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CONTENTS

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STUDY ON SCIENTIFIC PRODUCTION IN STRATEGIC MANAGEMENT PERIOD 1980-2014

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ABSTRACT
When a discipline is consolidated through advances and research it entails, it is necessary to analyze what were the elements of impact in the field, through an analysis of the work that the scientific community of the field generated. This paper analyzes, through free software programs Sitkis, Ucinet and VOSviewer, information on major authors, articles and keywords of the twelve high impact publications in Strategic Management for the period 1980 2014. The purpose of this research is to determine what were the major journals, authors and themes of SM in the past thirty-four years.

Keywords: Strategic Management, bibliometric indicators, literature review.

JEL: D80, D83, Z00

1. INTRODUCTION
Development and incorporation of knowledge in the discipline of strategic management (SM) is growing every day, so it is important to perform such studies that can be identified where the work, publications, authors and trends that mark the evolution of this area. Knowing the new research, adaptation and expiration of some of the theories of SM puts scholars in a more favorable conduct research to innovate and contribute to the development of new knowledge in the subject. This paper presents a methodology for the analysis of the scientific production of SM is exposed and it is considered that this could be applied in assessing the state of art of any other field using the following tools:

A. Google Scholar is a search of documents program with plenty of information retrieval, free and easy to use. It is a data source that complements other more specific as the Web of Science. Also, it offers a product called bibliometric statistics, which identifies the impact of scientific journals, using as the sort index metric h with a time frame of five years, giving stability results (Cabezas-Clavijo and Delgado -López-Cózar, 2013).

B. Web of Science Thomson Reuters (2015) is a product that allows access and analyze information indexed in the major journals of 150 disciplines (Cortés, 2008) is considered one of the main sources of information for bibliometric studies.

C. Sitkis is a bibliometric tool that accelerates the search, management and data processing. It was developed by Schildt H., (2002). Allows you to import text files result of searches in a Web of Knowledge to a database Microsoft Access, generates reports and analyzes that can be interpreted with other programs like Netdraw of Ucinet (Tarrats, 2012).

D. Ucinet 6 is a program that creates items correlation matrices and graph their relationships with network maps through Netdraw tool (Borgatti, Everett and Freeman, 2002).

E. VOS viewer 1.5.7 is free software based on neural network technique for segmentation, developed by Nees Jan van Eck and Ludo Waltman. It is used to generate maps that are based on data linked and is used mainly for analyzing bibliometric networks (Waltman and Van Eck, 2010).

2. BACKGROUND OF THE PROBLEM
According to Lyman and Varian (2000), in their report called How much information? mention that the number of scientific articles produced in the world each year is approximately two million items.Consistent with Tarrats, (2012), traditional techniques to determine the bibliographic contributions in this discipline that require the immersion of scientists on documents generated in their area of interest. However, these results in a process that requires a lot of time of reading and analysis, and the results are usually subjective and difficult to replicate. For this and given the technological tools available today, using programs that facilitate the location of the most relevant scientific material is recommended.

The bibliometric data analysis techniques are especially useful when large amounts of information as the literary production of some discipline (Frias, Ribeiro and Portugal, 2013) are discussed.

ISSN 2394 - 7780

3. DEFINITION OF THE PROBLEM

Assuming that publications in magazines have been exposed to a critical review and favorable assessment, these are representative of research generated in a certain discipline. This work is delimited to articles and journals in English that address the issue of SM for the period 1980-2014 and aims to present an overview of what has happened in the last three decades in this field.

When analyzing the evidence of the database available in Google Scholar and Web of Knowledge to identify the major journals of higher impact, it is present an overview of what has been the trend in the number of publications per year in the area, as is the relationship between the most important authors through co-citation analysis, the authors who are producing more goods and what is the link of the sub areas of the SM through a study of co-relation of the keywords more used.

4. CONCEPTUAL THEORETICAL BACKGROUND

According to Furrer, Thomas and Goussevskai, (2008), SM is a discipline that had its origins in studies of economic organization. At this stage, previous authors as Taylor (1947), Barnard (1938), Simon (1947) and Selznick (1957) initiated the study of enterprises through economic ideas, but it was not until the sixties with works such as: Strategy and structure of Chandler (1962), corporate strategy of Ansoff (1965) and the book Business Policy: Text and cases attributed to Andrews (1965) that the birth of the SM was marked. The works of that time are mainly case studies that their very specific nature resulted difficult to apply to other types of organizations.

Due to the problem of generalization, in the seventies began a new phase where the analysis and research is more weighted. In this period two main perspectives, one focused on the process of how they generated and implemented strategies, and the other focused on understanding the relationship between strategy and performance are observed. Among the most outstanding works in this period is that of Michael Porter with his contributions in 1979, 1980 and 1985, in which he suggested a framework for analyzing the structure of an industry and competitors.

Also in the decade of the 80s a change of direction is observed in the study of the resources and capabilities that differentiate companies. With this SM researchers resumed studies of organizational economics as transaction costs of Williamson 1975 and 1985 and the agency theory resulted of the work of Fama in 1980, Jensen and Meckling of 1976. With this were developed and conducted some works regarding the relationship between organizational structure and firm performance, functionality of hybrid ventures, strategic alliances and joint ventures, also to explain how companies choose their mode of market entry.

Alongside, itwas developed the theory of resources and capabilities that tries to explain the performance of a company compared to the resources they have. Works like Wernerfelt of 1984, Barney of 1991, dynamic capabilities of Stuart and Podolny of 1996, Teece (1997). The knowledge approach was developed by Grant in 1996, Powell and Dent-Micallef, 1997, which are considered among the most important works in the discipline.

5. CONTEXTUAL FRAMEWORK

According to Broadus(1987), bibliometrics is the quantitative study of the physical unities published or bibliographic units and according to Garfield(1973) citing a document with intention to aim their relevance to the discipline in question. The documents cited most frequently, are likely to have exerteda major influence on the discipline that the ones cited less often...the more frequent citeda particular work, the greater its influence on the scientific development of the field analyzed (Soriano,Pinillos,2011).

Therefore, the criteria used to define which articles, publications and authors have had more impact on the development of SM is the number of citations, then an article with more cites will be considered more important than another with less. The co-citation is a bond of co-occurrence and occurs when two literary elements as articles or authors are cited by a third party. It is expected that a higher frequency of co-citation there is a greater affinity between the elements (Miguel Moya-Anegón and Herrero-Solana, 2006).

The activity metrics provide information on the number and impact of scientific production indicators such as the impact factor or the number of items as examples of such metrics. On the other hand, metrics or relational indicators provide insight as a discipline is made. The study of co-citations or also called first generation and the relationship of associated words or second generation are the two types of analysis that allow reaching the relational indicators (Ruiz-Baños and Bailón-Moreno, 1998).

6. METHOD

The methodological approach is based on a bibliometric study of 1,882 items obtained from the Web of Knowledge (2015) and published in the twelve most important magazines of Strategic Management at the page

ISSN 2394 - 7780

of Google Scholar (2015).This allows seeing which has been the impact of major journals, authors and themes of the SM for the period 1980-2014.

Starting to search Google Scholar major publications listing SM it was obtained the first twelve magazines considered the greatest impact on the discipline, according to the h index proposed by Hirsch (2005), which seeks to establish simultaneously the quality and quantity of scientific production. A magazine or author has index h if h has published articles with at least h citations each number.

On the Web of Science it is obtained a list of all articles related with the word Strategic Management (GE) published in the period 1980-2014 was obtained, then the data is refined to work only with the articles published in twelve journals mentioned before, generated text file of this search and through Sitkis were exported data to a Microsoft Access file in which it is obtained the information as abstracts, authors, keywords, publication dates among others and from which can be analyzed and graph corresponding to 1,882 items resulting values.

The program Sitkis generates files on co-citation networks and relationships between keywords, which can be interpreted with VOS viewer Ucinet and software, by generating matrices and relational maps (Tarrats, 2012).

7. ANALYSIS OF RESULTS

Below is a list of the twelve major journals in the discipline of SM is presented, according to the results obtained with statistics tool Google Scholar.

Table 1: List of major journals in Strategic Management.

Journal	Índice h5
Academy of Management Journal	72
Strategic Management Journal	70
Organization Science	68
Journal of Management	67
Journal of Marketing	65
Management Science	62
Journal of Business Research	62
Journal of International Business Studies	60
Journal of Business Venturing	58
Journal of Management Studies	58
Academy of Management Review	57
Harvard Business Review	56

Source: Based on data from Google Scholar

Out of the 1,882 articles resulting it is seen an increasing trend in the number of items every year. This reflects the maturity of the discipline and the development of their sub areas of study.

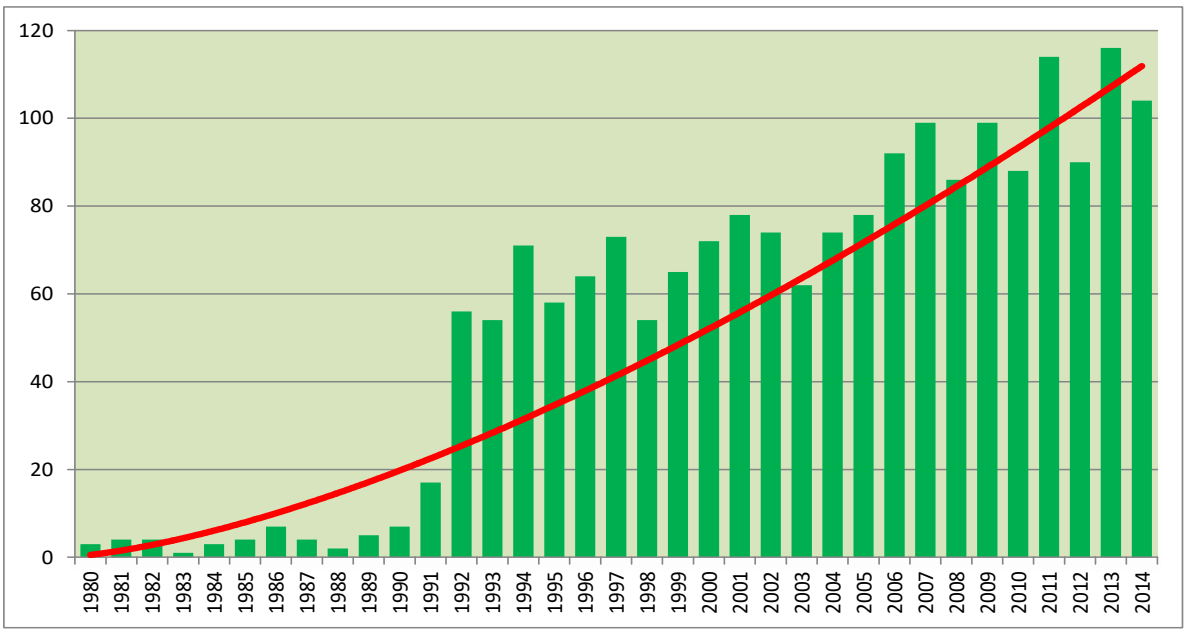

Figure 1: Number of articles per year
Source: Based on datafrom theWeb ofKnowledge

ISSN 2394 - 7780

Table 2: Number ofarticles per year

Año de publicación	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
registros	3	4	4	1	3	4	7	4	2	5	7	17	56	54	71	58	64	73
Año de publicación	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
registros	54	65	72	78	74	62	74	78	92	99	86	99	88	114	90	116	104	

Source: Based on data from the Web of Knowledge.

