is the ratio of Market Value of shareholder's Equity to total liabilities. This ratio indicates the performance of the fair market value of the bank's stock in comparison to the total liabilities. The higher the ratio, the higher the market price of the firms share is.

All the four ratios necessary to calculate Z-score are the higher, the better. It indicates that the bigger the ratios, the better the financial health of a bank.

Zones of Discriminations

The bankruptcy possibility of banks depends on the value obtained by using the formula. The following will be applicable for the values of Z-score:

| Scenario | Score | Zone or indicator | Description |
|----------|---|-------------------|---|
| | $Z > 2.6$ | “Safe” | The bank is financially sound and there is least possibility that the bank will face financial distress. It can be said that the bank is financially healthy. |
| | $1.1 \leq Z \leq 2.6$ | “Gray” | The bank falls in the gray area that means there is less possibility that the bank will face financial distress in the near future. |
| | $Z < 1.1$ | “Distress” | There is a high possibility that the bank will face financial distress even bankruptcy in near future. It can be said the bank is in vulnerable position. |

Source: Altman Z-score, Wikipedia, 2016

Research Hypothesis

For ANOVA (one-way) following hypothesis has been established:

H₀: Altman Z score is equal in the sample units.

H₁: Altman Z score is not equal in the sample units.

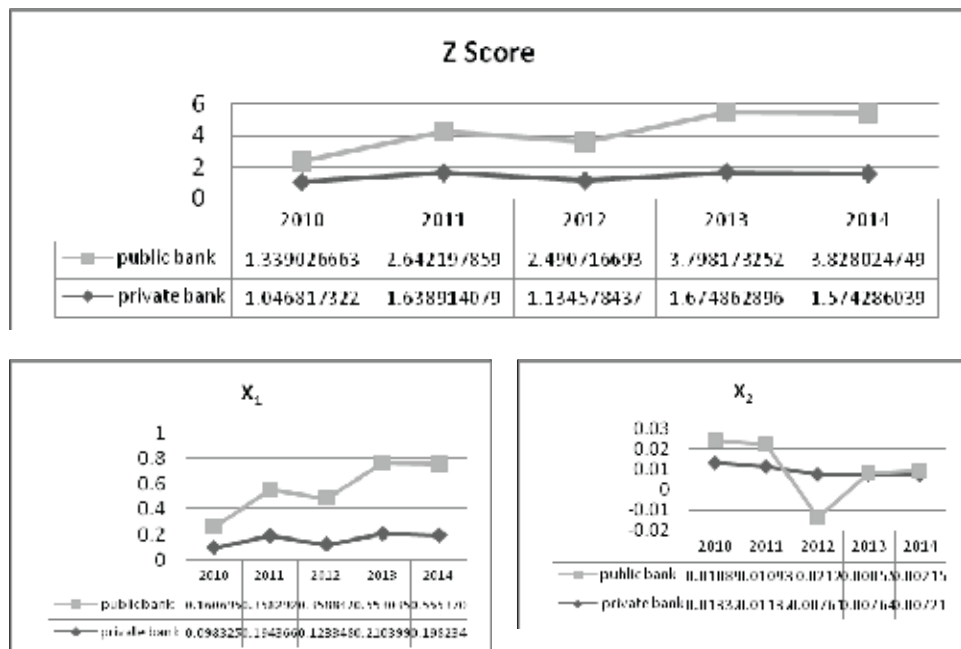
For Independent sample t-test following hypothesis has been drawn:

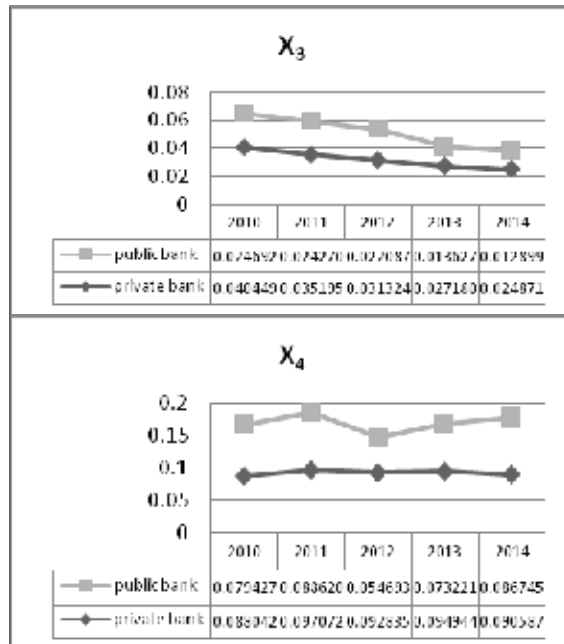
H₀: Z-scores for Public and Private Banks do not significantly differ.

H₁: Z-scores for Public and Private Banks significantly differ.

Analysis and Findings

According to the following graph average Z-scores (annexure I and II) of selected state-owned banks for the last five years (2010-2014) is better than that of private banks.





All the graphs have shown that state-owned banks are in better position in terms of bankruptcy model including X_1 and X_4 ratios in fact improving as the lines are upward. The trend of X_2 ratio is different as in 2012 state-owned banks had a huge fall which means there is some problems faced by the banks in terms of accumulated profitability. Then in 2013 and 2014 this ratio for both sectors is consistent. X_3 ratio has declining trend for both the sectors. Hence it can be said that the state-owned banks are becoming able to mitigate their distressed situation and maintain better financial health due to government support.

Table 1 : Anova for Private Banks

| ANOVA (one way) | | | | | |
|------------------|----------------|----|-------------|--------|-------|
| Z values | | | | | |
| | Sum of Squares | Df | Mean Square | F | Sig. |
| Between Groups | 62.943 | 2 | 31.471 | 23.305 | 0.000 |
| Within Groups | 29.709 | 22 | 1.350 | | |
| Total | 92.652 | 24 | | | |

As the calculated value i.e. $F=23.305$ is larger than critical value 2.866081 (table value) at 5% level of significance, statistically significant difference is seen. There is no support available to accept the null hypothesis which means Z score is not equal in the selected sample units.

Table 2 : Anova for State-owned Banks

| ANOVA (one way) | | | | | |
|------------------------|----------------|----|-------------|--------|-------|
| Zvalues | | | | | |
| | Sum of Squares | Df | Mean Square | F | Sig. |
| Between Groups | 11.024 | 1 | 11.024 | 10.860 | 0.003 |
| Within Groups | 28.425 | 28 | 1.015 | | |
| Total | 39.449 | 29 | | | |

As the calculated value i.e. $F=10.860$ is bigger than critical value 2.866081 (table value), statistically significant difference is seen. The null hypothesis is rejected which means Z score is not equal in the selected sample units.

Table 3 : Comparison between Z Scores

| Z Score-Private banks | | | | | | | | | |
|------------------------------|----------|----------|----------|----------|----------|----------|---------|----------|------|
| year | CBL | DBBL | DBL | IBBL | MBL | PBL | Mean | SD | Rank |
| 2010 | 3.85916 | 0.888097 | -3.42129 | 1.916708 | 2.935998 | 1.049941 | 1.20477 | 2.532764 | 1 |
| 2011 | 4.670045 | 0.88209 | 1.070434 | 0.953242 | 3.201919 | 1.136675 | 1.98573 | 1.582869 | 4 |
| 2012 | 0.72557 | 0.80508 | 0.839111 | 0.969332 | 2.733105 | 1.082568 | 1.19246 | 0.765291 | 5 |
| 2013 | 6.106466 | 0.826102 | 0.913213 | 0.925798 | 2.991282 | 1.065884 | 2.13812 | 2.112669 | 2 |
| 2014 | 5.607318 | 0.880107 | 0.346021 | 0.898182 | 3.017724 | 0.979891 | 1.95487 | 2.013987 | 3 |
| Mean | 4.193712 | 0.856295 | -0.0505 | 1.132653 | 2.976006 | 1.062992 | | | |
| SD | 2.122719 | 0.038007 | 1.903687 | 0.439138 | 0.168532 | 0.056782 | | | |
| Rank | 1 | 5 | 6 | 3 | 2 | 4 | | | |

| Z Score –State-owned banks | | | | | | | | | |
|-----------------------------------|----------|----------|----------|----------|----------|----------|-------------|----------|------|
| Year | SBL | RBL | ABL | JBL | BBL | BDBL | Mean | SD | Rank |
| 2010 | 1.35456 | 2.700506 | 2.77157 | 3.621502 | 5.56011 | 4.568116 | 3.429393878 | 1.492815 | 5 |
| 2011 | 2.149457 | 3.109088 | 3.105379 | 4.04878 | 5.942722 | 3.575628 | 3.655175716 | 1.285441 | 4 |
| 2012 | 1.917401 | 3.666894 | 3.354155 | 4.024291 | 5.888751 | 4.598027 | 3.90825316 | 1.322149 | 3 |
| 2013 | 2.827524 | 4.233339 | 4.012816 | 4.236187 | 6.09749 | 4.382222 | 4.298263105 | 1.048512 | 1 |
| 2014 | 2.935977 | 4.499414 | 3.956213 | 4.38096 | 4.885368 | 4.720573 | 4.229750799 | 0.709224 | 2 |
| Mean | 2.236984 | 3.641848 | 3.440027 | 4.062344 | 5.674888 | 4.368913 | | | |
| SD | 0.656848 | 0.750977 | 0.538687 | 0.28623 | 0.482851 | 0.459706 | | | |
| Rank | 6 | 4 | 5 | 3 | 1 | 2 | | | |

It can be said from the above tables that the Mean Z-scores for state-owned banks are consistently increasing which shows the gradual improvement in financial health of these banks. On the other hand, private commercial banks have consistent Mean Z-scores which show no improvement in health. According to standard deviation (SD) state-owned banks are in less risky than private ones. Among the selected private banks City bank has the highest mean and DBL has the lowest mean. In case of selected state-owned banks BBL has the highest mean and SBL has the lowest mean. It can be seen that on the basis of mean values year-wise performance of private commercial banks is fluctuating over the years having highest mean in 2010 and lowest in 2012. On the other hand, according to bank-wise mean CBL has got the highest position over 5 years and DBL has got the lowest position. For the state-owned banks it can be said that on the basis of mean values year-wise performance of state-owned commercial banks is apparently increasing over the years having highest mean in 2013 and lowest in 2010. On the other hand, according to bank-wise mean BBL has got the highest position over 5 years and SBL has got the lowest position.

Table 4: Descriptive Statistics and Correlation: Private Bank

| | | Correlations | | | | |
|----------------------|---------------------|----------------------|----------------------|----------------------|----------------------|------------|
| | | X₁ | X₂ | X₃ | X₄ | ROE |
| X₁ | Pearson Correlation | 1 | -0.506 | -0.711 | 0.649 | -0.480 |
| | Sig. (2-tailed) | | 0.384 | 0.178 | 0.236 | 0.413 |
| | N | 5 | 5 | 5 | 5 | 5 |
| X₂ | Pearson Correlation | -0.506 | 1 | 0.942* | -0.235 | 0.621 |
| | Sig. (2-tailed) | 0.384 | | 0.017 | 0.704 | 0.264 |
| | N | 5 | 5 | 5 | 5 | 5 |
| X₃ | Pearson Correlation | -0.711 | 0.942* | 1 | -0.240 | 0.579 |
| | Sig. (2-tailed) | 0.178 | 0.017 | | 0.698 | 0.306 |
| | N | 5 | 5 | 5 | 5 | 5 |
| X₄ | Pearson Correlation | 0.649 | -0.235 | -0.240 | 1 | -0.538 |
| | Sig. (2-tailed) | 0.236 | 0.704 | 0.698 | | 0.350 |
| | N | 5 | 5 | 5 | 5 | 5 |
| ROE | Pearson Correlation | -0.480 | 0.621 | 0.579 | -0.538 | 1 |
| | Sig. (2-tailed) | 0.413 | 0.264 | 0.306 | 0.350 | |
| | N | 5 | 5 | 5 | 5 | 5 |

* Correlation is significant at the 0.05 level (2-tailed)

From the above table it can be said that there is no significant correlation between ROE and the variables of Z score model for private banks.

Table 5 : Descriptive Statistics and Correlation: State-owned Bank

Descriptive Statistics

| Variables | Mean | Std. Deviation | N |
|----------------|--------|----------------|---|
| X ₁ | 0.1649 | 0.05052 | 5 |
| X ₂ | 0.0094 | 0.00275 | 5 |
| X ₃ | 0.0318 | 0.00624 | 5 |
| X ₄ | 0.0927 | 0.00355 | 5 |
| ROE | 0.8733 | 1.08573 | 5 |

Correlations

| | X ₁ | X ₂ | X ₃ | X ₄ | ROE |
|------------------------------------|----------------|----------------|----------------|----------------|--------|
| X ₁ Pearson Correlation | 1 | -0.506 | -0.711 | 0.649 | -0.480 |
| Sig. (2-tailed) | | 0.384 | 0.178 | 0.236 | 0.413 |
| N | 5 | 5 | 5 | 5 | 5 |
| X ₂ Pearson Correlation | -0.506 | 1 | 0.942* | -0.235 | 0.621 |
| Sig. (2-tailed) | 0.384 | | 0.017 | 0.704 | 0.264 |
| N | 5 | 5 | 5 | 5 | 5 |
| X ₃ Pearson Correlation | -0.711 | 0.942* | 1 | -0.240 | 0.579 |
| Sig. (2-tailed) | 0.178 | 0.017 | | 0.698 | 0.306 |
| N | 5 | 5 | 5 | 5 | 5 |
| X ₄ Pearson Correlation | 0.649 | -0.235 | -0.240 | 1 | -0.538 |
| Sig. (2-tailed) | 0.236 | 0.704 | 0.698 | | 0.350 |
| N | 5 | 5 | 5 | 5 | 5 |
| R O E Pearson Correlation | -0.480 | 0.621 | 0.579 | -0.538 | 1 |
| Sig. (2-tailed) | 0.413 | 0.264 | 0.306 | 0.350 | |
| N | 5 | 5 | 5 | 5 | 5 |

* Correlation is significant at the 0.05 level (2-tailed)

From the above table it can be said that there is no significant correlation between ROE and the variables of Z score model for public banks.