Of all the items it can be seen that the five journals that provide more elements are, from most to least: 1. Strategic Management Journal, Journal of Management Studies 2, 3. Journal of Business Research, 4. Journal of Management and 5. Organization Science.

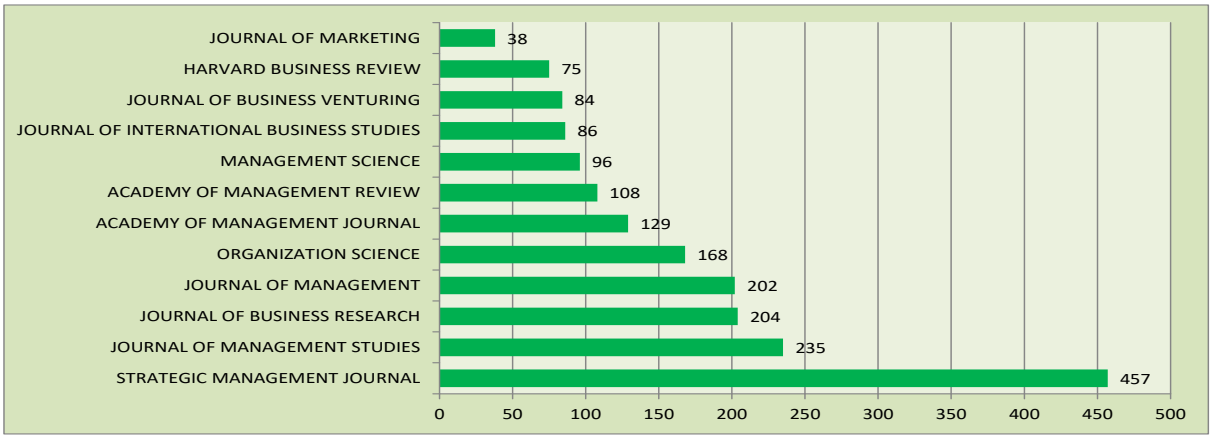

Figure 2: Number of articles per journal
Source: Based on data from the Web of Knowledge

For the study of major authors, first, it is presented the 50 researchers who have published more articles after the analysis of co-citations that can observe the relationship between authors independently year of publication. The VOSviewer tool allows interpreting the results of these relationships grouping into segments to those elements that are related. In this case four groups were generated, then the graph corresponding to these groups is presented and as Annex is incorporated table 3. Co-citations are incorporated by author by group, where can be consulted the results of the groups, number of occurrences and more important authors for each group.

Table 3: The 50 authors with morepublished papers

Autor	Registros	Autor	Registros	Autor	Registros	Autor	Registros	Autor	Registros
KETCHEN DJ	29	VERBEKE A	10	ZAHRA SA	8	SHORT JC	7	BARR PS	7
HITT MA	29	THOMAS JB	10	WRIGHT M	8	SHENKAR O	7	ZAJAC EJ	6
HAMBRICK DC	14	VOLBERDA HW	9	VAN DEN BOSC.	8	RUGMAN AM	7	WRIGHT PM	6
MAHONEY JT	12	SNELL SA	9	POWELL TC	8	RAJAGOPALAN N	7	WERNER S	6
CANNELLA AA	12	MCDOUGALL P.	9	MACMILLAN IC	8	OVIATT BM	7	WALTER J	6
BOYD BK	12	IRELAND RD	9	LYLES MA	8	MCGRATH RG	7	STEENSMA HK	6
PRIEM RL	11	HOSKISSON RE	9	KELLERMANNS	8	KAPLAN RS	7	SLEVIN DP	6
HULT GTM	11	COVIN JG	9	WESTPHAL JD	7	GREENWOOD R	7	SIMSEK Z	6
FLOYD SW	11	CARPENTER M.	9	THOMAS H	7	COMBS JG	7	SHIMIZU K	6
WIERSEMA MF	10	BERGH DD	9	SIRMON DG	7	BETTIS RA	7	SAPIENZA HJ	6

Source**:** Own elaboration with data of Web of Knowledge

ISSN 2394 - 7780

Grupo	1	2	3	4
Color	Rojo	Verde	Azul	Amarillo

Figure 3: Density mapof co-citation by author
Source: Based on data from ISI Web of Knowledge and software VOSviewer

Table 4: Co-citations per author per group

Grupo	No. de ocurrencias	Autor
1	68	Nelson RR-EVOLUTIONARY THEORY-1982-0
1	65	AMIT R-STRATEGIC MANAGE J-1993-14
1	64	LEONARDBARTON D-STRATEGIC MANAGE J-1992-13
1	64	WERNERFELT B-STRATEGIC MANAGE J-1984-5
1	63	MAHONEY JT-STRATEGIC MANAGE J-1992-13
1	62	Coase RH-ECONOMICA-NEW SER-1937-4
1	62	Schumpeter J. A.-THEORY EC DEV-1934-0
1	62	BARNEY J-J MANAGE-1991-17
1	62	Teece DJ-STRATEGIC MANAGE J-1997-18
1	61	HENDERSON R-STRATEGIC MANAGE J-1994-15
1	61	Cyert R.-BEHAV THEORY FIRM-1963-0
1	59	Rumelt R. P.-COMPETITIVE STRATEGI-1984-0
1	59	Itami Hiroyuki-MOBILIZING INVISIBLE-1987-0
1	59	Grant RM-STRATEGIC MANAGE J-1996-17
1	59	NELSON RR-STRATEGIC MANAGE J-1991-12
1	58	ZANDER U-ORGAN SCI-1995-6
1	58	TEECE DJ-RES POLICY-1986-15
1	57	Clark K. B.-PRODUCT DEV PERFORMA-1991-0
1	57	Leonard-Barton D.-WELLSPRINGS KNOWLEDG-1995-0
1	57	Szulanski G-STRATEGIC MANAGE J-1996-17
1	56	Kogut B-ORGAN SCI-1996-7
1	54	FREDRICKSON JW-ACAD MANAGE J-1984-27
1	54	WERNERFELT B-AM ECON REV-1988-78
1	54	MILGROM P-AM ECON REV-1990-80
1	53	Rosenberg Nathan-INSIDE BLACK BOX TEC-1982-0
1	52	Baumol W.J.-CONTESTABLE MARKETS-1982-0
1	50	FAMA EF-J POLIT ECON-1980-88
1	46	Womack J. P.-MACHINE CHANGED WORL-1991-0
1	44	Helfat CE-STRATEGIC MANAGE J-2000-21
1	42	Kim L-ORGAN SCI-1998-9
2	67	LEVITT B-ANNU REV SOCIOL-1988-14
2	66	DIERICKX I-MANAGE SCI-1989-35
2	65	Williamson O.E.-MARKETS HIERARCHIES-1975-0
2	65	PRAHALAD CK-HARVARD BUS REV-1990-68
2	64	COHEN WM-ADMIN SCI QUART-1990-35
2	63	HANNAN MT-AM SOCIOL REV-1984-49
2	63	Thompson J.-ORG ACTION-1967-0
2	62	Argyris C.-ORG LEARNING-1978-0
2	62	March JG-ORGAN SCI-1991-2
2	61	LEVINTHAL D-J ECON BEHAV ORGAN-1981-2
2	60	Weick K.E.-SOCIAL PSYCHOL ORG-1979-0
2	59	Huber GP-ORGAN SCI-1991-2
2	56	DAVID PA-AM ECON REV-1985-75
2	54	COHEN WM-ECON J-1989-99
2	51	STALK G-HARVARD BUS REV-1992-70
2	45	HERRIOTT SR-AM ECON REV-1985-75
2	42	SENGE P-5TH DISCIPLINE ART P-1990-0
2	39	Lorange P-CORPORATE PLANNING E-1980-0
2	37	Simon Herbert A.-ORGANIZATIONS-1993-0
2	35	Schonberger R.-BUILDING CHAIN CUSTO-1990-0
2	33	Wehrung D.A.-TAKING RISKS MANAGEM-1986-0
3	92	BARNEY JB-ACAD MANAGE REV-1990-15
3	68	Penrose E.-THEORY GROWTH FIRM-1959-0
3	67	BARNEY JB-ACAD MANAGE REV-1986-11
3	67	PETERAF MA-STRATEGIC MANAGE J-1993-14
3	67	Porter ME-COMPETITIVE STRATEGY-1980-0
3	64	RUMELT RP-STRATEGIC MANAGE J-1991-12
3	64	Williamson O. E.-EC I CAPITALISM-1985-0
3	62	Pfeffer J.-EXTERNAL CONTROL ORG-1978-0
3	62	Miles R.-ORG STRATEGY STRUCTU-1978-0
3	53	Stinchcombe A.-HDB ORG-1965-0
3	30	Zucker L.G.-RES ORGAN BEHAV-1986-8
3	21	DiMaggio P.-NEW I ORG ANAL-1991-0
4	56	PISANO GP-STRATEGIC MANAGE J-1994-15

Source: Own elaboration with data from software VOSviewer

With regard to the main issues discussed at SM during the period of this study in the following graphs it can be seen what are these and its interface based on the analysis of keywords, the red areas being those where the greatest impact is concentrated. Further presents the corresponding correlation matrix.

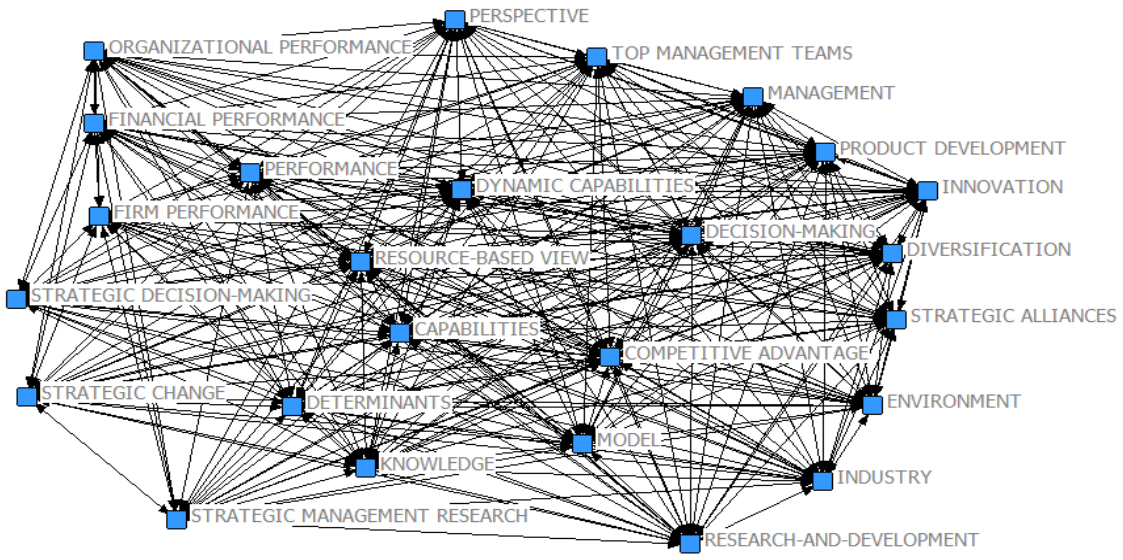

Figure 4.Networkkeywords used most frequently
Source: Based on data from software Sitkis and Netdraw.

ISSN 2394 - 7780

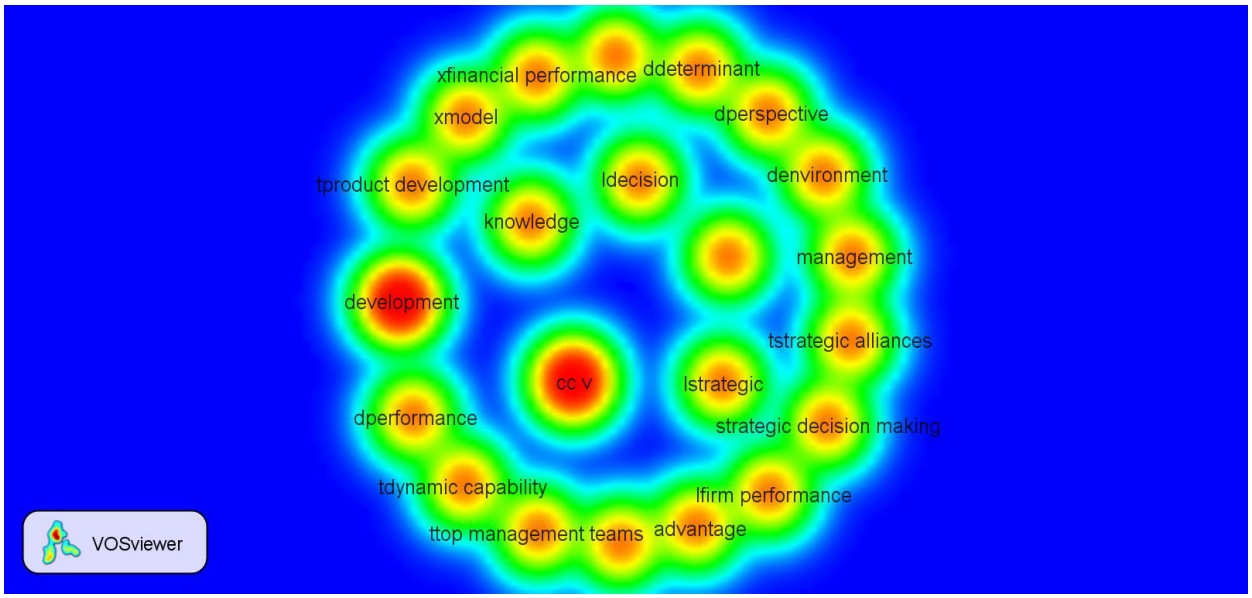

Figure 5.Map of density of keywords used most frequently.
Source: Based on data Ucitec- Netdraw and VOS viewer software.

Table 5: Correlation matrix of the keywords used most frequently

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 CAPABILITIES	0	34	1	5	2	7	3	17	15	33	20	23	4	5	30	11	11	7	38	10	5	1	9	4	0
2 COMPETITIVE ADVANTAGE	34	0	9	14	10	71	10	72	47	50	34	62	28	22	90	36	30	26	143	42	11	6	26	4	21
3 DECISION-MAKING	1	9	0	3	5	6	6	21	9	2	2	19	8	11	27	4	2	3	7	2	6	0	6	10	6
4 DETERMINANTS	5	14	3	0	4	1	8	15	13	5	2	18	13	8	28	6	0	4	8	8	2	10	3	6	6
5 DIVERSIFICATION	2	10	5	4	0	2	8	20	14	4	7	18	6	6	34	6	2	4	19	0	4	2	8	3	3
6 DYNAMIC CAPABILITIES	7	71	6	1	2	0	0	35	14	32	31	18	9	11	46	16	24	20	85	19	9	4	14	5	2
7 ENVIRONMENT	3	10	6	8	8	0	0	19	11	14	0	26	10	10	38	7	2	0	4	1	6	10	2	11	9
8 FIRM PERFORMANCE	17	72	21	15	20	35	19	0	36	20	15	43	16	47	12	19	15	9	54	11	25	22	20	33	42
9 INDUSTRY	15	47	9	13	14	14	11	36	0	23	13	48	22	24	64	19	3	2	30	18	16	5	8	9	11
10 INNOVATION	33	50	2	5	4	32	14	20	23	0	30	44	20	10	64	27	24	20	24	31	6	4	10	6	7
11 KNOWLEDGE	20	34	2	2	7	31	0	15	13	30	0	29	15	3	46	11	14	7	32	23	6	3	6	3	1
12 MANAGEMENT	23	62	19	18	18	18	26	43	48	44	29	0	52	30	139	39	14	13	36	42	34	18	1	2	23
13 MODEL	4	28	8	13	6	9	10	16	22	20	15	52	0	14	64	12	6	4	16	6	10	9	5	6	3
14 ORGANIZATIONAL PERFORMANCE	5	22	11	8	6	11	10	47	24	10	3	30	14	0	7	5	3	4	16	2	12	17	7	18	23
15 PERFORMANCE	30	90	27	28	34	46	38	12	64	64	46	139	64	7	0	49	25	14	74	53	25	25	22	28	3
16 PERSPECTIVE	11	36	4	6	6	16	7	19	19	27	11	39	12	5	49	0	9	5	24	19	10	6	5	7	8
17 PRODUCT DEVELOPMENT	11	30	2	0	2	24	2	15	3	24	14	14	6	3	25	9	0	19	14	14	4	2	5	1	2
18 RESEARCH-AND-DEVELOPMENT	7	26	3	4	4	20	0	9	2	20	7	13	4	4	14	5	19	0	18	13	4	5	4	3	4
19 RESOURCE-BASED VIEW	38	143	7	8	19	85	4	54	30	24	32	36	16	16	74	24	14	18	0	18	2	7	42	3	12
20 STRATEGIC ALLIANCES	10	42	2	8	0	19	1	11	18	31	23	42	6	2	53	19	14	13	18	0	0	0	0	3	0
21 STRATEGIC CHANGE	5	11	6	2	4	9	6	25	16	6	6	34	10	12	25	10	4	4	2	0	0	0	1	9	7
22 STRATEGIC DECISION-MAKING	1	6	0	10	2	4	10	22	5	4	3	18	9	17	25	6	2	5	7	0	0	0	0	17	8
23 STRATEGIC MANAGEMENT RESEARCH	9	26	6	3	8	14	2	20	8	10	6	1	5	7	22	5	5	4	42	0	1	0	0	0	8
24 TOP MANAGEMENT TEAMS	4	4	10	6	3	5	11	33	9	6	3	2	6	18	28	7	1	3	3	3	9	17	0	0	6
25 FINANCIAL PERFORMANCE	0	21	6	6	3	2	9	42	11	7	1	23	3	23	3	8	2	4	12	0	7	8	8	6	0

Source: Own elaboration with data from software Sitkis and Ucinet

According to the data presented by the authors observed that the largest number of publications of all articles analyzed is Ketcheb DJ, MA Hitt, Hambrick DC, Mahoney JT, AA Cannella and Boyd BK. Regarding the authors with more citations regardless of publication year, there are four outcome groups of co-citations analysis to group one, it has to authors such as Nelson, Amit, Wernerfelt, Mahoney, Coase, Schumpeter, Barney, Teece, Grant, etc.

To group two: Levitt, Dierickx, Williamson, Prahaladck, Cohen, Hannan; Group Three: Barney, Penrose, Peteraf, Porter, Rumelt and the group four to Peteraf. Among the most popular topics by reviewing key words, there are the organizational and financial performance, decision making, strategic change, industry analysis, resources and capabilities, dynamic capabilities, innovation, knowledge, research and development, study models, top management, diversification and alliances have been objects of study relevant discipline in the period 1980-2014.

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For the analysis of results, it is necessary to consider as mentioned Tarrats, (2012) a possible bias because only consider the total corpus of publications on SM to those articles published in English. Besides the analysis is based on a number of citations and co-citations that have the articles. Then, for recent publications is logical to assume that the time until now allow even reflect the true impact, moreover suggests that the study of shorter periods to evaluate the change in SM research, to determine the impact of journals not only by the number of publications but by publishing articles that have really contributed knowledge relevant to the discipline.

7. CONCLUSIONS

The development and application of information analysis techniques allow a more concrete vision of the most relevant research, authors and journals, which means a saving of time in the study of the relevant issues of discipline, showing the relationship between authors and lines of research, so it is important to use to accelerate the process of learning and research in a field in which only begins.

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ROLE OF AGGREGATOR IN INDIAN TAXI INDUSTRY

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I. ABSTRACT

The taxi market in India's big metropolitan cities was completely unorganized. It was served either by unorganized, inconsistent and somewhat expensive private operators or by state government controlled pre-paid taxis offering a standardized but low quality service. This was the scenario till 2003. Then about a decade back the concept of 24-hour radio cabs caught up in the country with Delhi-based Mega Corp setting the wheels rolling under the Mega Cabs brand in cities such as Bangalore, Mumbai, Calcutta, Chandigarh, Ludhiana and Amritsar. The Radio cabs business has emerged as one of the fastest growing businesses in the Indian transportation sector. It's booming in a huge way in India with versatile private operators both national and international investing tremendous money in setting up the call centers, acquiring fleet of new cars, incorporating latest technologies in their vehicles.