Table 6 : T Test

| Group Statistics | | | | | | | | | | |
|---|------------------|----|--------|----------------|-----------------|--|--|--|--|--|
| | Type of bank | N | Mean | Std. Deviation | Std. Error Mean | | | | | |
| Z values differ between private bank and state-owned bank | private bank | 30 | 1.6952 | 1.81161 | 0.33075 | | | | | |
| | state-owned bank | 30 | 3.9042 | 1.16632 | 0.21294 | | | | | |

| Independent Samples Test T test | | | | | | | | | | |
|---|-----------------------------|---|------------------------------|--------|--------|-----------------|-----------------|-----------------------|---|----------|
| | | Levene's Test for Equality of Variances | t-test for Equality of Means | | | | | | | |
| | | | | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | F | Sig. | | | | | | Lower | Upper |
| Z values differ between private bank and state-owned bank | Equal variances assumed | 2.853 | 0.097 | -5.615 | 58 | 0.000 | -2.20897 | 0.39337 | -2.99639 | -1.42156 |
| | Equal variances not assumed | | | -5.615 | 49.516 | 0.000 | -2.20897 | 0.39337 | -2.99928 | -1.41867 |

Because the standard deviations for the two groups are not similar (1.81 and 1.16), the "equal variances not assumed" column has been used. The results indicate that there is statistically significant difference between the Z-scores ($t = -5.615$, $p = 0.000$). Hence H_0 is rejected and H_a is accepted that means Z-score for state-owned banks differs from that of private banks.

Conclusion

Banking industry is the prime player in the financial system of any country. On that point of view this paper reveals the

financial health of banking industry in Bangladesh especially in state owned banks and private commercial banks. The study concludes that there is no significant relationship between ROE and the elements of Altman's Z score. The independent sample t test reveals that there is a huge difference between the Z scores of state owned banks and private commercial banks. In case of soundness of financial health, the state owned banks are gradually improving over the years. On the contrary, the trend for the private banks is consistent over the years but not improving. The government's influence and assistance may be the reason behind this difference. At last it can be recommended that private banks should give more emphasis on their asset liability management.

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Annexure-I

| Yearly average of z-scores for private commercial banks | | | | | |
|---|----------------|----------------|----------------|----------------|-------------|
| | X ₁ | X ₂ | X ₃ | X ₄ | Z score |
| 2010 | 0.098325 | 0.013324 | 0.040449 | 0.088043 | 1.046817322 |
| 2011 | 0.194366 | 0.011379 | 0.035196 | 0.097073 | 1.638914079 |
| 2012 | 0.123349 | 0.007618 | 0.031325 | 0.092836 | 1.134578437 |
| 2013 | 0.210399 | 0.007645 | 0.02718 | 0.094945 | 1.674862896 |
| 1014 | 0.198235 | 0.007211 | 0.024871 | 0.090588 | 1.574286039 |

Annexure-II

| Yearly average of z-scores for state-owned commercial banks | | | | | |
|---|----------------|----------------|----------------|----------------|-------------|
| | X ₁ | X ₂ | X ₃ | X ₄ | Z-score |
| 2010 | 0.160696 | 0.010899 | 0.024693 | 0.079427 | 1.339026663 |
| 2011 | 0.358292 | 0.010935 | 0.024271 | 0.088621 | 2.642197859 |
| 2012 | 0.358843 | -0.02121 | 0.022087 | 0.054693 | 2.490716693 |
| 2013 | 0.553035 | 0.000553 | 0.013627 | 0.073221 | 3.798173252 |
| 2014 | 0.555371 | 0.002156 | 0.012899 | 0.086745 | 3.828024749 |

Annexure-III

Return on Equity (ROE) for private and state-owned banks

| Year | Private banks | State-owned banks |
|------|---------------|-------------------|
| 2010 | 2.569529046 | 0.128162546 |
| 2011 | 0.188424098 | 0.121067705 |
| 2012 | 0.131735222 | 0.786834499 |
| 2013 | 1.363972393 | 0.097097534 |
| 2013 | 0.112844792 | 0.042793547 |

The Tragedy of Okonkwo and His Society in *Things Fall Apart*: Who is to Blame?

Bidduth Kumar Dutta¹ and Khayrul Islam²

Abstract: *Things Fall Apart* depicts tragedy of both Okonkwo, the protagonist, and the Igbo society. Okonkwo's plight is indeed caused partially by his own whim and mainly by the agents like fate and colonial power. Again, the society collapses because it fails to value the universal appeal of humanity and logic. Indeed, the root of the downfall of Okonkwo primarily lies in his own character, as he is whimsical, less considerate and inadaptible to changes. The society also seems rigorously unwilling to reconsider its customs and practices even though they go sharply against good sense and humanity. Again, Christian Missionaries with the help of colonizers manipulate the weaknesses and loopholes existing in the society to achieve their goals and finally they succeed in annihilating the old Igbo customs and their adamant upholders like Okonkwo and many others.

Keywords: Tragedy, missionary, Colonial power, Igbo society, Okonkwo.

Nigerian fictionist Chinua Achebe's novel *Things Fall Apart* manifests the ups and downs of the life of Okonkwo, the central character, and of the Igbo society he belongs to. Okonkwo, who started his life journey from a zero but turned out to be a hero, finally faces a terrible downfall and ignoble demise. In the same way, the Igbo society that has thousands of years' tradition and culture of its own also crumbles down. But why? What are the factors responsible for the reverse? Do the roots of the problem lie hidden in the personality of Okonkwo? Does the Igbo society have its own inability to withstand the rising discontentment inside the society for long? Are they unfortunate victims to the colonial impact or vulnerable enough to be affected by it? These are indeed some issues the article intends to explore.

The novel starts with a reference to the heroic stature of Okonkwo, the protagonist, who appears to be a historic wrestler defeating the great Amalinze the Cat unbeaten for seven years

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‘from Umoufia to Mbaino.’ Side by side, the beginning lines of the novel provide readers with a lofty impression about the extent of the hero’s physical structure and the associated essential sternness of expression. “He was tall and huge, and his bushy eyebrows and wide nose gave him a very severe look” (Achebe 1996, p.3). He is also a man of success. He is holding a very prestigious status, and therefore, is highly esteemed in his own clan as well as in the clans nearby. But how has he been able to reach that landmark? Is it because he has blue blood? Is it because he has inherited a huge amount of wealth from his forefathers? Readers happen to know very well that nothing is thrust upon him rather it is his firm determination and hard work which help him move the wheels of luck. “His fame rested on solid personal achievements” (Achebe, 1996, p.3).

Thus, the paramount resolution and honest commitment towards his life and society appear to be the fundamentals of his inspiration for reputation. The success, which Okonkwo has achieved in life, is the direct result of his own feat, not a generous gift or a smile of luck. He is indeed a man who always relies on his own vigour. Again, nothing comes from his father, who was indeed an unsuccessful man, or from any other sources. T S Varadharajan & K. Ramesh write: “The growth of Okonkwo in Umuofia sounds like a fairy tale where his “chi” appears to say ‘yes’ to all his endeavors”(2016, p. 152).

Wealth, success, fame, prestige and heroic treatment are Okonkwo’s lifelong pursuits. He earnestly runs after all those things throughout his life. “If ever a man deserved his success, that man was Okonkwo. At an early age, he had achieved fame as the greatest wrestler in all the land. That was not luck at the most; one could say that his chi or personal god was good. But the Igbo people have a proverb that when a man says yes, his chi says yes also. Okonkwo said yes very strongly: so, his chi agreed. And not only his chi, but his clan too, because it judged a man by the work of his hands” (Achebe, 1996, pp. 19-20). Thus, Okonkwo’s all-out effort turns out to be the core of his all attainments. He himself is the maker of his fortunes. Patrick C. Nnoromele mentions, “Okonkwo’s accomplishments in Umuofia earned him the respect and honor of the elders and the people. He defeated Amalinze the Cat and was proclaimed the greatest wrestler in Umuofia and Mbaino. He demonstrated exceptional skills as a warrior of the clan by bringing home five heads during inter-tribal conflicts” (1996, pp. 149). He also says

“Achebe portrayed him as a man with “incredible prowess” and passion to conquer and subdue his enemies” (1996, pp. 149).

In fact, Okonkwo’s yearning for success is deeply rooted in his psyche from the childhood. Success is his only god for which he has passion and reverence. All through his life he fights for securing honor and dignity, which, he firmly believes, comes through honest endeavour and he is fully uncompromising in this respect. He himself cannot imagine being unsuccessful. Again, he cannot put up with an unsuccessful and unworthy person. In this consideration, even his father is not spared. Okonkwo is found to strongly resent his father who had been fond of music and merry making than of hard work and of gaining the respect of his own fellows. To his eyes his father is an epitome of failure, for he did not succeed in making money and property. Okonkwo does not have any other dimension of the idea of success but wealth and consequent social status. In fact, he totally locks in the popular perspective of success. He is so occupied with that perspective of success that he cannot think out of box. Apparently, he cannot even tolerate being soft and kind. In fact, he has never developed any idea of positive impacts of being considerate and logical in life. He seems to be destined to follow traditions even if there is terrible harshness and even if there is prospective destruction. He seems to be devoid of the ability of thinking differently about the meaning of success. Achebe writes, “He had no patience with unsuccessful men. He had had no patience with his father” (Achebe, 1996, p. 4). T S Varadharajan & K. Ramesh echo the same thing, “Okonkwo’s obsession with being successful in life is caused by the failure of his father Unoka” (2016, p. 152). “Unoka, unlike his son Okonkwo, was “lazy and improvident and was quite incapable of thinking about tomorrow” (Achebe, 1996, p. 4). Defying all ignobility associated with his father’s name appears to be the prime concern of Okonkwo. Achebe writes, “The first challenge Okonkwo was expected to overcome was his father’s reputation- in this case his father had none. However, he was determined to succeed in whatever respect his father had failed, knowing that among his people a man was judged according to the worth of his father” (Achebe, 1996, p. 6).

Along with his unbending will-power for economic and social acceptance he seems to be hot, insolent and egoist. Why is this? How has his mentality been shaped this way? Are these the impacts of his economic independence and consequent social recognition? Okonkwo has already had confidence in himself.

Now he has both economic freedom and social acknowledgement. All these things are probably juxtaposed together to make him overconfident and to some extent arrogant. Again, all these characteristic traits are so naturally reflected in Okonkwo's personality that they seem to be inseparable and inborn.

He was very much pleased and proud of his entitlements, which he earned through his unfaltering determination and untiring diligence. He seems to be happy with his titles and position. Once he chastised a man, who happened to pass a piece of opinion about an issue, in a very insolent voice. Okonkwo says, "This meeting is for men" (Achebe, 1996, p.19). As the man had no title, "he had called him a woman. Okonkwo knew how to kill a man's spirit" (Achebe, 1996, p.19). Indeed, he fosters a strong sense of self-respect and dignity from his early life. He appears to be terribly inflicted when his playmates call his father 'Agbala' (woman or unsuccessful man). Thus, he is disturbed with his father's no reputation. Not only that he is even afraid of himself "...lest he should be found to resemble his father" (Achebe, 1996, p.10).

Thus, Okonkwo grows up with an utter abomination towards his father and his unmanly life style. He grows up with the promise not to fail in life. He always feels ashamed of unsuccessful men. In fact, the only ruling passion for Okonkwo is to avert things, which his father, who was totally a disappointment to his eyes and to those of society, preferred. "And so, Okonkwo was ruled by one passion- to hate everything that his father Unoka had loved. One of those things was gentleness and another was idleness" (Achebe, 1996, P.13). Such resentment towards indolence and gentility makes Okonkwo a slave of egocentricity and toughness. Yet, high reverence and compliments are showered upon him from all people irrespective of their age and sex. For his love of action and violence he is often chosen for perilous as well as honorable activities of the whole clan. Thus, when a neighboring clan 'Mbanio' kills a woman from Umoufia, he is sent to settle the issue whether the offending villagers are going to war over the matter or they will pay by way of compensation to Umoufia, one youth and one maiden. In fact, he has been able to raise his status in the society to such an extent that he is almost inevitable in resolving the issues requiring courage and confidence. In the negotiation, he plays the most significant role. On his return the elders make him the guardian of the male

hostage, Ikemefuna, for Okonkwo's respect and status. Surely, he has some animalism in his character as, we see, the sight of bloodshed by his opponents stirs his wild spirit and valour. "He was a man of action, a man of war. Unlike his father he could stand the look of blood. In Umuofia's latest war he was the first to bring home a human head" (Achebe, 1996, p.10).