But the taxi market in India is highly unorganized, only 15% is occupied by the organized sector Radio Taxi operators. The unorganized operators are mostly unprofessional, unreliable and less safe. Against these Radio Taxi's are professional, reliable and safer but majority have a limited number of fleets as compared to the demand, due to these last minutes cancellation rate are very high. In addition to this they offer a single fare option and the booking process is time consuming. These leads to a huge requirement for multiple option taxi and fares with smart & faster booking. This makes an attractive market for taxi aggregators. In aggregator model, the aggregator has a network of partners — either drivers who own and drive a single car, or operators who have a number of cars and drivers on their rolls.

The objectives of the present study are to understand the role of Aggregator in taxi operation, analyze the opportunities and challenges faced by the industry and to offer suggestion to improve the performance.

Keywords: taxi market, radio taxi operators, hue demand, aggregator.

II. INTRODUCTION

Rapid economic growth coupled with huge infrastructure development, rigorous effort from Ministry of Tourism to project India as travel destination and emergence of BPO industry has given a huge push to the car rental industry in India. Till 2003, the point-to-point taxi market in India's big metropolitan cities was completely unorganized. It was served either by unorganized, inconsistent and somewhat expensive private operators or by state government controlled pre-paid taxis offering a standardized but low quality service.

According to the industry sources, unorganized operators dominate about 85% of the market. The car rental industry grew from ` 30bn in FY03 to ` 200bn in FY11 notching up an annual average growth of 30%.The Radio cabs business has emerged as one of the fastest growing businesses in the Indian transportation sector. It's booming in a huge way in India with versatile private operators both national and international investing tremendous money in setting up the call centers, acquiring fleet of new cars, incorporating latest technologies in their vehicles.

The concept of 24-hour radio cabs caught up in the country about a decade back with Delhi-based Mega Corp setting the wheels rolling under the Mega Cabs brand in cities such as Bangalore, Mumbai, Calcutta, Chandigarh, Ludhiana and Amritsar. Today, 15,000 plus professionalized air-conditioned taxis are available to customers in 6 big cities in a largely reliable, convenient and affordable manner.

The organized car rental industry, which is just 15% of the total rental market in India, contributes about 10% or ` 8 bn to the total revenue. Of this, a mere 10% is currently contributed by the self-drive business, 20-25% by leasing of cars and the rest come from chauffeur-driven cars that are largely used by corporate houses. Demand for radio taxis have been soaring in the metros and large cities as MNC executives, tourists, IT sector executives opt for a faster and smoother means of transportation through well maintained radio taxis. Today, radio taxis capitalize on its comfort quotient and availability quotient to attract people even though fares are comparatively higher than normal taxis. The entry of new players like SIXT, Euro car, Thrifty and Dollar over the last one-and-a-half years is expected to bring about a further consolidation in the organized segment.

III. OBJECTIVES OF STUDY

The objectives of the present study are to understand the role of Aggregator in taxi operation, analyze the opportunities and challenges faced by the industry and to offer suggestion to improve the performance.

ISSN 2394 - 7780

IV. RESEARCH METHODOLOGY AND SAMPLE

The study mainly depends on secondary data and the required data were collected from the reports, websites of the companies, books, journals and newspapers, magazines, etc.

V. OPPORTUNITIES FOR THE ORGANIZED SECTOR TAXI OPERATORS IN INDIA

- **Growth in economy & Incomes of Middle Class**

With rapid growth in all sectors, the middle class segment of population is not only growing but has also become wealthier and their disposable income is increasing day by day. Increasing instances of double incomes in most families is a reason for the increase in the spending power. This has given rise to the demand of comfortable and reliable services.

- **Growth in Air & AC class passenger traffic**

Number of people traveling by Air is increasing day by day and mostly, they are the ones who are using this service. In August 2013, domestic air passenger traffic rose to 10.3 million from 8.7 million in August 2012. This translates into a smart 19.2 per cent rise. All the six major airports in India (Mumbai, Delhi, Chennai, Bangalore, Kolkata and Hyderabad) have reported a year by year increase in domestic passenger traffic. The international passenger traffic increased by 14.3 per cent as compared to that in the year-ago month. Similarly in Rail passenger traffic, there is a huge growth in AC class passengers.

- **Low entry barriers**

The cab requirement to launch a Radio cab venture is also very low.

- **Availability of Variety & Cheaper Cab Models**

Indian automotive industry has undergone a massive transformation in the last two decades from being limited to a handful of manufacturer (Hindustan Motor, PAL Maruti) up until 1991 to more than 14 multinational and domestic manufacturer offering a wide variety of Sedan model cars at affordable price. The radio cab sector has been a direct beneficiaries from this. Automakers are eager that radio cab fleet operators select their vehicles and to do so they have started offering discount and operator specific models also. For instance, Maruti Suzuki, offers discounts on some of its models for taxi operators. Toyota Kirloskar Motor Pvt Ltd is planning to offer a compressed natural gas (CNG) based variant of its multi-utility vehicle, the Innova, to radio cab operators.

- **Innovation in Technology**

Global positioning system (GPS) or the General packet radio service (GPRS) based technology have enabled the operators to monitor the cabs on real time basis, make efficient use of cabs and high utilization ratio resulting in good financial performance. The deep penetration of mobile internet helps customer to book cabs online and monitor cabs on real time. The SMS service helps operators to inform the status of cab and driver's information and book cabs.

- **Changing Lifestyle**

Demand for radio cabs is soaring in the metros and large cities as companies, executives, international tourists and affluent Indians opt for traveling in well maintained and modern taxis. They do not mind paying a slightly higher fare to travel in the comfort of air-conditioned taxis.

VI. RADIO CABS' BUSINESS MODELS: SNAPSHOT OF RADIO CABS' BUSINESS

The radio cab business functions on various distinct business models. The Radio Cabs' market works both on pure B2C (Business to Consumer) model i.e, the services are provided directly from the cab company to the customer and B2B (Business to Business) model i.e, the cab company provides its services to the corporations which further provides it to their employees. The companies are becoming more popular and profitable by incorporating "the franchise model". All the cab companies work on the mixed models such as a mixture of

a. Asset Owned Model

b. Franchise Model

c. Attached Vehicle Model

d. Rent-a-Cab Model

ASSET OWNED MODEL

In Company owned cabs model, the cabs are owned by the company and drivers are paid a fixed salary and incentives based on income he generated. This type of model required a huge investment initially. Meru and TABcab are operating on this model.

ISSN 2394 - 7780

FRANCHISE MODEL

In franchise model, the cab driver himself is the cab owner and he is associated with the radio cab company to get the brand name and increase his business. The driver pays certain daily /weekly /monthly fee in return to the radio cab company. Following this model, the radio cab company gets rid of the responsibility of maintenance of the vehicle, and parking area costs and the driver has the incentive to keep his vehicle well-maintained. The fee paid by the franchisees (drivers) is used to train and support the franchisees, market and advertise the brand, improve the quality of goods or services, and widen the market. Benefits for the franchisees (drivers) includes the better chances of getting daily business, higher income, power of a known brand and simultaneously having the options of getting the passengers directly.

ATTACHED VEHICLE MODEL

Each cab associated with the cab company is supposed to get at least some minimum business per day as per the company's norms, for which in return they pay certain fee weekly /daily/ monthly. The vehicle working under such procedure is called "attached vehicle". The cab company promises some minimum fixed number of trips to the cab drivers for the paid duration. To own the attached vehicle, driver has to sign a contract for certain time period with some fixed amount of investment.

RENT-A-CAB MODEL

In this model the cab drivers have to pay a security deposit to the company and he was allotted a cab. The driver is supposed to pay a daily rent to the company of approximately Rs.900 - 1300 per day for the cab depending upon the model of the car and the operator and whatever he earns beyond that belongs to him. He has to pay for the CNG out of his pocket and the maintenance of the vehicle is paid by the cab company itself. If the cab driver wants to avail a leave for a day or so, he is still liable to submit the fee to the cab company and same applies on weekends too. If he happens to take a leave on some particular day, his cab is assigned to somebody else and on returning he is reassigned a cab which might or might not be the same. Therefore the cab drivers have the incentive to work as much as they can even though there is no compulsion from the cab company. On an average they work for 12-15 hours a day. This model is used by Easycab and Priyadarshini Taxi Service.

VII. NEED AND ROLE OF A AGGREGATOR

The taxi market in India is highly unorganized, only 15% is occupied by the organized sector Radio Taxi operators. The unorganized operators are mostly unprofessional, unreliable and less safe. Against these Radio Taxi's are professional, reliable and safer but majority have a limited number of fleets as compared to the demand, due to these last minutes cancellation rate are very high. In addition to this they offer a single fare option and the booking process is time consuming. These leads to a huge requirement for multiple option taxi and fares with smart & faster booking. This makes an attractive market for taxi aggregators. Since 2009, the market has witnessed a compounded annual growth of 41.90% in terms of market revenues.

In aggregator model, the aggregator has a network of partners — either drivers who own and drive a single car, or operators who have a number of cars and drivers on their rolls. Typically, each vehicle in the aggregator's network is fitted with a GPS device that is used for communication and metering and is integrated with the company's IT system. The device cost is paid either by the partner or the aggregator, depending on their business arrangement. The partner has the option to log on to the aggregator's system only when he or she wishes to. Any business obtained from the aggregator is in addition to his or her existing business. A customer can typically book a taxi through multiple channels — the aggregator's website, its call center or through a mobile phone application. The aggregator passes on the customer requirement to its partners. Once a partner accepts a particular request, the passenger and driver details are shared. The driver then reaches the pick-up point at the scheduled time. To the end customer, aggregator is a car rental company. While day-to-day operations and maintenance of vehicles are taken care of by the drivers and operators, all aspects related to technology, branding and marketing are the responsibility of the aggregator. Most companies develop the technology in-house. The aggregator's revenue comes from a commission on every trip that the partners undertake. Currently the commission ranges from around 10% to 20% per trip plus booking charge. The aggregator approach is a "win-win" model, it gives the cab owners access to a wider pool of customers and reliable business in addition to his/her own customers. This allows them to optimize their assets. To the customers, it offers choice, convenience, accurate billing and also a degree of safety since the driver and trip details are registered with the company. The incentives for the driver in the aggregator model are better aligned. The harder he works the more customers he gets and for the customer, there's more access to different brands. The travel sector is taking advantage of rapidly growing mobile penetration and allowing both smartphone and non-smartphone, or feature phone users to book cabs with the help of apps. Presently aggregators, along with

ISSN 2394 - 7780

the radio taxi and car rental companies, are part of an estimated Rs 18,000 crore industry, which is getting rapidly organized and attracting funding from venture capitalists.

VIII. OPPORTUNITIES FOR AGGREGATOR

- Nowadays many radio taxi operators have started charging extra for cab booking via telephone, so users who have access to internet prefer to book cabs online on the website or via mobile app.
- People don't want to pay for unused kilometers, Package deals for luxury cars still remains the order of the day. In most of the cities companies offer a package of Rs 5,500 for 80 km and 8 hours. Aggregator provides these luxury cars on per kilometer basis.
- India's chauffeured transportation market is estimated at Rs 6,000 crore. Though the market is generally price sensitive, Indians are opening up to experimenting with new offerings like self-drives and hiring luxury sedans.
- People prefer to use single site offering multiple options of cars and fares.