Thus, Okonkwo gradually strengthens his position as a man of rank and high profile in the society as he has started receiving high prominence and honour. Besides, there are some other factors, which have also made him a success. He is an owner of some burns of yams indicating riches and ultimate independence. He has three wives and nine children. Despite such a huge family, he is good enough to manage and to feed all its members well throughout the year. All these things demonstrate his masculinity, which was a long cherished dream of Okonkwo. Again, these are indeed the criteria of manliness in the Igbo society. However, by his deep inclination and persistence to success he has reached to the zenith of the society and the climax of success.

But his own success as a self-made man makes him impatient of others who are not so successful as he is. He never cares about other people's feelings. He never shows any sensibility towards others' emotions, passions or likes and dislikes. To him softness means weakness. He is merely obsessed with the idea of success. His riches and physical vigour never inspire him to be soft rather he has become more ferocious and more intolerant about others. Even gods are not spared from the list let alone human beings. During a week of peace, an annual festival, during which any violent action is forbidden, he beats one of his wives for neglecting her duty. Despite the appeal of other two wives, he does not stop beating. "In his anger he had forgotten that it was the week of peace. His first two wives ran out in great alarm pleading with him that it was the sacred week. But Okonkwo was not the man to stop beating somebody half way through, not even for fear of a goddess" (Achebe, 1996, p.27).

Okonkwo also gets involved in the murder of Ikemefuna, the male hostage, who called him father despite being asked by Ogbuefi Ezeudu, the oldest man in the tribe, not to participate in the killing of the boy as he called him father. But he did not heed the advice. Now the question is what forced Okonkwo to

do so. Is it the animalism living inside him? Is it the phobia of being called a coward by his kinsmen? Is it his haughtiness and subsequent inability to judge the implications of the murder deeply? In the article "The Story of a man and His people" Ernest A. Champion rightly observes that Ezeudu's suggestion "presents to Okonkwo a dilemma which he is incapable of rationalizing" (1974, p. 274). In fact, to Okonkwo expressions of valour and cruelty are the most precious things in the world. He has indeed been confounded by his excessive zeal for name and fame. The father-son relationship, which is always considered supreme and viewed as a gift of God in all customs and society, appears to him very silly in comparison to the so-called power and honour. Ikemefuna was crying for help but that cry did not transform Okonkwo rather out of the fear of being considered effeminate he himself cut the boy with his matchet. "My father, they have killed me!" as he ran towards him. "Dazed with fear, Okonkwo drew his matchet and cut him down. He was afraid of being thought weak" (Achebe, 1996, p.55).

Thus, none of the advice of the wise old man and the boy's cry for mercy had any effect on Okonkwo's preconceived mind. Immediately after the horrible incident of killing the innocent boy, Okonkwo temporarily lost his zeal for life. He almost starved for a couple of days. The memories of the boy haunted him every moment. The more he wanted to forget the boy the more the boy came to his mind. He felt weak and tired but could not sleep. "He did not sleep at night. He tried not to think about Ikemefuna, but the more he tried, the more he thought about him. Once he got up from bed and walked about his compound. But he was so weak that his legs could hardly carry him. He walked like a drunken giant walking with the limbs of mosquito. Now and then a cold shiver descended on his head and spread down his body" (Achebe, 1996, p. 44). Thus, the slaying of the seemingly small and insignificant boy terribly shakes Okonkwo's whole world. "When did you become a shivering old woman?" Okonkwo asked himself. "you are known in all the nine villages for your valour in war. How can a man who has killed five men in battle fall to pieces because he has added a boy to their number? Okonkwo, you have become a woman indeed" (Achebe, 1996, p. 45). Thus, Okonkwo falls into a big dilemma and goes through an acute inner predicament, which seems to drain him slowly. His natural world is tremendously shaken and about to collapse. Probably, Okonkwo never conceived that such a small killing might trouble him so much. He took the killing as a divine

responsibility. The ethical question whether he should accomplish the murder had no meaning to him. Such a rash step implies his incapability of thinking something sagaciously. Here lies his weakness. When Obierika, a man with less wealth and less respect, who is also Okonkwo's bosom friend, has a clear view about such a sensitive issue, Okonkwo makes a poor impression about his conscience and consideration. In a conversation between them while Okonkwo tries to justify his role in the murder of Ikimefuna, Obierika says: "You know very well, Okonkwo, that I am not afraid of blood; and if any one tells you that I am, he is telling a lie. And let me tell you one thing, my friend. If I were you I would have stayed at home. What you have done will not please the Earth. It is the kind of action for which the goddess wipes out whole families" (Achebe, 1996, p. 46). In this case Obierika indeed represents most of the villagers who are also against pride and haughtiness. Akers Rhoads observes, "Most villagers...though respecting industry and success, dislike the pride which causes a man like Okonkwo to deal brusquely with other men" (1993, p. 67).

The incident, which brings a terrible plight to Okonkwo and his family, which reverses the total achievement of his life and which forces him to start his life from zero again, is another murder though accidental. In fact, in the funeral of Ezeudu, the head of the Oybuafu, there was much dancing and firing of crackers and guns. Okonkwo was doing the same but it exploded and a fragment of metal killed Ezeudu's own son. Though it was an accident, Okonkwo had to compensate for this incident, as, according to the Igbo culture, it was unpardonable and heinous to kill one's kinsman. The only choice open to him was taking an exile to his mother's clan for seven years. "The only course open to Okonkwo was to flee from the clan: It was crime against the earth goddess to kill a clansman, and a man who committed it must flee from the land" (Achebe, 1996, p. 113). Thus, he unfortunately falls into the den of despair and unworthiness from the peak of success. It is indeed an irony of fate that the fortunes, which he himself has made with utmost love and care, has faded away soon not because of his miscalculation rather of the action for which he is barely responsible.

After the tenure was over when he came back to his own clan, he found everything strange and unfriendly. Nothing remained as he expected. In fact, the presence of white men and the

missionaries had changed everything. Individuals started being influenced by new ideas and propaganda. People started questioning about the rightness of their age-old customs and practices openly. Ideas considered right in the past appeared to them wrong and misleading. Values for which they were ready to sacrifice even their lives seemed to them mere inhumane. Obierika reports to Okonkwo “The white man is very clever. He came quietly and peaceably with his religion. We were amused at his foolishness and allowed him to stay. Now he has won our brothers, our clans can no longer act like one. He has put a knife on the things that held us together and we have fallen apart” (Achebe, 1996, p. 124-125). This was indeed a big threat to the existence of the Igbo society. It always becomes a big concern when own people turn away and start undermining the existing systems.

Perceiving all those changes, Okonkwo feels appallingly shocked and starts planning what to do. Even his own son Noye does not listen to him as he has already converted to Christianity. Things have already fallen apart. Despite all these odds Okonkwo remains unchanged. He does not falter a bit from his own position and belief. Rather he plans how to uphold the Igbo values and traditions. But ultimately he commits suicide, an unmanly step, apparently to avoid disgrace about which he was intolerant throughout his lifetime. In fact, after the murder of a white man Okonkwo was supposed to be tortured and finally hanged.

Now the question is if all these arrogance, haughtiness, whim and misfortune are only factors responsible for Okonkwo’s ruin. Certainly, not, as readers also come to know that there are some other inevitable causes behind the collapse. Indeed, the causes of the tragedies of Okonkwo and the Igbo society can be viewed from two perspectives. The first is the weakness of the ancient system, which finally undermines the society itself. The second is the advent of colonialism and Christian missionaries which take the advantages of existing social defects.

We see that the odd and inhumane custom of casting the twins away and the utter humiliation to the mothers of twins prove to be major defects of Igbo society. These cruelties not only shake the conscience of the people outside the society but also of the people living within the society. Foley, A. writes, “Of course it is true that there are flaws and contradictions in Umuofian clan tradition which give rise to internal tensions and which

alienates certain members of the society. These include such specific instances as the throwing away of twins, the irrational taboo of the osu or outcasts, as well as, at times the apparently senselessness of the gods and oracle, which produce fear and uncertainty rather than stability in the society” (2001, p. 42.). Surely majority of the people never raised a question against it but the system was a big riddle to the thoughtful. Both Nwoye, the young son of Okonkwo and Obierika, a friend of Okonkwo, seem puzzled and confused. In the same way, the killing of Ikemefuna in the name of so called oracle and society shakes the conscience of Nwoye vehemently. His young heart is tormented with “the question of the twins crying in the bush and the question of Ikemefuma who was killed” (Achebe, 1996, p.134). We already know that even Okonkwo, the icon of extremity and toughness, is tremendously traumatized though inwardly. We know that the killing of Ikemefuna makes his balanced world imbalanced, harmonious world disharmonious. When he thinks about the boy he simply starts trembling. “His mind went back to Ikemefuna and he shivered” (Achebe, 1996, p. 58).

But Okonkwo is completely helpless. His thoughts and actions are constrained by the personal, social and religious prejudice. In fact, the Igbo social scheme has taught Okonkwo to behave thus because here human emotion is valueless and considered to be weakness. Feelings and passions are something, which should go with women only, certainly not with men. Thus, it is not only the fault of Okonkwo but also the defect of the society. Naturally, both Okonkwo and the society must compensate for this.

The cause, for which Okonkwo is forced to go for an exile, also appears to Obierika as inhumane and irrational. His rational mind finds no logical and consolatory answer of such issues. Obierika asks himself: “Why should a man suffer so grievously for an offence he had committed inadvertently?” (Achebe, 1996, p. 113). But what to do? Surely nothing. Here people are just the puppets acting as the society wants.

These weaknesses and the complex systems of the Igbo society have already weakened the foundation of the clans. Here, Nwoye and Obierika are the representatives of the considerate folks of their society. The questions that they have raised are indeed the questions of the thoughtful part of the whole tribes. The victims of such rules have expected a radical change though not openly. They do not feel courageous enough to

break the conventions of their ancestors. There is no alternative, which they can follow.

Now the Christian missionaries come forward with the offering of a prestigious and wholesome life for the humiliated and persecuted who seize the opportunity immediately. Very soon the Igbo world starts crumbling. Day by day the Christian missionaries see a boost in power and population. The enthusiastic converts begin showing utmost abhorrence and contempt for their old religion and customs. On the other hand, the traditional Igbo society slowly proceeds to face decay and death. Robert Fraser notes, "Igbo society has been plunged into anomy by the intervention of the British. In this new world of slipping realities, the villagers have lost their bearings. Okonkwo, in some ways their most typical hero, is completely at a loss to explain the change" (1979, p.112). However, despite his confusion once again Okonkwo, the ardent disciple of the Igbo culture, rushes to the spot to save the thousand-year old practices of his clan from the ensuing collapse though in the long run he fails. In fact, the Igbo people are completely disheartened and not capable enough of standing against the well-equipped military power of the British government with the old arms.

Okonkwo, though he himself is a victim of the old, illogical and inhuman system of the society, tries to uphold its values. He vows to keep his ancestors' religion alive and goes to challenge the advent of Christianity. He calls a meeting to decide how to protect the clans and their old orders. When the white men try to stop the meeting, he kills one of them. At the same time, he feels dismayed when he sees that none of his men comes to protest the white men. Because of the murder he was given death penalty. But without giving into the British Army he commits suicide. What prompted him to the act of suicide? Was it a way to shun the shame of being captured only? Gerald Moore says "Okonkwo cannot reconcile himself to the paralysis of will which he sees around him" (1962, p. 64). But Arthur Ravenscroft gives a slightly different observation, "He hangs himself, not to avoid arrest but out of despair for the future of the people" (1969, p. 18). However, with this incident not only the chapter of Okonkwo gets closed but also the Igbo culture and tradition are finally under the threat of being extinguished very soon. Here lies the tragedy of Okonkwo that he is to compensate with his life for the murder, which is not his own fault. Nnoromele, Patrick C. notes, "Okonkwo's downfall is not necessarily due to weaknesses in character or departed African

glories but rather is function of heroism in the cultural belief system of the Igbos” (2000, p. 147). The echo of the same statement is heard in the writing of Okhamafe, I. who says, “Things begin to fall apart in this nine-village Umuofia clan long before a European colonialist missionary culture inserts itself there” (1995, p. 134).

Finally, the novel *Things Fall Apart* depicts the faults of both Okonkwo and of his society. It says how he has entangled himself with his own ego, mistakes and defects. At the same time, it also highlights the weaknesses and problems of the Igbo society, which inspire, and to some extent, compel him to make mistakes. Again, the underlying weaknesses of the society are responsible for its tragic faults. Thus, the novel *Things Fall Apart* explains the tragedy of both Okonkwo and his society.

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Ecological Degradation at Lama Upazila of Bandarban District

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Abstract: Ecological degradation is a wider term that means disturbance of ecosystem equilibriums, environmental stability and ecological balance caused in various magnitudes by natural and human activities. It is also a consequence of both affluence and poverty. Commercial plantation and practices of intensive agriculture are increasing day by day at hilly areas in Bangladesh. At Lama Upazila, out of 100 respondents, 84 percent think environmental degradation is the common phenomenon at their land. Commercial plantation, intensive agricultural practices, cattle grazing, illicit removal of forest production, reduction of forestland are accelerating soil erosion, changing vegetation and climate and lowering the water layer. Local respondents think that, scheme of social forestry, alternative use of land, monitoring system, effective implementation of forest laws, community development program and environmental education can overcome the degradation status. The study solely analyses the causes and consequences of environmental degradation at Lama Upazila of Bandarban district with taking the measures of existing deterioration into consideration.

Keywords: Degradation, environment, commercial cultivation, environmental education.

Introduction

In this cosmic macrocosm, Earth is but a tiny iota within expanses of blue seas and green forests. The people of this earth are busy to make artificial settlement even each and every single time by using ecological resources, seas and forests. But the earth has a cancer, and the cancer is man. Mainly due to anthropocentric reasons, men-environment relationship has become flimsy. The cancer of man's pollution and poverty is fast extending itself over the face of the earth (Moddie, 1981). Over the last twenty years, Bangladesh has accelerated economic growth in order to meet the demands of fast growing population with limited space and natural resources since the independence of the country. Now the country has attained a consistent development in different areas such as

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industrialization, infrastructure development, tourism, food productivity, social safety net and agricultural modernization. But such sector centered development merely embraced protection of natural resources and environmentally sound management practices in the development history of the country (Reza, 2016). The country has been grappling with a series of environmental deterioration due to deforestation, commercial cultivation in forests, agricultural intensification, destruction of wetlands and inland fisheries, surface and groundwater pollution, soil nutrient depletion and inland salinity intrusion. Apart from that natural calamity like floods, cyclones, tidal surges, landslides and tornadoes have resulted in severe socio-economic and environmental damage by a combination of natural and anthropogenic factors (MoEF, 1992). The social scientists opine that in the near future people in our country may not die of hunger, but may die because of their inability to cook food due to the scarcity of firewood. Irrational destruction of forests in the country results in serious ecological imbalance or extermination. It has been creeping over the Chittagong hill tracts unspectacularly, but relentlessly ecological degradation is setting in across the whole region. The political economy of unpeopling, statistical politics, demographic engineering under political engineering (Barkat, 2016), hill slides, environmental problems and insecurity in particular at hilly area have recently received attention from researcher of varying fields. Lama Upazila of Bandarban district is not out of those patterns. The socio-economic consequences of such changes are not congenial to the living condition of the local inhabitants. There has been as increased interference with forest eco-systems as more wood is extracted for different purposes. In this context, the biodiversity conservation and the issue of management of hill environment have become a burning question for strategists and environment development planners of Bangladesh.

Objectives of the Study

1. To assess the causes and consequences of biotic pressure at Lama Upazila;
2. To improve environmental security and forest biodiversity by asserting policy recommendations.

Area Acquaintance and Methodology of the Study

Lama is an Upazila of Bandarban district in the division of Chittagong, Bangladesh. Lama is located at 21.7750⁰ north

latitude 92.2000⁰ east longitudes. It has 5 unions, 18 mauzas and 247 villages with the population of 64,717 (density-96k/m²). The total forest area of this upazila is about 19,525 acres and cultivable land is 9,995 acres. In this area, rice cultivation is done throughout the year. There are three rice-growing seasons – Aus, Aman, Boro. Among the HYV rice is grown in the area, the varieties like BR-3, BR-4, BR-11, and BR-14 are very popular.

Data has been collected from both primary and secondary sources. In primary data, 100 respondents (both male and female) from all the 5 unions of Lama Upazila were selected for interview on the basis of judgment sampling (Feb-Mar, 2017). The household head is used as unit of respondent (20 persons per union = 100 participants). In addition, participants' opinions on environment, degradation, deforestation were integrated where necessary. On the other hand, secondary data were collected from upazila statistical office, periodicals, books, articles, newspapers, journals etc. Finally, statistical methods – mean, ratios and percentages were used. The analysis of the findings integrated in this paper is mainly qualitative.

Findings and Analysis of the Study

In 100 respondents, 84 percent agreed on ecological instability and only 14 percent were not aware on emerging deterioration. According to the findings, the following causes were blamed for upsetting the ecosystem in Lama.

Overgrazing: Over the years, with the increase in cattle population, there has been a rapid degradation of the forest environment. Cattle are specially reared in the area for milk and agricultural purposes. Very often cattle are left to roam around in the forests for several days at a stretch. This practice has gained popularity in the recent years primarily because of decrease in wild animals in the hilly areas.

Illicit Removal of Forest Produces: Since there is no modern source of energy like coal, gas etc. in hilly regions, the tribal people and the people in the surrounding area are to depend upon cattle dung and fuel wood obtained from nearby forests for their energy needs. Most villagers collect dry stems, barks and leaves from the neighboring forests for energy needs. Dry twigs and leaves from natural forest are seldom enough to supply the fuel wood needs of a village having large number of households. Therefore, the villagers indulge in extraction of

more fuel wood from the forest than are allowed under the rules. As a result, the illicit removal of fuel wood takes place. Contractors who collect wood to sell for house construction, furniture etc. are often in the habit of cutting more than that is allowed. The local people also enter the forests illegally and often remove one or two trees as per their needs.

Reduction of Forestland: Due to the increase in the new human settlement, more and more land capable of supporting good forest has been brought under homestead. Besides, the increasing flow of population owing to new human settlement has been putting a continuous pressure on forest resources. The natural resources are being continuously used by these new settlers for domestic and other purposes at an increasing rate. Each year new roads are being built in the hilly areas to improve the communication system. As a result, strips of forestland are being cleared for making these roads. Landslides, hill slide, storm, cloudbursts etc. are also responsible for reduction in the forest area.

Local people have given their opinions about the causes of ecological degradation – 40% due to cattle grazing, 60% due to illicit removal of forest produce and 84% for reduction of forest land.

Table 1: Opinion on the Causes of Environmental Degradation

| Causes of Degradation | Percentages (%) |
|-----------------------------------|------------------------|
| Cattle grazing | 40 |
| Illicit removal of forest produce | 60 |
| Reduction of forest land | 84 |

Source: Questionnaire survey, (2017)

Effects on Environment, Biodiversity and Water Resources

The increasing biotic pressure owing to cattle grazing, reduction of forest land, is going to exert the following effects on hilly ecology.

Accelerated Erosion: Degraded forestlands lead to erosion. It is a well known fact that the leaves break the force of the falling rainwater and prevents soil erosion to a large extent. In areas, which have little or no vegetative cover, the raindrop falls directly on to the forest floor. Due to its kinetic force, the drop causes ‘splash erosion’. In rainy season, in most cases no

topsoil is left on the peak or slopes of the hills, whereas in the valley areas, cultivated fields, roads, canals and settlements are encroached upon by the debris which has been brought down by the surface runoff.

Change in Vegetation and Climate: In the hilly areas, a distinct change is emerging regarding the vegetation due to deforestation. The hilly areas once known for its dense forests now lie denuded. A clear change in the pattern of vegetation is also noticeable due to a gradual change in the climate condition. In areas under dense vegetation, the trees absorb the heat; whereas the bare rocky slopes heat up the surrounding atmosphere by acting as a mirror. Moreover, trees also break the force of winds, which roar across the slopes, thereby minimizing erosion by wind. It is important to mention here that, the temperature of a forest, vis-à-vis open country is different. Because forest area means more transpiration leads to more precipitation.

Water Layer: The water layer has fallen down in the hilly areas through increasing biotic pressure on forests. Women and children have to walk a longer distance to fetch pure drinking water. It is common to come across springs which have been reduced to a mere trickle or completely dry spring beds. Water absorption power of a soil depends on its permeability. It is maintained by the roots, leaf litter, humus etc. In the steep mountain slopes, where the soil is shallow, the forest floor litter plays a major role. It absorbs about four times more water than ordinary soil and by easy decomposition, adds to the depth of the soil.

Local people have given their opinions about the impacts of ecological degradation – 64% respondents said soil erosion, 32% told change in vegetation and climate and 28% indicated lowering water level.

Table 2: Opinion on the Effects of Environmental Degradation

| Effects of Degradation | Percentages (%) |
|----------------------------------|-----------------|
| Soil erosion | 64 |
| Change in vegetation and climate | 32 |
| Lowering water level | 28 |

Source: Questionnaire survey, (2017)

Thoughts of Local People in Overcoming Environmental Instability

According to questionnaire survey (2017), local people have asserted their opinions in searching solution. They stressed on social forestry (64%), restriction on cattle grazing (44%), integrated monitoring systems (92%), proper enforcement of forest laws (96%), community development program (88%), planned human settlement (65%) and implementation of environmental education (44%).

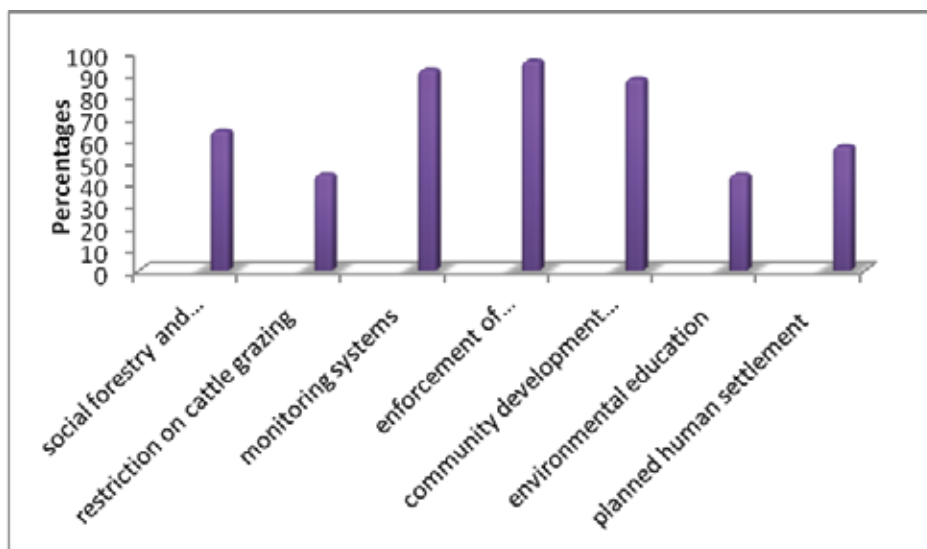


Fig 1: Recommendation to Overcome of Environmental Degradation

Social Forestry and Afforestation: Massive social forestry and afforestation scheme in the barren hilly areas has to be undertaken to check further deterioration of the hill ecology.

Restriction on Grazing: Overgrazing of cattle in the hilly areas should not be allowed to reduce environmental crisis. Government should provide a planned pastureland for cattle grazing in the hilly areas. The fallow land can be used for this purpose.

Monitoring Systems: To keep track of the environmental set up of the natural vegetative cover in the hilly region, there is a dire necessity of establishing a widespread network of monitoring systems.

Enforcement of Forest Laws: The forest laws should be properly enforced to check illegal removal of forest produce, trees. The crime- doer should be severely dealt with. The corruption of the forest officials should be stopped by all means

and the honest officials of the forest department should be rewarded.

Community Development Program: Community development program should be effectively implemented to improve health and sanitation, food and nutrition, transport, communication and educational systems in the hilly areas. This system in the desired way will create an environment congenial to human resource development in the hilly region.

Planned Human Settlement: The new human settlement in the hilly areas should be discouraged as far as possible. Government should undertake measures to make an evenly distribution of population geographically and in a planned manner so as to reduce undue pressure on forest resources and environment in hill.

Environmental Education: Last but not the least is the need to educate the indigenous people and the people in the nearby villages about environmental degradation. Courses on various aspects of environment and ecology should be introduced at the school level in the hilly region. The illiterate adults can be educated about this by running special programs in villages, by broadcasting over the radio, distributing leaflets, announcements at bus stands, public places etc. Special emphasis should also be laid upon environmental education for women, as they play significant role in the socio-economic set-up of the hilly areas.

Conclusion

If we consider the strategies of sustainable development, leaving no one behind – is the main motto. It is important to realize ‘feelings to shape’ and thoughts to implement’. Regarding society, economy and environment, we need inclusive feelings and thoughts correctly. Without one, the development would not be sustainable. At hilly areas of Bangladesh, the local people are victim of social crime, economic stress, political killing historically. In this context, poverty of their feelings ‘listless people’ affects the local environment, biodiversity and wildlife. But we can ensure their participation through utilizing positive thoughts and indigenous capacities to conserve the forest ecology and environment. After all, to ensure ecological stability and environmental security, policy makers need to shape all the actions as mass-people oriented action for collective progress.

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Superheroes for Sale?: A Critical Reading of Superhero Films vis-à-vis the Formation of Cyborg Identity and Culture of Consumption

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Abstract: In the culture industry propounded by Adorno and Horkheimer, 'art' and 'life' are not wholly separable. It produces standardized products to serve the capitalist economy and does so by representing the 'fictional' life as realistically and seductively as possible for the purpose of pure entertainment. The superhero films, a 'well-functioning' outcome of the culture industry, present the emergence of 'responsible' and 'powerful' superheroes who possess superhuman qualities which make them enviable and desirable as well. On one hand, the superheroes invoke the 'desire' for perfect simulation in the audiences while, on the other hand, they infuse the concept of 'cyborg' and destabilize the traditional conception of 'human' by blurring the distinction between man, animal and machine. However, in the guise of this postmodernist boundary-crossing, the 'cyborg' identity in superhero films generates in the audience senses of 'lack,' and, then, 'desire' leading them to further consumption. The present paper thus views superheroes as 'creators' of lack and desire. Reading some selected Superhero Films including Paul Verhoeven's *RoboCop* (1987), James Cameron's *Terminator 2: Judgement Day* (1991), and Sam Raimi's *Spiderman* (2002), the paper explores whether the superheroes serve the good will of the technologized phenomena or they merely lead the audiences towards more consumption serving consumerist bonanza. Drawing heavily from Freudian and Lacanian Psychoanalysis, Cybercriticism and Disability Studies, it contends that Superhero Films naturalize the concept of 'cyborg' by 'humanizing' machine and 'machinising' human, leading consumers to desire to-be. This invocation of false lack and desire leads towards a fetishistic practice that uses consumption (e.g. purchasing costumes and accessories and role-playing in video games relating to the superheroes) as the 'fulfillment' of the gap. This is a qualitative research that incorporates textual analysis and visual methodology.