IX. MAJOR AGGREGATORS IN TAXI INDUSTRY

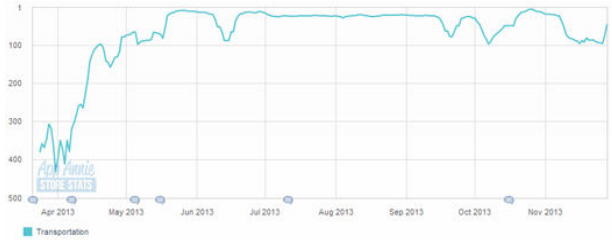
- **TaxiForSure**

TaxiForSure.com is an aggregator of car rentals and taxis providing services in Bangalore, Chennai and Delhi NCR. It is the brand name of Bangalore based Serendipity Infolabs Pvt. Limited and was founded by IIM Ahmedabad graduates Raghunandan G and Aprameya Radhakrishna in June 2011. It works with various taxi operators and enables them with technology to ensure customers get an easily accessible, safe & reliable taxi ride 'for sure'. Customers can book taxis for point-to-point hires, airport transfer taxis, local packages and outstation across various types of car – hatchbacks like Tata Indica, sedan such as Mahindra Logan, Maruti Dzire and Toyata Etios, SUV's like Innova and Xylo and premium cars from BMW, Jaguar and Mercedes by logging on website, calling to call centre and via mobile app's. Its taxi can take one to Agra, Manali, Ooty, Nainital, Mysore, Jaipur, Shimla, Coorg, Wayanad, Shimoga, Tirupati, Bandpur, Coinbatore, Rishikesh, Haridwar, Mussoorie, Dehradun, Alleppey, Mahabalipuram and Pondicherry. The company has partnered with around 25 cab operators in Bangalore and around 15 in Delhi, including branded operators like Mega Cabs and Cell Cabs. It has average 2000 plus bookings per day across Bangalore and Delhi. The company, which claims to have reached operational profitability in Bangalore, has also done its own branding on about 550 cabs. It has 1500+ cabs across India powered by their technology and access to 3000+ cabs across 3 cities and services 3000+ bookings per day. For expansion and growth it has raised $4 million (about Rs 23 crore)in the first round of institutional funding from its seed investors, Accel Partners, Helion Venture Partners and Blume Ventures.

- **TaxiPixi**

TaxiPixi a smartphone based Radio Taxi aggregator for Indian markets is India's first multi-operator taxi booking app. It is a Radio Taxi and Tourist Cab Booking and Monitor Application that allows the customer to send taxi request directly to drivers of multiple Radio Taxi companies - including drivers of Meru Cabs, Mega Cabs, Easy Cabs, Quick Cabs, gCabs, Air Cabs, Super Cabs, Yo! Cabs, Dot Cabs and other companies.

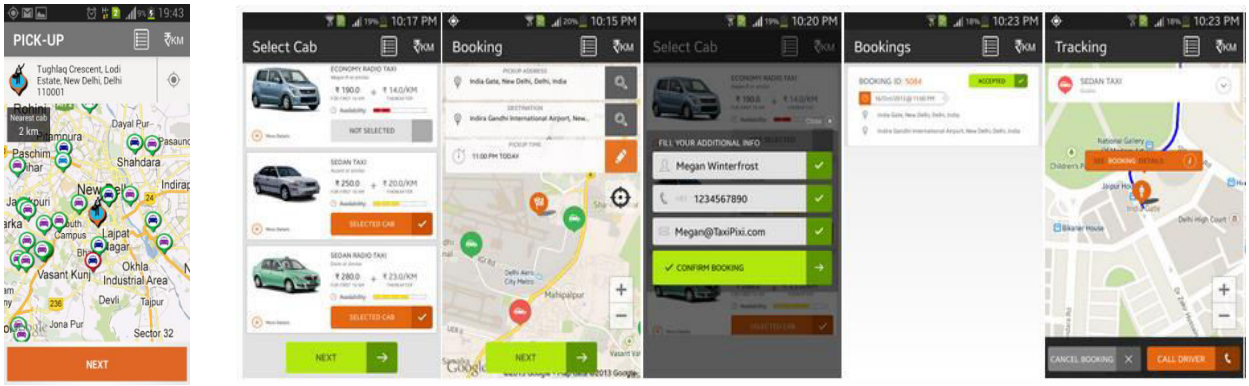
TaxiPixi is currently available only for Android but shortly versions for other platform, specially iOS, will come. TaxiPixi surpassed the 10,000 downloads mark in August 2013 within 10 weeks of its launch and the service is presently available in Delhi NCR area and Hyderabad.



Source : www.appannie.com

The booking request can be send to 4 different types of taxis at once – Economy, Economy Plus, Regular and Premium. As soon as any driver accepts your booking, it sends the customer an instant notification along with all the driver and cab details. Customer can also track your driver and cab in real-time as it approaches. Booking a taxi from TaxiPixi app is very easy and fast and could be done in just 15-30 seconds on Wi-fi and 3G.

ISSN 2394 - 7780



TaxiPixi does not determine the fares. TaxiPixi is simply a quick and convenient booking platform for Taxis. TaxiPixi requires cab drivers to own a smartphone to receive job leads. Drivers pay a small fees of INR 1,000 ($20) to join the platform. Drivers also pay nominal monthly subscription fees of INR 250 ($5). Receiving job leads is free for drivers. TaxiPixi charge customer convenience fees of INR 50 per booking.

- **Olacabs**

Olacabs, the Mumbai based online aggregator was founded in January 2011 by IIT Bombay alumni Bhavish Aggarwal and Ankit Bhati. It provides point-to-point services within a city, hour-based rental services and bookings for outstation travel. It is in operations in 4 more cities including Mumbai, Delhi NCR, Bangalore, Pune and Chennai with over 6,000 cabs. It has plans to expand its services in Chandigarh, Ahmedabad and Nagpur by end of this year. It has tied up with around 1500 operators across these cities and has also partnered with OTAs like GoIbibo, MakeMyTrip, ClearTrip, etc. Olacabs was India's first smartphone-enabled cab service provided via its iOS and Android app, that helps a customer call for a taxi and track it till it reaches its destination. The smartphone application enables customer booking information, provides all the necessary details like the name of the cab, driver and vehicle number, distance from the user's location, expected time taken to reach the location as well as tracks and shows the real time movement of the cab from its location to the location of the customer, on a map.

Olacabs had raised USD 3.2 Mn in series B funding from Tiger Global in July for expansion. Olacabs is now in the process of finalising a second round of funding that could be as much as $20 million, fromits existing investor Tiger Global and also from Matrix Partners. It will be primarily used to expand into newer markets and scale up their technology infrastructure. Olacabs had recently launched "Ola Luxury," a premium car hire service. The company's luxury fleet includes Jaguar, Mercedes, Camry and other premium cars. The startup is charging Rs 20 per kilometers for premium cars**.**

- **Uber**

Uber, the San Francisco based online taxi aggregator firm recently started operation in Bangalore and Delhi. It started operation in Bangalore on August 2013 and after six weeks in Delhi. It is a high-end cab service, where users can summon a cab instantly from an app on their phones. The app would give customer details of the nearest cab and an estimated ETA. The current fleet of cars in Delhi includes a mix of Toyota Camry, Honda Accord, Mercedes E and S class, BMW 3 and 5 Series and Audi Q3, A4 and A6.Uber is present in more than 45 cities in 19 countries with new cities being added almost on a weekly basis has raised $361 million from Google Ventures, TPG and other investors valuing the company at $3.5 billion. Users are charged Rs 20 per kilometre and Rs 2 per minute for waiting. The minimum fare is Rs 200 and are uniform across all the cars. Uber's USP is also its technology platform that connects riders to drivers though its apps. The Uber app allows customer to book a luxury ride with a tap on his smartphone and also track the arrival of your car. The promise is that the car will arrive in less than 15 minutes. The credit card on file is charged at the end of the ride and customer will get an email receipt detailing the trip.

- **Bookmycab**

Bookmycab.com is run by LiveMinds Solutions, an initiative of IIT Mumbai alumni is the first taxi service operator Mumbai and possibly in India to launch metered Black & Yellow (non-air conditioned) taxis as well as metered Cool Cab (Air conditioned) as Radio Taxis licensed by State Transport Authority, Maharashtra. Bookmycab.com provides taxi for Local Travel, i.e., Point to Point, fixed - route, Airport Transfer, Railway Station Transfer using Non-Ac and AC Metered Taxi which includes models like Santro, EECO, Swift Dzire, Wagon R etc. Bookmycab.com is a leading provider of the most affordable radio taxi service and customer can

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book taxi by calling call center or by logging on the website. Presently it has over 3000 taxis registered for the service. In 8 months time it had converted 5% of unorganized taxi market in organize in Mumbai.

X. CHALLENGES FOR THE AGGREGATOR

- **Higher Operating Cost**

The operating and infrastructure cost is high.

- **Shortage of Trained Manpower**

There is a huge shortage of trained manpower. Good people are always very hard to find. Since it is based on software, the salary factor is high. Person having experience in this sector is very limited.

- **Customer Retention**

Understanding customers in terms of customer behavior and loyalty is a difficult job. Aggregator need to implement effective customer relation management and loyalty program.

- **Competition in Market**

Competition from unorganized / organized sector taxi operator is another challenge facing by it. Most of the Radio Taxi companys are implementing mobile app for quicker booking. The entry of international players like Uber in India will further fuel the competition.

- **Service Quality**

The company doesn't have control on quality and service of cab & chauffeurs as they don't have 100% control over the vehicles and the chauffeurs. It is a huge pitfalls because it is a very loose model. Aggregator should follow strict rules on quality and service with taxi operators and make surprised checks.

- **Lack of Brand Image**

Getting initial consumer acceptance can be tough because there is a shortage of brand presence.

- **Fear of Shifting of Taxi Operators**

If any new player comes into the market with a lower fee, because there's no commitment from the drivers toward the aggregator, they will just shift and that aggregator would be left high and dry.

- **Latest Technology**

Most of the aggregator have mobile app on Android platform, this leads to selected customer only. Company should work of all available platform like iOS, window etc.