Keywords: Superhero films, cyborg identity, psycho analysis, 'lack' and 'desire', culture of consumption.

Introduction

In the age of what Ernest Mendel dubbed 'Late Capitalism,' the definition of 'human' went through significant negotiation and

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ramification. For the extensive coverage of capitalist economy, the (postmodern) culture of consumerism accommodates every possible conception of 'human,' a conception that is increasingly embracing technological appliances including prosthesis that are able to fill in and enhance human limitations. This praxis of *constructing human* is characteristically postmodern. While theorists have been struggling to define postmodernism as "the era of 'space age', of Consumerism, late capitalism and the dominance of the virtual and the digital" (Nicol, p.2), Fredric Jameson, a Marxist critic, considers postmodernism as a way of upholding 'late capitalism' and multinational consumerism. In his essay, "Postmodernism and Consumer Society," Jameson says: "I believe that the emergence of Postmodernism is closely related to the emergence of the new moment of late consumerism or multinational capitalism. I believe also that its formal features in many ways express the deeper logic of this particular social system" (p.11). He maintains that "a new kind of society began to emerge" which is "described as post-industrial society, multinational capitalism, consumer society, media society and so forth" with new types of consumption (Jameson, p.11).

Identifying popular culture as the mode or form that contributes significantly to the promotion (even legitimization) of consumerism, the present paper concentrates on a phenomenal genre of popular culture, viz. popular Hollywood superhero films, to explore if and how superhero films endorse consumerism. In "The Culture Industry," Adorno and Horkheimer contend that "[r]eal life is becoming indistinguishable from the movies" and that "film forces its victims to equate it directly with reality" (During, p. 35). The real/fictional dichotomy is particularly evident in the superhero films which are 'becoming' extension of the world outside or vice-versa. In this genre, traditional concepts of 'human' are destabilized and a new kind of 'human' comes into being that celebrates technological appliances as it meets the expectations the present human race (i.e. audience) aspires for. Human's increasing attraction towards and dependence on the cyborg (human-machine, human-animal, exogenous- endogenous phenomena) has given way to the emergence of a human society that depends on the 'cyborg' for its security and survival. The representation of human-superheroes in Hollywood films has popularized and naturalized, or *humanized*, the cyborg. Addressing how this increasing association with cyborgic potentiality leaves consumers desire for the more, the present dissertation explores if popular superhero films, in the guise of creating a 'more sufficient

human,' generate a wholesale notion of the 'lack' in the *natural* human being, leading to the desire for technological filling in the lacks and, thus, increasing consumerism. Drawing heavily from Freudian and Lacanian Psychoanalysis, Cybercriticism, and Disability Studies, this paper contends that the hegemonic creation of *lack* and *desire* leaves the audience dependent on technology which, in the long run, buttresses consumption.

To summarize: this paper contends that the cyborgic superheroes in popular films serve, in the name of border-crossing and technological enhancement, the dominant ideology of late capitalism. The title of the paper endorses this argument, and the answer to the question "Are superhorse for Sale?" that this paper gives is: yes, they are.

Cyborg, Lack or Fake Lack, and Desire for Consumerism

The research identifies 'cyborg' elements in popular discourses (Superhero films) that are infused subtly in it and make a connection with the audiences. The present paper addresses the theoretical aspects relevant to the paper. Popular Hollywood movies address some factors in the process of infusing 'Cyborg' identity formation and making it a 'household' need. It incorporates the ideas meticulously where the audiences are positioned in the movie and made feeling like that. Now, the question arises: how 'cyborg' identity is created in the superhero films? And how it is done? How audiences can connect with the whole phenomena? Is technology a revolutionary tool or it just paves the way for 'endless' consumption. Considering Psychoanalysis, cinema and cybercriticism, this chapter theorizes 'cyborg' and how it creates 'lack' and 'desire' among the audiences and leads to subsequent consumption.

Cyborg Identity Formation

Cyborg as a New Subjectivity

A cyborg is a theoretical or fictional being with both organic and biomechatronic parts. The term was coined in 1960 by Manfred Clynes and Nathan S. Kline. Cyborg is a person whose physical tolerance or capabilities are extended beyond normal human limitations by a machine or other external agency that modifies the body's functioning so that it becomes an integrated human-machine system. The Control-mechanisms of human portion are modified externally by drugs or regulatory devices (e.g. electronic pacemakers, artificial hips, cosmetic

surgery) so that the being can live in an adverse environment. In her essay, “A Manifesto for Cyborgs: Science, Technology, and socialist feminism in the 1980s”, Donna Haraway defines cyborg in four ways: a “cybernetic organism”, a “hybrid of machine and organism”, a “creature of lived social reality” and a “creature of fiction”.

Cyborg destabilizes the traditional notion of ‘human’ which conceptualizes human as ‘natural’ and identity as ‘original’. It/he emerges as a new subjectivity which/who cannot be fully fit into the concept of traditional ‘man’ or ‘machine’. He/it challenges the boundary imposed for distinguishing human, animal and machine through coalescence of all the border lines. In her essay, Donna Haraway proposes Cyborg as a “creature in post gender world” which can break out all the gender discrimination and marginalization. Coming out of the paradox of essentialism, naturalism and identity based on dualism, the idea of cyborg is “a condensed image of both imagination and material reality”. While the traditional notion of ‘human’ is based on naturalism and essentialism, Cyborg breakdowns, as Haraway identifies, three crucial boundaries: between human and animal, between animal-human (organism) and machine and between physical and non-physical. Regarding the boundary between human and animal, Haraway thinks that the boundary is “thoroughly breached”. She observes:

The last beachheads of uniqueness have been polluted if not turned into an amusement parks —language, tool use, social behavior, mental events, nothing really convincingly settles the separation of human and animal. And many people no longer feel the need for such a separation.

Again, in this century where technology is at its height, there is no distinction between machine and human beings. Being a part and parcel of our existence, machines cannot be differentiated from ‘us’. Haraway discusses about the problematized boundary between organism (animal-human) and machine: “Late twentieth-century machines have made thoroughly ambiguous the difference between natural and artificial, mind and body, self-developing and externally designed, and many other distinctions that used to apply to organisms and machines. Our machines are disturbingly lively, and we ourselves frighteningly inert” (During, p. 274).

The problematized border of man, animal and machine is celebrated by Haraway. She considers cyborg as a political agency which can set it as an integrated man-machine system, a new subjectivity devoid of the charge of gender discrimination,

rigidness and essentialism. This particular subjectivity represents the scenario of the members of human race in the twenty first technologized society where every human is 'cyborg.' Haraway confidently declares: "By the late twentieth century, our time, a mythic time, we are all chimeras, theorized and fabricated hybrids of machine and organism; in short, we are cyborgs. The cyborg is our ontology; it gives us our politics" (During, p. 272).

In the superhero films, cyborg is 'identified' in several forms and ways that naturalize it/him as a nearby 'neighborhood.' Starting with the movie Terminator, terminator T 800 is a cybernetic organism which brought within itself/himself an era of cyborg revolution. T 800 is a creature which coalesce characteristics of both machine and human. Apparently, it/he is a machine that has "living tissue over a metal endoskeleton" (Cameron, 1991). But we can see it/him with humane qualities whose main job is to save John, the future leader of human race. At the beginning, it is seen that T800 does not possess any emotion or any humane qualities as he is programmed in such a way.

Years ago, social constructivists Peter Berger and Thomas Luckmann detailed the dialectical processes at work in human identity construction (1967). As lucid as their analysis was, it really only delineated what life experiences teach everyone: becoming human is a social endeavor. People determine who they are through interaction with the environments they encounter and, in turn, shape by their actions and inactions with and toward them. Now, poised on the brink of the third millennium, it is technology, material and ideal, that structures social life in the West. It begins with artifacts but technology is more than artifacts. Technology is a culture. It is a "signifying system through which . . . social order is communicated, reproduced, experienced and explored" (Williams, p. 13). Technology is an epistemology, a way of knowing in which new technologies materialize as the most plausible response to problems that arise. It is also a quality of social relationships that demand the production, distribution, and consumption of goods and services using technology to survive (Gell). A flagrant result of this technological saturation is that people are being transformed into cyborgs: the simultaneously imaginative and real creatures evoked into existence through human/technology semiotics. A quasihumanness, cyborg-identity is fed by the technological organization of contemporary life as well as by the material products of technology.

Naturalising Cyborg

The concept of cyborg has gained immense popularity among the audiences of Science Fiction. One of the reasons of the popularity of cyborg is undoubtedly for the qualities that the superheroes possess but a 'normal' person does not have. The superheroes, in a subtle way, idolize the concept of cyborg with their extra-ordinary power. The question arises if the audiences know that the qualities that the superheroes have are something "not fully attainable" as a 'normal' person cannot fly and thread webs like the "Spidey" can or he cannot gain that 'steel body' that the Robo Cop has, why the audiences still get fascinated by the characters. If the terminator is someone who is merely a program or the Robocop a Robot, then why we think them belonging to 'Us'? Well, there lies the process of 'naturalising' the superheroes/cyborgs as part of human race. The plot is structured in a way that we end up categorizing them as 'human'. Starting with Spiderman, from the very beginning, he is projected as nerd, 'harmless' who is a 'next-door neighborhood'. His image is someone with whom anyone can be safe. After gaining power, he is someone above the 'average' human being. He suffers from mental turmoil to cope up with the newly gained power. He has problems choosing 'a path', as in Uncle Ben's words, "with great power comes great responsibility." In the end, the good will reigns and Spiderman chooses to use his power for the service of the New York City. Well, does it make any sense? Obviously, it does. Spiderman, being a Cyborg, is not projected as separated entity rather he belongs to 'us'. He is 'us'. In every place, Spiderman is introduced as "your friendly neighborhood Spiderman". His job is to protect the city from all odds. This is what makes 'Spidey' one of 'us'. Beside his 'social' life, his personal life also remains very much 'normal'. His attachment with his family and his secret love, Mary Jane Watson, remains the same. Uncle Ben's death leaves in his life an ever-lasting scar that makes him suffer. In a word, Spiderman is projected as a 'normal' human being with superhuman qualities. We forget that this 'friendly', 'responsible' and 'desirable' 'spidey' is not like 'us' rather he is a 'genetically reconstructed' human being. We never want to remember this. What we want to know is his exciting journey of 'responsibility'.

Ordinary masculinity lacks, and the technological *Terminator* represents a fetishized, idealized masculinity that is a desirable alternative. In *Terminator 2*, the Terminator represents an idealized phallic masculinity heavily dependent upon technofetishes to ward off the anxieties of the male spectator

faced with the prospect of a future vision of castrated masculinity. Although he learns to make jokes, the Terminator admits he could never cry. He becomes more human in every way except those that display weakness or vulnerability. It is perhaps for these reasons that Sarah Connor decides that, in an insane world, he will make the best possible father for her son-John.

‘Lack’ in the Making

‘Lack’ of the Signified: the Imaginary Signifier

The concept of ‘lack’ is central to psychoanalysis. As Psychoanalysis and the cinema were ‘born’ at around same time (the end of the nineteenth century), they share a common historical, social, and cultural background. How psychoanalysis, with its emphasis on the importance of desire in the life of the individual, has influenced the cinema- the theorists explore that ground. However, the reverse also happened where Freud took several ideas from Films. Not only did Freud draw on cinematic terms to describe his theories, as in ‘screen memories,’ but a number of his key ideas were developed in visual terms-particularly the theory of castration, which is dependent upon the shock registered by a close-up image of the female genitals.

Robert Lapsley and Michael Westlake in their book *Film theory: An introduction* says:

The child is born into the experience of lack, what Lacan terms the *manqué à être* (the ‘want to be’); the subject’s subsequent history consists of a series of attempts to figure and overcome this lack, a project that is doomed to failure [...] As compensation for the continual failure to re-establish unity, the child will console itself with imaginary solutions, notably in idealized images of itself as complete. (p. 66)

In his book, *The imaginary signifier: Psychoanalysis and the cinema*, Christian Metz introduced a notion which became the subtitle of his book: the imaginary signifier. According to Metz, the signifier of cinema is more ‘perpetual’ (visual and auditory) than any other media. He argued that the cinema makes present what is absent. The screen might offer images that suggest completeness, but this is purely imaginary. According to Metz (1982): “The imaginary, by definition, combines within it a certain presence and a certain absence in the cinema, it is not just the fictional signified, if there is one, that is just made

present in the mode of absence, it is from the outset a signifier” (p. 44).

As the spectator is aware that the offer of unity is only imaginary, Barbara Creed (1998) argues that “he (the spectator) is forced to deal with a sense of lack that is an inescapable part of the viewing process”. The ‘absence’ of the image presented on the screen create a lack among the audiences. In the superhero films, the presence of a ‘powerful’ superhero is a remainder of the ‘perfect’ simulation/completeness of the audiences. But the audiences, at the same time, are aware of the absence of the characters. This gap between imaginary signifier and signified creates ‘lack’ among the audiences.

Metz drew an analogy between this process and the experience of the (male) children in the mirror phase. (Metz assumes the spectator is male.) When the boy looks in the mirror and identifies for the first time with himself as a unified being he is also made aware of his difference from the mother. She lacks the penis he once thought she possessed. Entry into the Symbolic also involves repression of desire for the mother and the constitution of the unconscious in response to that repression. (Here, Lacan reworks Freud's theories of the phallus and castration.) Along with repression of desire for the mother comes the birth of desire: for the speaking subject now begins a lifelong search for the lost object - the other, the little 'o' of the Imaginary, the mother he relinquished in order to acquire a social identity. As the child enters the Symbolic it acquires language. However, it must also succumb to the 'law of the father' (the laws of society) which governs the Symbolic order. Entry into the Symbolic is entry into law, language, and loss - concepts which are inextricably bound together. Thus, entry into the Symbolic entails an awareness of sexual difference and of the 'self' as fragmented. The very concept of 'I' entails lack and loss.

In this viewing process, the spectator sees itself complete and ‘recognise’ himself with the image on ‘mirror’. This concept can be connected with Lenard J Davis’ concept of “act of splitting” (Spaltung) that divides body into two immutable categories: abled and disabled. This splitting defends against the “repressed fragmented body” as human is aware that “its wholeness is in fact a hallucination.” This defense mechanism is incorporated in the superhero films where the protagonists are ‘cyborgs’ and somehow they gain the ‘completeness’ through the use of technology/ exogenous ingredients against the odd of ‘incompleteness’.

Meeting the 'lack': Identification

In his essay 'Ideological Effects of the Basic Cinematographic Apparatus' (1970), Jean-Louis Baudry argued that the cinema is ideological in that it creates an ideal, transcendental viewing subject. By this he meant that the cinema places the spectator, the 'eye-subject' (1986a, p. 290), at the center of vision. Identification with the camera-projector, the seamless flow of images, narratives which restore equilibrium—all of these things give them spectator a sense of unity and control. The apparatus ensures “the setting up of the ‘subject’ as the active center and origin of meaning” (1986a, p. 286). Further, according to Baudry, by hiding the way in which it creates an impression of realism, the cinema enables the viewer to feel that events are simply unfolding – effortlessly – before his eyes. The 'reality effect' also helps to create a viewer who is at the center of representation.

To explain the processes of identification at work in the viewing context. Baudry turned increasingly to the theories of Jacques Lacan. Baudry argued that the screen-spectator relationship activates a return to the Lacanian Imaginary, the period when the child experiences its first sense of a unified self during the mirror stage. 'The arrangement of the different elements – projector, darkened hall, screen – in addition to reproducing in a striking way the *mise-en-scène* of Plato's cave [...] reconstructs the situation necessary to the release of the ‘mirror stage’ discovered by Lacan. However, the important thing to consider is that the audiences can locate themselves in the film through the characters they identify. According to Metz (1982): “the spectator can also identify with the actor, in more or less a ‘fictional’ films in which the latter is represented as an actor, not a character, but is still offered thereby as a human being (as a perceived human being) and thus follows identification.” (p. 47)

According to Lacan, there are three orders in the history of human development: the Imaginary, the Symbolic, and the Real. It is this area of Lacanian theory, particularly the Imaginary and the Symbolic that is central to the 1970s film theory. Drawing on Freud's theories of narcissism and the divided subject, Lacan proposed his theory of subjectivity. The mirror stage, which occurs during the period of the Imaginary, refers to that moment when the infant first experiences the joy of seeing itself as complete, and imagines itself to be more

adult, more fully formed, and perfect, than it really is. The self is constructed in a moment of recognition and misrecognition. Thus, the self is split.

Similarly, the spectator in the cinema identifies with the larger-than-life, or idealized, characters on the screen. Thus, as Mulvey (1975) later argued, the viewing experience, in which the spectator identifies with the glamorous star, is not unlike are-enactment of the moment when the child acquires its first sense of selfhood or subjectivity through identification with an ideal self. But, as Lacan pointed out, this is also a moment of misrecognition - the child is not really a fully formed subject. He will only see himself in this idealized way when his image is reflected back through the eyes of others. Thus, identity is always dependent on mediation.

Amanda Fernbach in her essay "The Fetishization of Masculinity in Science Fiction: the Cyborg and the Console Body" (2000) contends that in classical psychoanalysis, the fetish functions to fix woman's 'lack' to mask her 'wound,' and to disavow the castration anxiety it causes. As Freud writes:

When now I announce that the fetish is a substitute for the penis, I shall certainly create disappointments; so I hasten to add that it is not a substitute for any chance penis, but for a particular and quite special penis that had been extremely important in early childhood but had later been lost. To put it more plainly: the fetish is a substitute for the woman's (the mother's) penis that the little boy once believed in and-for reasons familiar to us-does not want to give up. (pp. 152-153)

Freud, taking "the little boy" as the norm, theorizes that this boy, when confronted with the fact that his mother does not have a penis, fantasizes that the powerful father has castrated her. The little boy fears his own castration and death, for to take away his narcissistically invested organ would amount to both. He fantasizes that the father may take revenge upon him for his Patricidal Oedipal fantasies, fantasies in which he imagines that he has exclusive access to the mother. In normal development, according to Freud, this castration threat prompts the boy to turn away from the "castrated" mother and to identify with the father, taking up in the process a heterosexual subject position (p. 236).

The male Spectator of such movies as *Terminator 2* can, however, through a narcissistic identification with on screen hyper masculinity, reassured that anxieties raised by postmodern future worlds can be disavowed. This disavowal is facilitated by the fetishized spectacle of the white male cyborg protected by his hard techno parts, still, thankfully, at the center

of the narrative, representing an invincible, idealized, traditional action-hero masculinity. This fetishization of masculinity thus works to conceal the male subject's actual and imagined feminized position in a postmodern world.

According to Lacan, when the child enters into the symbolic, the realm of law, language, power, society, the child gets to know that the 'mother' is different from 'I'. The child comes to know the social relations. It then, realizes the power dynamics where Father is the source of power/phallus. So, the mother is substituted by the father. But the sense of lack starts from then as it comes to know the difference between it and mother and the 'loss' of the mother. This child then wants to be like the father, the 'powerful'. The superhero films induce that lack to be 'masculine'/like 'my father' through the 'powerful' superheroes and the audiences can identify with them.

Desiring the 'Desirable'

Sean Nixon, in his essay, "Exhibiting masculinity" observes identification as one of the central concepts of Freud's writings. Freud distinguishes between two kinds of relationship which individuals enter into with the external world of objects around them. On one hand, there is relationship with the object that involves focusing of libidinal investments (the sexual drives), on the other hand there is identification which involves the projection of similarity between the individual and an external person. Freud summarizes this distinction as a distinction between two kinds of desire: a desire to have the other person and a desire to be the other person.

According to Freud, a 'boy' child taking up a masculine identification with the father and in the process displacing earlier aggressive fantasies towards the father. It also entailed the stabilizing of a heterosexual object choice. This masculine identification, however, precluded the 'boy' from taking up feminine identification with mother.

The superhero films project the 'responsible' and 'powerful', in a word, masculine characters on screen. Through this, a standard form of 'masculinity' is constructed that provoke the audiences with the identification (desire to be).

Fernbach (2000) discusses on how the concept of masculinity is constructed in the films like *Terminator 2: Judgement day*. When in *Terminator 2*, the Terminator (Arnold

Schwarzenegger) arrives stark naked from the future and enters a tough saloon, the crowd stares. The patrons are both shocked and amused; we hear gasps and chuckles. Despite the Terminator's perfect physique, it is painfully obvious that he lacks the phallus. His naked body signifies vulnerability. This vulnerability is confirmed by the laughter that meets him and the fact that the bikers refuse to take him seriously until he has demonstrated his extraordinary capacity for violence, made possible, of course, by his techno parts. It is not until the Terminator has brutally dealt with the bar clientele, dressed himself in biker clothes, and brandishing two guns and a cool pair of shades drives off on a Harley Davidson Fat Boy motorcycle that he can embody a successful phallic masculinity. Only then he is taken seriously, transformed into someone who is visibly "Bad to the Bone"-at least metaphorically, for his body is literally boneless, being, as he says, a layer of "living tissue over a metal endoskeleton". Within the film's diegesis, phallic power is located in and constituted by technological metaphors rather than anatomical signifiers, and rapidly proliferating techno props seem necessary for the performance of a phallic masculinity. (p. 236)

With the help of machine/technology/exogenous material, one kind of idealized, hypermasculinity is constructed in the superhero films who become the desire-to-be for the audiences. Other selected films, *RoboCop* (1987) and *Spiderman* (2002) also construct an idealized masculine figure. Quite similarly as Terminator, *RoboCop* becomes a figure of hypermasculinity with his prosthetic steel body. As a 'normal' human being, he lacks that masculinity and he suffers for that- that is projected in the movie. But with the use of mechanic body, he becomes the ultimate hero who saves the crime-ridden Detroit from destruction. And referring to *Spiderman*, he also emerges as a 'masculine' and 'responsible' man after his DNA has been changed with the help of exogenous material. The nerdy, shy 'boy' becomes the maintainer of harmony in the New York city. Somehow, responsibility and masculinity are associated with each other in discourses. So, here is no exception. And *Spiderman's* long-time love interest, Mary Jane Watson knowingly/unknowingly gets closer to him when he gets the power. So here also, the concept of masculinity is constructed and the audiences are 'forced' towards desire-to-be.

Consumerism: To be Continued

This section discusses about how that desire-to-be leads to further identification process that requires several consumptions. The consumptions are diverse in range. But this

paper focuses on the consumption of costumes and accessories and video games that are other brand extensions of the superhero films.

In his analysis of Hollywood film industry in the early 2000s, Thomas Schatz finds that this era is significantly different from the post-1975 New Hollywood era. In this newer era, the larger media industry is dominated by six mega conglomerates (such as Time Warner) that continually absorb comparatively smaller media producers into their individual gestalts. These mega conglomerates all have film divisions which are not only efficiently integrated and cross-promoted with their other existing divisions such as television, print media, and home entertainment, but which also seek to tap upon an increased international appetite for Hollywood-produced entertainment. (Schatz, p. 20) There has correspondingly emerged 'a new breed of blockbuster-driven franchises specifically geared to the global, digital, conglomerate-controlled marketplace, which spawn billion-dollar film series installments while also serving the interests of the parent conglomerate's other media and entertainment divisions.' (Schatz, p. 20) Indeed, as Schatz finds from his taxonomy of Hollywood studio outputs and box-office receipts, the era is one where 'with each passing year since the late 1990s, the studio's compulsive pursuit of franchise-spawning blockbusters has become more acute and more successful.' (Schatz, p. 25)

Schatz even specifically discusses the Spider-Man film trilogy as an example of these new franchise blockbusters. He notes that while its titular character was already 'pre-sold [to audiences] by countless iterations in various media dating back to Marvel Comics's Stan Lee in 1962' (Schatz, p. 35), these iterations 'did not include a live-action Hollywood film ...which meant that [its producers] Sony and Columbia could effectively re-originate the story, tailoring it to current industry conditions and their own interests.' (Schatz, p. 35) Schatz finds that for *Spider-Man 2* (Raimi, 2004), Sony's bundling of the film and its companion videogame 'with its new Playstation 2 system ...help[ed] it become the best-selling game console of 2005.' (Schatz, p. 36. For Schatz, thus, the Spider-Man superhero film trilogy is 'a quintessential conglomerate-era media franchise' (Schatz, p. 35), one which synergistically taps upon existing audience goodwill and familiarity with its subject, and is additionally expanded in multiple ancillary products and media formats.

Starting with costume consumption of the Spiderman, a website called *Mirror* presents a piece of news on March 22, 2015 that

shows that around 27,000 Spiderman light up costumes have been sold before one of the costumes accidentally explodes as it is battery operated. The outfit worth \$12.50 made for the children (*Mirror*, n.p., 2015).

The full body radio-controlled figure used in *Terminator 3: Rise of The Machines* which stood in for Arnold Schwarzenegger in the final scenes of the film is estimated at \$40,000 - \$60,000. The miniature/modified outfit for teenagers came into the market after the film release. According to an online news called Icon reports that popular outfit has been sold more than 10000 pieces within a week in a store in New York.

As the live-action *Spider-Man* movie was released in 2002, a game developed by Treyarch titled, *Spider-Man: The Movie* was developed for PC, PlayStation 2, Xbox and Nintendo GameCube with a separate title developed by Digital Eclipse Software for Game Boy Advance. After the critical success of both the first Spider-Man film and the video game releases, Marvel ordered a wider selection of titles to coincide with the release of *Spider-Man 2*. The flagship titles being Treyarch's *Spider-Man 2: The Game* for PlayStation 2, Xbox and Nintendo GameCube, which extended the open environment concept started by their previous title.