XI. CONCLUSION

According to the industry sources, unorganized taxi operators dominate about 85% of the market. The car rental industry grew from ` 30bn in FY03 to ` 200bn in FY11 notching up an annual average growth of 30%.The Radio cabs business has emerged as one of the fastest growing businesses in the Indian transportation sector. It's booming in a huge way in India with versatile private operators both national and international investing tremendous money in setting up the call centers, acquiring fleet of new cars, incorporating latest technologies in their vehicles. But still the taxi market in India is highly unorganized, only 15% is occupied by the organized sector Radio Taxi operators. These leads to a huge requirement for multiple option taxi and fares with smart & faster booking. This makes an attractive market for taxi aggregators. In aggregator model, the aggregator has a network of partners — either drivers who own and drive a single car, or operators who have a number of cars and drivers on their rolls. Typically, each vehicle in the aggregator's network is fitted with a GPS device that is used for communication and metering and is integrated with the company's IT system. However there are many challenges for the aggregator like higher operating cost, shortage of trained manpower, customer retention, competition, service quality etc. But as the demand for organized taxi services is increasing day by day so is the opportunity for aggregators. So, if aggregators can face these challenges then they are sure to be very successful.

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EVALUATING THE PERFORMANCE OF ALTERNATIVE TECHNIQUES FOR ESTIMATING THE COST OF EQUITY OF THE U.S. UTILITY INDUSTRY

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ABSTRACT
This study compares and contrasts several alternative techniques for evaluating the cost of equity in the U.S utility industry over time periods of five to ten years for the period July 1963 to July 2009. These techniques are the ordinary CAPM beta, the Blume-adjusted beta, the unity beta, the outlier-adjusted beta, the reward beta and the shrunk beta. The purpose of this study is to find the best technique for evaluating the cost of equity where the optimal technique is drawn from those which generate the lowest mean absolute prediction error. The most important result shows that the reward beta within the CAPM is the best method to estimate cost of equity in the U.S utility industry over five years because it produces the lowest mean absolute prediction error (MAE). Additionally, increasing the length of time for estimating the cost of equity does not leads to obtaining more precise results for evaluating the cost of equity.

Keywords: cost of equity, utility, CAPM, Three-factor model

1. Introduction

The goal of this research is to compare and contrast several alternative techniques for estimating the cost of equity in the United States utility industry over the period July 1963 to July 2009. These techniques are the ordinary least square (OLS) beta, the Blume-adjusted beta, the outlier-adjusted beta (10% trimmed beta), the shrunk beta, the reward beta and the constant beta in the capital asset pricing model (CAPM). Then, the best technique for estimating the cost of equity will be determined. As a component of the cost of capital, the cost of equity plays a crucial role in financial decision-making, and has a role in project evaluation and capital budgeting. The cost of equity is also used by regulators in Australia and in many other countries to set allowable prices that can be charged for the use of billions of dollars of infrastructure for the supply of gas, water, electricity and other utilities. The CAPM is the most widely used method by practitioners to estimate the cost of equity. The CAPM is also used in applications, especially in evaluating portfolio performance and cost of equity for corporations (Fama & French, 2004).

There is debate whether the CAPM is a consistent model to estimate the cost of equity or not. A number of researchers argue that the CAPM does not provide precise results because it depends on OLS beta and beta is always biased downward (Homaifar & Graddy, 1991). Therefore, they propose that the CAPM should not be used. However, the CAPM is an essential model associated with the expected return on a portfolio and individual securities using systematic risk (beta) which led other researchers to suggest modifying and developing the CAPM (Homaifar & Graddy, 1991). Beta assessment represents a crucial step in evaluating the cost of equity capital for a company and evaluating the cost of equity is employed in business valuations (Ronchetti & Genton, 2008). In addition, portfolio managers use beta assessment to achieve high profits and to minimize the risk (Ronchetti & Genton, 2008). Beta evaluations are also used to create portfolios that diversify the risk and returns (Ibbotson, Kaplan, & Peterson, 1997). Furthermore, the increasing need for beta forecasts comes from the increasing use of beta. Two methods have been employed by practitioners for calculating the beta estimates: the first is to estimate beta from historical data, and the second method is to estimate beta by using investment advisory services (Harrington, 1983).

Therefore, for all of these reasons, the current study puts forward a modified the CAPM which focused on improving beta and compared and contrasted the alternative techniques. These techniques are the ordinary CAPM beta, the Blume-adjusted beta, the outlier-adjusted beta (10% trimmed beta) the shrunk beta, the reward beta and the constant beta to find the best method for estimating the cost of equity in the U.S utility industry.

This study makes the following contributions: Firstly, It proposes new methods for estimating the utility industry's cost of equity that produce significantly better estimates than current CAPM practice produces. CE estimates based on the reward beta reduce MAE by a significant 21.7% relative to estimates based on the OLS beta. CE estimates based on the Shrunk10 beta reduce MAE by a significant 16.3% relative to estimates based on the OLS beta. Secondly, It provides new evidence that values of the utility industry's OLS beta are not positively related to the industry's cost of equity over the following five-year forecast period. The positive linear transformation of the OLS beta that minimizes MAE in the sample is simply the value of 0.954. The value of the OLS beta is ignored. Thirdly, It identifies that there is not a book-to-market effect at the industry

ISSN 2394 - 7780

level for industries with large average firm size, even though there is a book-to-market effect amongst large firms. Finally, It introduces a new methodology for assessing the predictive ability of cost of equity estimates that is more realistic and that is more aligned with the how CE estimates are used by practitioners. Previous studies test the CE estimates that would be available if the user could perfectly predict future market returns.

2. LITERATURE REVIEW

2.1 THE CAPITAL ASSET PRICING MODEL (CAPM)

The CAPM model is a one-period model developed by Sharpe (1964) and Lintner (1965) that relates the expected return on an asset or security to its systematic risk. The CAPM model for security *i* can be written:

$$E[R_i] = R_F + \beta_i\left(E[R_m] - R_F\right)$$

where:

$E[R_i]$ is the expected return of security *i*;

R_F is the risk-free rate;

β_i is the CAPM beta of security *i*, where $\beta_i = \text{cov}(R_i, R_m) / \text{var}(R_m)$; and

$\left(E[R_m] - R_F\right)$ is the market risk premium.

A number of additional assumptions are needed to extend the model to the multi-period setting that is needed in practice. The beta coefficient in the CAPM is generally computed as the slope coefficient estimate in a regression using ordinary least squares (OLS). This beta estimate will be denoted the OLS beta in this study. The regression typically involves regressing the security's excess returns on the chosen market proxy's excess returns. OLS is widely used among practitioners and the academic sector to estimate the CAPM beta (Martin & Simin, 1999). Sharp (1964) and Lintner (1965) showed that there is a positive relationship between a security's beta and its expected return. However, the next section presents early empirical evidence that CAPM has some issues and discusses potential solutions to improve the CAPM performance.

2.2 EARLY CAPM TESTS AND ANOMALIES

Blume (1970) suggested a new technique for testing the CAPM based on portfolios of stocks. He first sorted individual securities into portfolios based on the values of the securities' estimated betas, and it was these portfolios that were then used in tests of the CAPM. This sorting method became standard in many later empirical tests of the CAPM, including in the landmark paper of Fama and French (1992). Using this technique in a cross-sectional regression of average return on market beta reduces the estimated CAPM's errors in variable problem, thus improving the precision of the estimated beta.

Black (1972) investigated the assumptions behind the CAPM and provided a variation on the CAPM that did not assume the existence of a risk-free asset. Black (1972) also showed that using a market proxy instead of the actual market portfolio leads to increased model specification errors. The empirical evidence presented by Black (1972) suggested that the relationship between average returns and the OLS beta (the empirical market line) is flat. This relationship was justified by the no risk-free asset assumption, and is consistent with Blume and Friend's (1973) results. Blume and Friend (1973) justified a flat relationship as the result of a violation of another assumption related to borrowing and lending.

Fama and MacBeth (1973) investigated the relationship between risk and average returns for stocks listed on the NYSE. A key contribution of their study was that they suggested a new statistical technique to solve the problem caused by the correlation of the residual in cross-section regressions. Instead of evaluating a single cross-section regression of average monthly return on betas, they estimated month-by-month cross-section regressions of monthly returns on beta. Their technique is still widely used to this day. However, its weakness is that it assumes that the coefficient evaluated every period is taken from a stationary distribution. Fluctuations in the level of the independent variables over time can lead to this assumption being invalidated (Chan, Hamao, & Lakonishok, 1991). Although the Fama and MacBeth (1973) study appeared to present persuasive evidence for the CAPM, this is mainly due to their study not including CAPM anomalies such as the size that only became known after the 1970s.

Brigham and Crum (1977) proposed that the CAPM produces downward biased beta estimates. This problem especially appears when the firms suffer from fundamental changes in their financial structure and systematic risk positions but the same time the expected returns of firm are still constant and do not increase to compensate

ISSN 2394 - 7780

for this rise in risk. Therefore, the cost of equity estimates will be too small. As a result, estimating the cost of equity by using beta to measure the risk may provide misleading results. They proved and demonstrated this point by providing examples during the period 1964 to 1975, where public utilities such as telephone and electronic firms declined in betas. Overall, they recommend that caution should be taken in using the OLS beta in the CAPM to produce cost of equity estimates in utility rate cases.

2.3 RECENT EMPIRICAL EVIDENCE

The importance of Fama and French's (1997) study to this paper is that they compared techniques for estimating *industry* cost of equity. They compared the CAPM with their three-factor model using of 48 US industry returns for the period. These industry returns were derived from portfolios of NYSE, AMEX and NASDAQ stocks from July 1963 to 1994. Their method involved rolling OLS betas for the CAPM and conditional and unconditional estimates of the three-factor model to generate a variety of industry cost of equity estimates. As noted in section 2.4.2, Fama and French (1997) also applied the Bayes shrinkage technique of Blattberg and George (1991). This technique was used to improve the rolling regression slopes by shrinking them toward unity. Overall, their results found that the CAPM based on OLS betas and the various versions of the three-factor model all produced poor estimates of industry cost of equity. The three-factor model produced, at best, only marginally better cost of equity estimates in terms of predictive ability. Moreover, the different versions of the three-factor model often produced wildly different cost of equity estimates.

In short, the results presented in Fama and French (1997) did not provide sufficient justification for recommending that practitioners should switch from the CAPM to the three-factor model when estimating industry cost of equity. Maybe this helps explain why the three-factor model is rarely used by practitioners to estimate the cost of equity.

Ibbotson, Kaplan and Peterson (1997) proposed a new adjusted beta to overcome their observation that OLS betas tend to be biased downwards for small firms. They documented that OLS betas of small firms are biased downwards while their adjusted betas are more precise and generate a better predictor of future returns for these firms. Although these results seem inconsistent with Chan and Lakonishok's (1993) findings, the methodology of these two studies are quite different. Chan and Lakonishok (1993) assess beta estimates over an initial 3 year period and then re-compute them over the subsequent 3 years using Fama-MacBeth regressions, while Ibbotson et al. (1997) evaluate beta estimates over an initial five year period and then re-calculated them in the five years that follow.