***Spiderman* (2000) Video Games**

Following is the list of the *Spiderman* (2002) video games that have been marketed since the release of the film:

Spider-Man: The Movie (2002)

Spider-Man 2 (2004)

Ultimate Spider-Man (2005)

Spider-Man: Battle for New York (2006)

Spider-Man 3 (2007)

Spider-Man: Friend or Foe (2007)

Spider-Man: Web of Shadows (2008)

Spider-Man: Toxic City (2009)

Ultimate Spider-Man: Total Mayhem (2010)

Spider-Man: Shattered Dimensions (2010)

Spider-Man: Edge of Time (2011)

The Amazing Spider-Man (2011)

The Amazing Spider-Man 2 (2014)

Terminator Video Games

Following is a list of *Terminator* video games marketed since the release of the first film in the franchise in 1984:

1. *The Terminator* (1984) games:
The Terminator (DOS)
The Terminator (NES)
The Terminator (Virgin video game)
The Terminator (SNES)
The Terminator (mobile game)
2. *Terminator 2: Judgement Day* (1991) games
Terminator 2: Judgment Day (arcade game)
Terminator 2: Judgment Day (Game Boy)
Terminator 2: Judgment Day (Ocean Software)
Terminator 2: Judgment Day (pinball)
Terminator 2: Judgment Day (16-bit version)
Terminator 2: Judgment Day – Chess Wars
Terminator 2: Judgment Day – Slot Game
3. *Terminator 3: Rise of the Machines* (2003) games
Terminator 3: Rise of the Machines (video game)
Terminator 3: War of the Machines
Terminator 3: Rise of the Machines (pinball)
Terminator 3: The Redemption
4. *Terminator Salvation* (2009) games
Terminator Salvation (video game)
Terminator Salvation (arcade game).

RoboCop Video Games

Following is a list of *RoboCop* video games marketed since the release of the first film in the franchise in 1988:

RoboCop (1988)
RoboCop 2
RoboCop 3
RoboCop 3D
RoboCop Versus The Terminator
RoboCop: The Official Movie Game

Conclusion

Superhero films function as impressive outcome of the culture industry which opens further space for consumerism. In its reading of three superhero films, the present dissertation explores how they create senses of lack and manipulate the audiences to fill the lack through more consumption. The paper contends that superhero films thread the concept of Cyborg by blurring the boundary between human, animal and machine and destabilizing the traditional conception of 'human'. The representation of the Cyborg identity in the films is done in such a way that it is 'normalized.' This concept is disseminated among the 'mass people' who get fascinated with the idealized superheroes. That way, the ideology is infused in the psyche of the consumers who are forced to feel lack and desire. And the capitalist economy already finds the way for them to satisfy their desire. This operates in a circle where a medium of the culture industry leads towards another media to boost the consumerist bonanza. In their classic "The Culture Industry," Adorno and Horkheimer observe that the culture industry produces safe, standardized products geared to the larger demands of the capitalist economy and they do so by representing 'fictional' life for purpose of pure entertainment or distraction as seductively and realistically as possible. For them, "the more intensely and flawlessly his (the producer's) techniques duplicate empirical objects, the easier it is today for the illusion to prevail that the outside world is the straightforward continuation of that presented on the screen" (During, 1999, p. 35). Gradually, the real life becomes indistinguishable from the fictional world, and the latter soon starts replacing the former. The screen superheroes are presented so 'realistically' and 'lively' that they become the ideal, 'real' figure whom the audiences identify with. This is one of the reasons of the overwhelming popularity of superheroes. More significantly, the image of the superheroes as 'Saviour' of humanity facing danger and horror adds ethical significance to the conception and consumption of superheroes. The politics of superhero films lies in the fact that audience, with their desire *to-be* (like) the superheroes, submit knowingly (or unknowingly) to the demands of capitalist consumerism.

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A Comparison of Bayesian and Classical Approach for Estimating Parameter of Maxwell Distribution

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Abstract: In this paper, Bayesian approach is used for estimating the parameter of Maxwell distribution. Squared error (SE), LINEX and MLINEX loss functions and conjugate prior are used. The performance of the obtained estimators for different types of loss functions are then compared among themselves as well as with the classical maximum likelihood estimator. Better result is found in Bayesian approach under MLINEX loss function. Mean Square Error (MSE) of the estimators are also computed and presented in graphs.

Keywords: Maximum likelihood estimator (MLE), modified linear exponential (MLINEX) loss function, linear exponential (LINEX) loss function, squared error loss function (SE).

Introduction

In the context of the kinetic molecular theory of gases, a gas contains a large number of particles in random motions. Each particle has a different speed and each collision between particles changes the distribution of speeds of molecules in thermal equilibrium as given by statistical mechanics. The Maxwell (or Maxwell-Boltzmann) distribution is an equation first derived by James Clerk Maxwell in 1859 and extended by Ludwig Boltzmann in 1868. The Maxwell distribution is closely related to the Rayleigh distribution, which governs the magnitude of a two dimensional random vector whose coordinates are independent and identically distributed with mean zero normal variables.

A continuous random variable X is said to be Maxwell (Walck, 2007) distribution if its p.d.f. is given by

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$$f(X/\lambda) = \sqrt{\frac{2}{\pi}} \frac{1}{\lambda^3} x^2 e^{-\frac{x^2}{2\lambda^2}} ; 0 < x < \infty, \lambda > 0 ; \quad (1)$$

where, λ is the only parameter of the distribution and $\lambda = \sqrt{kT/m}$ k is the Boltzmann constant, T is the temperature, m is the mass of a molecule and x denotes the speed of molecule.

From (1), we can write $f(X/\lambda) = \sqrt{\frac{2}{\pi}} \left(\frac{1}{\lambda^2}\right)^{\frac{3}{2}} x^2 e^{-\frac{x^2}{2\lambda^2}} ; 0 < x < \infty, \lambda > 0$

and replacing $\frac{1}{\lambda^2}$ by θ we get

$$\begin{aligned} f(X;\theta) &= \sqrt{\frac{2}{\pi}} \theta^{\frac{3}{2}} x^2 e^{-\frac{\theta x^2}{2}} ; X, \theta > 0 \\ &= 0 ; otherwise \end{aligned} \quad (2)$$

Now the sample generating techniques of Maxwell distribution have been applied by using Monte Carlo method. In this paper, we shall discuss Monte Carlo method with the help of inverse transformation method.

Sample Generation of Maxwell Distribution

The p.d.f. of Maxwell distribution is

$$\begin{aligned} f(X/\lambda) &= \sqrt{\frac{2}{\pi}} \frac{1}{\lambda^3} x^2 e^{-\frac{x^2}{2\lambda^2}} ; 0 < x < \infty, \lambda > 0 \\ &= 0 ; otherwise \end{aligned}$$

The c.d.f. of distribution is

$$\begin{aligned} F_x(x) &= \int_0^x f(x) dx \\ \Rightarrow F_x(x) &= \sqrt{\frac{2}{\pi}} \frac{1}{\lambda^3} \int_0^x x^2 e^{-\frac{x^2}{2\lambda^2}} dx \end{aligned} \quad (3)$$

$$\text{Let, } \frac{x^2}{2\lambda^2} = p$$

Now from equation (3) we have

$$\begin{aligned}
 F_x(x) &= \frac{2}{\sqrt{\pi}} \int_0^{\frac{x^2}{2\lambda^2}} p^{1/2} e^p dp \\
 &= \frac{\Gamma\left(\frac{3}{2}, \frac{x^2}{2\lambda^2}\right)}{\Gamma\left(\frac{3}{2}\right)} \\
 F_x(x) &= p\left(\frac{3}{2}, \frac{x^2}{2\lambda^2}\right)
 \end{aligned}$$

Where, we have made the substitution $p = \frac{x^2}{2\lambda^2}$ in order to simplify the integration. Here $p\left(\frac{3}{2}, \frac{x^2}{2\lambda^2}\right)$ is the incomplete gamma function. For this reason, we take sample from Maxwell distribution by using uniform distribution over the range (0,1).

Different Estimators of Parameter

Bayes estimators of parameter θ for different loss functions along with maximum likelihood estimator have been determined.

Maximum Likelihood Estimator

Let $X = (X_1, X_2, \dots, X_n)$ be a random sample of size n drawn from the Maxwell distribution having p.d.f. defined in (2). Then the likelihood function of θ for the given random sample X is given by

$$\begin{aligned}
 L(\theta/X) &= \prod_{i=1}^n f(x_i/\theta) \\
 \Rightarrow L(\theta/X) &= \left(\sqrt{\frac{2}{\pi}}\right)^n \theta^{\frac{3n}{2}} \prod_{i=1}^n x_i^2 e^{\frac{-\theta \sum x_i^2}{2}}
 \end{aligned}$$

Taking log on both sides, we get

$$\log L(\theta/X) = \frac{n}{2} \log 2 - \frac{n}{2} \log \pi + \frac{3n}{2} \log \theta + 2 \sum \log x_i - \frac{\theta \sum x_i^2}{2} \quad (4)$$

since,

$$\frac{1}{\lambda^2} = \theta \quad (5)$$

Using equation (4) and (5), the maximum likelihood estimator is

$$\hat{\lambda}_{MLE}^2 = \frac{\sum x_i^2}{3n}$$

Prior and Posterior Density Function

From (1) we got the p.d.f of Maxwell distribution which is

$$f(X; \theta) = \begin{cases} \sqrt{\frac{2}{\pi}} \theta^{\frac{3}{2}} x^2 e^{-\frac{\theta x^2}{2}} & ; X, \theta > 0 \\ = 0 & ; otherwise \end{cases}$$

Let the prior density function of θ is a gamma distribution defined as

$$g(\theta) = \frac{\beta^\alpha}{\Gamma \alpha} e^{-\beta \theta} \theta^{\alpha-1}; \quad \theta, \alpha, \beta > 0$$

where α and β are the shape and scale parameter respectively. Now the posterior density function of θ can be obtained as follows

$$\begin{aligned}
 f(\theta/X) &= \frac{\prod_{i=1}^n f(x_i/\theta)g(\theta)}{\int \prod_{i=1}^n f(x_i/\theta)g(\theta)d\theta} \\
 &= \frac{\left(\sqrt{\frac{2}{\pi}}\right)^n \prod_{i=1}^n x_i^2 \theta^{\frac{3n}{2}} e^{-\frac{\theta \sum x_i^2}{2}} e^{-\beta\theta} \theta^{\alpha-1}}{\int_0^\infty \left(\sqrt{\frac{2}{\pi}}\right)^n \prod_{i=1}^n x_i^2 \theta^{\frac{3n}{2}} e^{-\frac{\theta \sum x_i^2}{2}} e^{-\beta\theta} \theta^{\alpha-1} d\theta}
 \end{aligned}$$

$$f(\theta/X) \sim G\left(\frac{3n}{2} + \alpha, \frac{\sum x_i^2}{2} + \beta\right)$$

Therefore,

Bayes Estimator under Squared Error (SE) Loss Function

Now, let the loss function be squared (Rahman et al., 2012)

error defined as

$$L\left(\hat{\theta}; \theta\right) = \left(\hat{\theta} - \theta\right)^2$$

Hence, under SE loss function Bayes estimator of θ is

$$\begin{aligned}
 \hat{\theta}_{BSE} &= \frac{\frac{3n}{2} + \alpha}{\frac{\sum x_i^2}{2} + \beta} \\
 \Rightarrow \hat{\theta}_{BSE} &= \frac{3n + 2\alpha}{\sum x_i^2 + 2\beta}
 \end{aligned}$$

Since $\frac{1}{\lambda^2} = \theta$,

$$\hat{\lambda}_{BSE}^2 = \frac{1}{\hat{\theta}_{BSE}} = \frac{\sum x_i^2 + 2\beta}{3n + 2\alpha} \text{ is the Bayes estimator of } \lambda^2 \text{ under}$$

SE loss.

Bayes Estimator under LINEX Loss Function

Let us consider the following LINEX (Zellner, 1986) loss function

$$L(D) = k \left[e^{c(\hat{\theta} - \theta)} - c(\hat{\theta} - \theta) - 1 \right]; k > 0, c \neq 0$$

where $D = (\hat{\theta} - \theta)$ represents the estimation error and c is the shape parameter of the loss function.

For LINEX loss function, the Bayes estimator of θ is given by

$$\hat{\theta}_{BL} = -\frac{1}{c} \ln E_{\theta}(e^{-c\theta})$$

Now,

$$E_{\theta}(e^{-c\theta}) = \int e^{-c\theta} f(\theta/X) d\theta$$

$$\text{or, } E_{\theta}(e^{-c\theta}) = \left(1 + \frac{c}{\frac{\sum x_i^2}{2} + \beta} \right)^{-\left(\frac{3n}{2} + \alpha\right)}$$

Therefore,

$$\hat{\theta}_{BL} = -\frac{1}{c} \ln E_{\theta}(e^{-c\theta})$$

$$= \frac{\frac{3n}{2} + \alpha}{c} \left(\frac{c}{\frac{\sum x_i^2}{2} + \beta} - \frac{c^2}{2 \left(\frac{\sum x_i^2}{2} + \beta \right)^2} + \frac{c^3}{3 \left(\frac{\sum x_i^2}{2} + \beta \right)^3} - \dots \right)$$

Now, neglecting third and higher order terms we get

$$\begin{aligned}\hat{\theta}_{BL} &= \frac{\frac{3n}{2} + \alpha}{c} \frac{c}{\frac{\sum x_i^2}{2} + \beta} - \frac{\frac{3n}{2} + \alpha}{c} \frac{c^2}{2 \left(\frac{\sum x_i^2}{2} + \beta \right)^2} \\ &= \hat{\theta}_{BSE} - \frac{c(3n + 2\alpha)}{\left(\sum x_i^2 + 2\beta \right)^2}\end{aligned}$$

Since, $\frac{I}{\lambda^2} = \theta$,

$$\hat{\lambda}_{BL}^2 = \frac{I}{\hat{\theta}_{BL}} = \frac{\sum x_i^2 + 2\beta}{3n + 2\alpha} - \frac{\left(\sum x_i^2 + 2\beta \right)^2}{c(3n + 2\alpha)}$$

is the Bayes estimator under LINEX loss function.

Bayes Estimator under MLINEX Loss Function

Now, let us consider the MLINEX loss (Wahed and Uddin, 1998) function defined as

$$L(\hat{\theta}; \theta) = \omega \left[\left(\frac{\hat{\theta}}{\theta} \right)^c - c \log \left(\frac{\hat{\theta}}{\theta} \right) - 1 \right] ; \omega > 0, c > 0$$

For MLINEX loss function Bayes estimator of θ is obtained from

$$\hat{\theta}_{BML} = \left[E(\theta^{-c}/x) \right]^{\frac{1}{c}}$$

Here

$$E(\theta^{-c}) = \int \theta^{-c} f(\theta/x)$$

$$\hat{\lambda}_{BML}^2 = \left(\frac{\Gamma\left(\frac{3n}{2} + \alpha - c\right)}{\Gamma\left(\frac{3n}{2} + \alpha\right)} \right)^{\frac{1}{c}} \left(\frac{\sum x_i^2}{2} + \beta \right) \quad \text{since, } \frac{I}{\lambda^2} = \theta,$$

Therefore,
 which is the Bayes estimator under MLINEX loss function.

Empirical Study

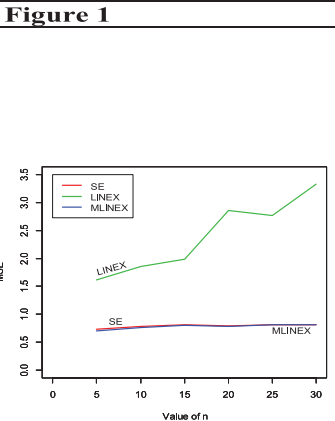
We discussed Bayesian estimation of parameter and reliability function of one parameter, Maxwell distribution using three different loss functions: the SE loss function, LINEX loss function and MLINEX loss function. To compare the estimators

$\hat{\lambda}^2_{BSE}, \hat{\lambda}^2_{BL}$ and $\hat{\lambda}^2_{BML}$, we have considered the MSE of the estimators. The MSE of an estimator $\hat{\lambda}^2$ is defined as

$$MSE(\hat{\lambda}^2)=E\left[\left(\lambda^2-\hat{\lambda}^2\right)^2\right]$$

The estimated values of the parameter for different loss functions and MSE of the estimators are computed by Monte-Carlo simulation method for Maxwell distribution. The results and their graphs are given below.

| Estimated value and MSE/Variance of different estimators λ^2 of the parameter of Maxwell distribution when $\alpha = 2, \beta = 1, \lambda^2 = 1$ and $c = 1$ | | | | | |
|---|----------|-------------------------|------------------------|-------------------------|-------------------------|
| Table 1 | | | | | |
| n | Criteria | $\hat{\lambda}^2_{BSE}$ | $\hat{\lambda}^2_{BL}$ | $\hat{\lambda}^2_{BML}$ | $\hat{\lambda}^2_{MLE}$ |
| 5 | Estimate | 0.148 | -0.269 | 0.166 | 0.077 |
| | MSE | 0.726 | 1.611 | 0.696 | 2.305 |
| 10 | Estimate | 0.119 | -0.361 | 0.126 | 0.111 |
| | MSE | 0.776 | 1.854 | 0.763 | 6.635 |
| 15 | Estimate | 0.102 | -0.409 | 0.107 | 0.123 |
| | MSE | 0.806 | 1.986 | 0.798 | 11.053 |
| 20 | Estimate | 0.112 | -0.692 | 0.116 | 0.082 |
| | MSE | 0.788 | 2.864 | 0.782 | 9.811 |
| 25 | Estimate | 0.098 | -0.663 | 0.101 | 0.090 |
| | MSE | 0.813 | 2.764 | 0.809 | 13.454 |
| 30 | Estimate | 0.099 | -0.824 | 0.101 | 0.092 |
| | MSE | 0.812 | 3.326 | 0.808 | 16.613 |
| Note: MSE for Square Error (SE), LINEX and MLINEX Loss function and Variance for MLE | | | | | |



For $\alpha = 2, \beta = 1, \lambda^2 = 1, c = 1$ and different sample sizes, the Bayes estimator under MLINEX loss function has the smallest MSEs that indicates better estimation of the parameter.

| Estimated value and MSE/Variance of different estimators of the parameter λ^2 of Maxwell distribution when $\alpha = 3, \beta = 2, \lambda^2 = 1$ and $c = 1$ | | | | | |
|---|----------|-------------------------|------------------------|-------------------------|-------------------------|
| Table 2 | | | | | Figure 2 |
| n | Criteria | $\hat{\lambda}_{BSE}^2$ | $\hat{\lambda}_{BL}^2$ | $\hat{\lambda}_{BML}^2$ | $\hat{\lambda}_{MLE}^2$ |
| 5 | Estimate | 0.245 | -1.019 | 0.271 | 0.077 |
| | MSE | 0.569 | 4.076 | 0.531 | 2.305 |
| 10 | Estimate | 0.203 | -1.284 | 0.215 | 0.111 |
| | MSE | 0.635 | 5.218 | 0.616 | 6.635 |
| 15 | Estimate | 0.187 | -1.593 | 0.194 | 0.123 |
| | MSE | 0.661 | 6.722 | 0.649 | 11.053 |
| 20 | Estimate | 0.135 | -1.067 | 0.139 | 0.082 |
| | MSE | 0.748 | 4.271 | 0.741 | 9.811 |
| 25 | Estimate | 0.132 | -1.288 | 0.136 | 0.090 |
| | MSE | 0.753 | 5.235 | 0.747 | 13.454 |
| 30 | Estimate | 0.128 | -1.449 | 0.131 | 0.092 |
| | MSE | 0.760 | 6.000 | 0.755 | 16.613 |

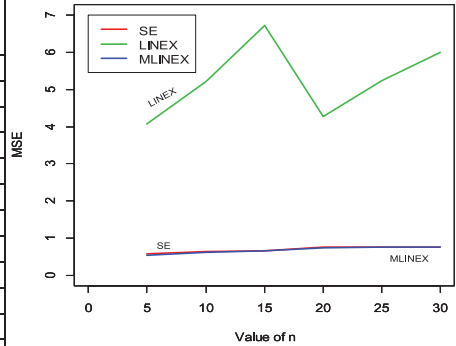
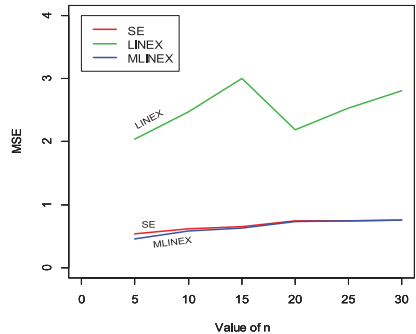


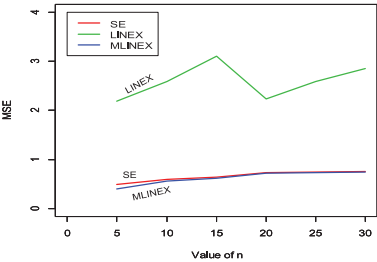
Figure 2 indicates that, for $\alpha = 3, \beta = 2, \lambda^2 = 1$ and $c = 1$ the $\hat{\lambda}_{BML}^2$ has the smallest MSEs among the other loss functions.

| Estimated value and MSE/Variance of different estimators of the parameter λ^2 of Maxwell distribution when $\alpha = 2, \beta = 2, \lambda^2 = 1$ and $c = 2$ | | | | | |
|---|----------|-------------------------|------------------------|-------------------------|-------------------------|
| Table 3 | | | | | Figure 3 |
| n | Criteria | $\hat{\lambda}_{BSE}^2$ | $\hat{\lambda}_{BL}^2$ | $\hat{\lambda}_{BML}^2$ | $\hat{\lambda}_{MLE}^2$ |
| 5 | Estimate | 0.271 | -0.427 | 0.323 | 0.077 |
| | MSE | 0.531 | 2.038 | 0.459 | 2.305 |
| 10 | Estimate | 0.215 | -0.572 | 0.236 | 0.111 |
| | MSE | 0.616 | 2.472 | 0.583 | 6.635 |
| 15 | Estimate | 0.194 | -0.732 | 0.207 | 0.123 |
| | MSE | 0.649 | 2.999 | 0.629 | 11.053 |
| 20 | Estimate | 0.139 | -0.480 | 0.146 | 0.082 |
| | MSE | 0.741 | 2.192 | 0.729 | 9.811 |
| 25 | Estimate | 0.136 | -0.592 | 0.141 | 0.090 |
| | MSE | 0.747 | 2.536 | 0.738 | 13.454 |
| 30 | Estimate | 0.131 | -0.675 | 0.135 | 0.092 |
| | MSE | 0.755 | 2.805 | 0.748 | 16.613 |



For $\alpha = 2, \beta = 2, \lambda^2 = 1, c = 2$ and for different sample sizes, $5 \leq n \leq 30$, the Bayes estimate under MLINEX loss function is better than the other loss functions.

| Estimated value and MSE/Variance of different estimators of the parameter λ^2 of Maxwell distribution when $\alpha = 1, \beta = 2, \lambda^2 = 1$ and $c = 2$ | | | | | |
|---|----------|-------------------------|------------------------|-------------------------|-------------------------|
| Table 4 | | | | | Figure 4 |
| n | Criteria | $\hat{\lambda}_{BSE}^2$ | $\hat{\lambda}_{BL}^2$ | $\hat{\lambda}_{BML}^2$ | $\hat{\lambda}_{MLE}^2$ |
| 5 | Estimate | 0.303 | -0.478 | 0.369 | 0.077 |
| | MSE | 0.486 | 2.184 | 0.398 | 2.305 |
| 10 | Estimate | 0.229 | -0.608 | 0.252 | 0.111 |
| | MSE | 0.595 | 2.586 | 0.559 | 6.635 |
| 15 | Estimate | 0.203 | -0.763 | 0.217 | 0.123 |
| | MSE | 0.636 | 3.107 | 0.614 | 11.053 |
| 20 | Estimate | 0.144 | -0.496 | 0.151 | 0.082 |
| | MSE | 0.733 | 2.238 | 0.721 | 9.811 |
| 25 | Estimate | 0.139 | -0.608 | 0.145 | 0.090 |
| | MSE | 0.741 | 2.585 | 0.731 | 13.454 |
| 30 | Estimate | 0.134 | -0.689 | 0.138 | 0.092 |
| | MSE | 0.750 | 2.854 | 0.743 | 16.613 |



It is seen from table 4 that Bayes estimator under MLINEX loss function has the smallest MSEs among the other functions.

| Estimated value and MSE/Variance of different estimators of the parameter λ^2 of Maxwell distribution when $\alpha = 2, \beta = 3, \lambda^2 = 1$ and $c = 3$ | | | | | |
|---|----------|-------------------------|------------------------|-------------------------|-------------------------|
| Table 5 | | | | | Figure 5 |
| n | Criteria | $\hat{\lambda}_{BSE}^2$ | $\hat{\lambda}_{BL}^2$ | $\hat{\lambda}_{BML}^2$ | $\hat{\lambda}_{MLE}^2$ |
| 5 | Estimate | 0.376 | -0.521 | 0.480 | 0.077 |
| | MSE | 0.389 | 2.314 | 0.271 | 2.305 |
| 10 | Estimate | 0.274 | -0.577 | 0.311 | 0.111 |
| | MSE | 0.527 | 2.487 | 0.475 | 6.635 |
| 15 | Estimate | 0.235 | -0.669 | 0.256 | 0.123 |
| | MSE | 0.585 | 2.784 | 0.553 | 11.053 |
| 20 | Estimate | 0.170 | -0.449 | 0.182 | 0.082 |
| | MSE | 0.688 | 2.100 | 0.669 | 9.811 |
| 25 | Estimate | 0.161 | -0.522 | 0.170 | 0.090 |
| | MSE | 0.704 | 2.317 | 0.689 | 13.454 |
| 30 | Estimate | 0.152 | -0.574 | 0.159 | 0.092 |
| | MSE | 0.719 | 2.476 | 0.707 | 16.613 |

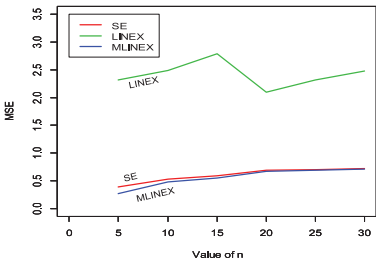


Figure 5 indicates that for $\alpha = 2, \beta = 3, \lambda^2 = 1, c = 3$ and different values of n, the Bayes estimator under MLINEX loss function provides better estimation than the other loss functions.