Daves, Ehrhardt and Kunkel (2000) also used the CAPM for evaluating the cost of equity. This study uses four return intervals, based on daily, weekly, two-weekly and monthly returns over the period 1982-1989. Additionally, Daves et al. (2000) used 8 different evaluation period lengths to estimate beta. They found that an estimation period length of three years gives the least standard error compared with other evaluation periods. furthermore, they revealed that estimating beta employing daily returns generate the most precise results. This result is inconsistent with most previous studies, perhaps because the sample period of this study is too short.

Campbell and Vuolteenaho (2004) show that the cross-section of average stock returns was explained by a version of Merton's (1973) ICAPM. Campbell and Vuolteenaho (2004) divided beta into two types to measure risk and expected return. The first beta refers to news about cash flows in the future. If the investors expect that cash flows will decrease in the future, then this will lead to a decrease in beta and vice versa. The second beta refers to news about the discount rate in the market. If the discount rate or cost of capital decreases then this will lead to an increase in beta.

This division is consistent with Campbell, Polk and Vuolteenaho (2010) who divided beta into two group "good beta" and "bad beta". Good beta is related to good news that depends on temporary shocks associated with market discount rate therefore beta is positive and the risk associated with its price is minimal. on the other hand, bad beta will be negative because it depends on permanent cash flow shocks to the market, hence, investors bearing this risk will request high prices. As a result, Campbell and Vuolteenaho (2004) showed that firms that are small value stocks and have a historically low beta will attain more cash flow in the future than larger growth-oriented firms and this result is consistent with Campbell et al. (2010).

Gray et al. (2005) examined alternative techniques for estimating equity beta of Australian firms. These techniques involved the Blume-adjusted beta, the outlier-adjusted beta, the unity beta and an industry beta. They contrasted the performance of these betas with the OLS beta. Gray et al. (2005) estimated beta based on monthly returns and re-estimate them in each quarter between the forth quarter of 1983 and the forth quarter of 2003. The mean square error (MSE) criteria and the percentage of wins is used to compare actual returns to the predicted returns calculated using the competing techniques. They found that the OLS beta is inferior to a

variety of alternative techniques. First, they showed that using the Blume-adjusted beta in the CAPM was better than using the OLS beta in the sense that it provides a lower mean square forecast error. Similarly, Gray et al. (2005) report that the OLS beta is inferior to a beta of unity and an outlier- adjusted beta. Martin and Simin (2003) obtained a similar result with an outlier-adjusted beta outperforming the OLS beta. In addition, the Blume-adjusted beta estimated over a long period does better than a beta of unity (better in the sense of lower mean square forecast error).

Cummins and Phillips (2005) suggested a new methodology based on a full information industry beta (FIB) to evaluate the cost of equity for the property liability insurance industry. Both the CAPM and the Fama- French three-factor model are employed to obtain the cost of equity estimate. They found that the cost of equity estimate for insurance using the OLS beta in the CAPM is significantly lower if based on Fama French's three-factor model. In additon, they showed that the sum of beta estimate is significantly higher than the OLS beta. This study is consistent with results of Fama and French (1997) except for the book to market equity factor. The analysis showed that propriety liability stock returns are much more sensitive to book to market equity than stock in all industries and that book to market equity carries a significant cost of capital punishment for property liability insurance.

Gray et al. (2009) investigated the effect of different estimation period lengths on the performance of the OLS beta in predicting future returns, and included an investigation of the benefits of using the Varsicek (1973) bias correction. They found that the performance of the beta estimates increases with the length of the estimation window and with the Varsicek (1973) bias correction. However, these better performances could not be shown to significantly outperform that which results from the naïve assumption that beta equals one for all stocks. They concluded that caution should be taken when employing all beta estimates that are based solely on historical returns data.

Gregory and Michou (2009) estimated the industry cost of equity capital for 35 U.K industries using several models, including the CAPM, the Fama-French three-factor model, the Cahart four- factor model, and also the R&D model which is considered an extension to the three-factor model and which was developed by AL-Horani, Pope and Stark (2003). The sample extended from 1975 to 2005 and included all companies, both de-listed and listed companies, to reduce the survivorship bias. In addition, an adjusted Newey-West (1987) test was employed to accommodate the overlapping forecast errors.

While the three-factor model marginally outperformed the CAPM in Fama and French's (1997) US industry results, Gregory and Michou's (2009) UK industry results were mixed with the CAPM being preferred in some cases. They report that the three-factor model, especially the SMB and HML factor slopes have significantly fluctuated through time. Conversely, the parameter on the forth R&D factor has predictable power and appears to be comparatively more stable than both SMB and HML slopes coefficients. Gregory and Michou (2009) suggested that adding a fourth factor (momentum) did not improve performance significantly. As a whole, they showed that all models outperformed the simple substitute of assuming that all companies have beta equal to one.

3. RESEARCH DESIGN AND METHODOLOGY

This paper outlines the research design and methodology applied to test the hypotheses developed in the current study. The remainder of this paper is organized as follows: The next section overviews of research design used in this study. Section 3.2 describes the CAPM model and standard CAPM practice, while Section 3.3 introduces some alternative methods for estimating cost of equity. Section 3.4 describes the units of observation and the time frame. Section 3.5 explains the data collection. Section 3.6 describes the selection of the risk-free rate and the selection of the market risk premium estimate. Performance evaluation and measurement is explained in Section 3.7, while Section 3.8 provides the hypotheses developed from the literature review. Section 3.9 summarizes the statistical tests employed in this study. Section 3.10 states the research limitations of the present study. Finally, Section 3.11 presents the concluding comments.

3.1 CAPM-BASED METHODS

This study investigates the out-of-sample performance of the utility industry CE's that result from estimating the CAPM with a number of alternative beta estimators. This section begins by briefly describing the CAPM in notation form, followed by a description of the standard ordinary least squares (OLS) approach to estimating cost of equity using the CAPM.

3.1.1 THE CAPM MODEL

The CAPM model is a one-period model that relates the expected return on an asset or security to its systematic risk. The CAPM model for industry expected returns can be written:

ISSN 2394 - 7780

$$E[R_i] = R_F + \beta_i \left(E[R_m] - R_F \right) , \quad (1)$$

where:

$E[R_i]$ is the expected return of industry *i*;

R_F is the risk-free rate;

β_i is the CAPM β of industry *i*, where $\beta_i = \text{cov}(R_i, R_m) / \text{var}(R_m)$; and

$\left(E[R_m] - R_F \right)$ is the market risk premium.

Although the CAPM is a single-period model, real-world applications of the CAPM are in multi-period settings. As a result, the application of CAPM theory in practice requires users to make a number of implementation decisions:

1. what is the length of the investment period (commonly, users are interested in expected annual returns. Cost of equity is a per annum figure not a per month figure);
2. what is the length of the beta estimation period (usually the most recent five years of monthly data);
3. what is the frequency of data to be used in beta estimation (usually monthly data);
4. what index will be used as the market proxy (usually a value-weighted stock index from the local stock market);
5. what asset will be used as the risk-free asset (commonly, users either use a short-term security like Treasury Bills or a medium-term government bond); and
6. what estimate (call it MRP) of the market risk premium ($E[R_m] - R_F$) will be used (commonly, users adopt some conventional figure between 4% and 8%)?

3.1.2 STANDARD CAPM PRACTICE

As noted above, the standard CAPM beta estimate (also called the OLS beta) is typically estimated by regressing the most recent five years of a security's monthly excess returns on the corresponding monthly excess returns of a value-weighted market index. Let β_{iOLSt} denote this estimator's value for industry *i* at the end of month *t*. It can be written:

$$\beta_{iOLSt} = \frac{\sum_{j=t-59}^{t} (r_{ij}^m - \bar{r}_i^m)(r_{mj}^m - \bar{r}_m^m)}{\sum_{j=t-59}^{t} (r_{mj}^m - \bar{r}_m^m)^2} , \quad (2)$$

where:

$r_{ij}^m = R_{ij}^m - R_{Fj}^m$ is the monthly excess return of industry *i* for month *j*;

$r_{mj}^m = R_{mj}^m - R_{Fj}^m$ is the monthly excess market return for month *j*;

R_{ij}^m is the monthly return of industry *i* for month *j*;

R_{mj}^m is the monthly market return for month *j*; and

R_{Fj}^m is the monthly risk-free rate for month *j*.

The expected industry return in (1) is then estimated using this beta estimate. That is, the OLS beta in (2) is combined with the estimated risk-free rate for the next year (call it R_{Ft+1}), and with the chosen estimate (MRP) of the annual market risk premium to produce the cost of equity estimate for industry *i* at the end of month *t* given by:

$$CE_{iOLSt} = R_{Ft+1} + \beta_{iOLSt} MRP \quad (3)$$

ISSN 2394 - 7780

where CE_{iOLSt} denotes the estimated cost of equity for industry *i* at the end of month t based on the standard OLS beta. In this study, the standard approach to estimating the cost of equity described by (3) is denoted 'CAPM practice' in order to differentiate it from the 'CAPM model' in (1) above and from the alternatives to be discussed below.

Finally, it is important to note that a very common variation on the OLS beta in (2) is to base it on raw returns rather than excess returns. The raw returns OLS beta is written:

$$\beta_{iOLSt} = \frac{\sum_{j=t-59}^{t}(R_{ij}^{m} - \overline{R}_{i}^{m})(R_{mj}^{m} - \overline{R}_{m}^{m})}{\sum_{j=t-59}^{t}(R_{mj}^{m} - \overline{R}_{m}^{m})^{2}}. \quad (4)$$

This study will compare both versions of the OLS beta.

3.2 ALTERNATIVE CE ESTIMATES

This study compares the out-of-sample performance of the utility industry CE based on (3) with the corresponding results from estimating the CAPM with a number of alternative beta estimators. Let β_{igt} denote an estimate of β_i at the end of month *t* calculated using method *g*, where the subscript *g* simply indexes OLS or the various alternative beta estimation methods to be described below (e.g., *g* = OLS, Trimmed, Shrunk5, Shrunk10, Reward, etc.). Replacing the OLS beta in (3) with β_{igt} gives the estimated cost of equity for industry *i* at the end of month *t* using beta estimation method *g* as:

$$CE_{igt} = R_{Ft+1} + \beta_{igt} MRP\ . \quad (5)$$

The following subsections of Section 3.5 describe the alternative beta estimators used in this study.

3.2.1 AN OUTLIER-ADJUSTED BETA

As discussed in the Section 2 there have been a number of different outlier-adjusted beta estimators proposed in the literature. However, the utility industry is a relatively stable industry with large average firm size. Consequently, it is not expected that outlier-adjustment will provide much of an improvement over the standard approach. Nevertheless, one outlier-adjusted beta is included in this study for completeness. This new estimator is called the 10% trimmed beta, and it is motivated by the trimmed mean approach from robust statistics. It is calculated by first discarding the observations that produced the higher and lower 5% from each tail of the cross deviations $(r_{ij}^{m} - \overline{r}_{i}^{m})(r_{mj}^{m} - \overline{r}_{m}^{m})$, and then recalculating beta using (2) with those observations remaining. Since the standard OLS beta is based on 60 monthly observations, this means that the 10% trimmed beta is based on the 54 observations remaining after 6 have been eliminated. The reason that the extremes of the cross deviations are targeted for trimming is because it is clear from (2) that an observation that produces an extreme cross deviation in the denominator of (2) will have a large influence on the standard beta estimate. The 10% trimmed beta estimator for industry *i* at the end of month *t* will be denoted $\beta_{iTrimmedt}$.

3.2.2 THE BLUME-ADJUSTED BETA

The second alternative beta is called the Blume-adjusted beta. A common adjustment to standard betas used by commercial data service providers (Bloomberg, Merrill Lynch) is the following Blume-type beta for industry *i* at the end of month *t*:

$$\beta_{iBlumet} = 0.67 \times \beta_{iOLSt} + 0.33\,. \quad (6)$$

Blume (1975) observed a tendency for OLS beta estimates to mean-revert over time, and the Blume-type beta in (6) follows the general format that Blume (1975) developed. Note that the Blume-adjusted beta is a shrinkage estimator in the sense that it is always closer to one than is the corresponding OLS beta from which it is constructed.

3.2.3 CONSTANT BETA

Given that the utility industry is known to be a relatively low-risk industry, a variety fixed beta values (beta = 0.60, 0.70, 0.80, 0.90 and 1) are included in the study in order to assess whether or not they would have had advantages over the standard approach for this particular industry.

ISSN 2394 - 7780

3.2.4 SHRUNK BETAS

A number of shrinkage estimators have been proposed in the literature. Fama and French (1997) employ a Bayesian shrinkage method that does not produce substantially better industry CE estimates. The Blume-adjusted beta in (6) can also be considered a type of shrinkage estimator because its value is closer to one than is its corresponding OLS beta.

This study introduces two new shrinkage estimators that employ a different method to shrink betas towards one than that used for Blume-adjusted betas. Before describing these new estimators, first recall that the OLS beta β_{iOLSt} is based on 60 months of monthly data ending with month *t*. This calculation is repeated for every month ($t \geq 60$) until the end of the dataset. This means that there are rolling OLS betas available each month beginning with $t = 60$ until the end of the dataset. The new 'shrunk' betas are derived from these rolling OLS betas. The 'Shrunk5' beta for industry *i* at the end of month t (denoted $\beta_{iShrunk5t}$) is the OLS beta from (4) that is closest to one out of all the rolling OLS betas in the last five years up to the end of month *t*. Similarly, the 'Shrunk10' beta for industry *i* at the end of month t (denoted $\beta_{iShrunk10t}$) is the OLS beta from (4) that is closest to one out of all the rolling OLS betas in the last ten years up to the end of month *t*.

These shrunk betas have been designed in part to overcome one of the difficulties standard OLS betas have with estimating the expected returns of those industries (like the utility industry) that are considered 'defensive' by investors. The returns of defensive industries tend to have low correlation with stock market returns in boom periods (perhaps because they are considered too boring), and then, when the stock market busts, these defensive industries tend to come back into fashion as investors seek out safe-havens. That is, the returns of defensive industries tend to do relatively well in stock market busts. This means that there also tends to be a low correlation between the returns of defensive industries and the returns of the stock market during market busts. This low correlation during boom/bust cycles may produce very low OLS beta estimates, even though the boom/bust cycle may have little effect on the future profitability of such industries, and hence may have little effect on the defensive industries' medium-term expected returns. This means that low OLS betas may be particularly poor predictors of the expected returns of defensive industries during, and immediately following, boom/bust cycles. The shrunk betas are designed to produce beta estimates closer to one when current OLS betas deviate further from one than some of their values in the recent past.

3.2.5 REWARD BETA

By rearranging the CAPM in (1), we can see that the CAPM beta can also be written:

$$\beta_i = \frac{E(R_i - R_F)}{E(R_m - R_F)} \tag{7}$$

Borrnholt (2007) calls the representation of the CAPM beta given by (7) the 'reward beta' representation. This representation can be further rearranged:

$$\begin{aligned}\beta_i &= \frac{E(R_i - R_F)}{E(R_m - R_F)} \\ &= \frac{E(R_i - R_F + R_m - R_m)}{E(R_m - R_F)} \\ &= 1 + \frac{E(R_i - R_m)}{E(R_m - R_F)}\end{aligned} \tag{8}$$

The new reward beta estimator used in this study replaces the expected return in the numerator of the ratio in (8) with the corresponding sample averages, and replaces the market risk premium in the denominator with its estimate, MRP. That is, the reward beta estimate for industry *i* at the end of month *t* is given by:

$$\beta_{i\,\mathrm{Re}\,wardt} = 1 + \frac{\overline{R}_{it} - \overline{R}_{mt}}{MRP}, \tag{9}$$

where the sample averages are the averages of the respective rolling annual returns from the start of the sample until the end of the current month *t*. These rolling annual returns are calculated by compounding the respective monthly returns. For example, the annual return of industry *i* at the end of month *k* is given by:

ISSN 2394 - 7780

$$R_{ik} = \left[\prod_{j=k-11}^{k} (1 + R_{ij}^{m}) \right] - 1 \qquad (10)$$

where:

R_{ik} is the annual return of industry *i* for year ending with month *k*; and

R_{ik}^{m} is the monthly return of industry *i* in month *k*.

Note that inserting the reward beta estimate (9) into (5) produces the CE estimate

$$CE_{i\,\mathrm{Re}\,ward\,t} = R_{Ft+1} + MRP + \overline{R}_{it} - \overline{R}_{mt}\,.$$

We can see that the utility cost of equity estimate based on the beta estimate from (9) is simply the risk-free rate plus the estimate of the market risk premium plus the difference between utility industry's past average return and the market's past average return. Note also that the reward beta estimator in (9) differs from the one proposed by Bornholt (2007). He proposed a matching portfolio approach based on size and book-to-market effects. Such an approach is not relevant for estimating the utility industry cost of equity because, as discussed in Section 3.3, there is no book-to-market effect for those US industries such as the utility industry that have a large average firm size.

3.3 UNITS OF OBSERVATION AND TIME FRAME

Following Fama and French (1997), the units of observation are monthly US industry and market returns beginning with July 1963. Annual returns are derived from these by compounding monthly returns as described by (10). The time frame of this study is from July 1963 until the end of December 2009.

3.4 DATA SELECTION

The study uses monthly returns, average firm size, and the value-weighted average firm book-to-market ratio for 48 US industries covering the period from July 1963 to December 2009. The monthly market returns (denoted R_{mt}^{m}) are the monthly returns of the Center for Research Securities Prices' (CRSP) value-weighted US market index of all US stocks. Additionally, the study uses the one-month Treasury bill rates as the risk-free rate (denoted R_{Ft}^{m}) reported at the beginning of each month for the period from July 1963 to December 2009. All this data is downloaded from Kenneth French's website (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). His data has itself been compiled from the well-regarded CRSP database of all US stocks listed on the NYSE, AMEX and NASDAQ exchanges. The study starts from July 1963 because the CRSP database has a less comprehensive coverage of US stocks prior to July 1963. The final sample is composed of 558 monthly returns on each industry, on the market index and the risk-free asset, together with observations on the average firm size and value-weighted average firm book-to-market ratio of each industry.

3.5 THE RISK-FREE RATE AND ESTIMATING THE MARKET RISK PREMIUM

The various competing beta estimators to be used in the CE estimates in (5) have been described in Section 3.5. The two remaining elements of (5) to be described are the annualized risk-free rate (R_{Ft+1}) and the value of MRP (the estimate of the market risk premium). As already stated in Section 3.7, this study uses the one-month Treasury bill rate observed at the beginning of the month as the monthly risk-free rate. For the annualized risk-free rate at the start of month *t*+1, this study annualizes the corresponding monthly rate:

$$R_{Ft+1} = 12 \times R_{Ft+1}^{m}\,. \qquad (11)$$

The selection of an appropriate value for MRP for use in (5) needs to be addressed. Conventionally, users select a value between 4% and 8%. Note that if too small a value is chosen then CE estimates will be too small on average, leading to out-of-sample forecast errors that are positive on average. Similarly, if too high a value is chosen for MRP then CE estimates will be too high on average, leading to forecast errors that are negative on average.

Recall also that an important objective of this study is to investigate if there is a better way to estimate the utility industry CE than standard CAPM practice based on the OLS beta. Thus, to be conservative, this study initially assesses the out-of-sample forecast errors produced by the standard CAPM approach in (3) when used

ISSN 2394 - 7780

in conjunction with a range of possible MRP values (3%, 4%, …, 9%, 10%). The value of MRP which generates an average industry bias (the average across all industries of each industry's average forecast error) that is closest to zero then becomes the MRP used in all subsequent analyses in which alternative CE methods are compared. It is clear then that this method of determining MRP implicitly favours the standard approach involving the OLS beta over the alternative methods. It follows that if strong evidence is reported in Section 4 that an alternative method is better than the standard approach then this evidence has been obtained *in the face of a bias towards the OLS beta* through the method of selection of the value of MRP.

As a final comment on this topic, it is worth observing that the selection of the risk-free asset and the selection of the value for MRP are interrelated decisions. The two traditional choices for the risk-free asset are either Treasury bills or a medium-term government bond. Medium-term bonds tend to have larger returns than Treasury bills, so had a medium-term bond been selected as the risk-free asset then a lower value of MRP would have been appropriate. For this reason, it is not expected that different choices for the risk-free asset would materially change the relative rankings of the various CE estimation methods to be tested in this study. Nevertheless, it is a limitation of this study that other choices for the risk-free asset were not investigated.

3.6 PERFORMANCE EVALUATION

The evaluation of the competing CE estimates (CE_{igt} for various g) from (5) should not ignore the uses to which CE estimates are frequently put by practitioners. Cost of equity estimates are estimates of expected equity return that are predominantly calculated in order to incorporate into an estimate of the cost of capital that is then used to discount future cash flows of projects. Since the length of most projects is at least five years, these CE estimates need to be reasonable estimates of industry expected return over at least the next five years. However, expected returns are unobservable. This means that we need a proxy for expected returns over at least the next five years, and one obvious choice is the average return over the next five years.

Let A_{it}^{5YR} denote the average non-overlapping annual return of industry i over the next five years following month t. It can be written:

$$A_{it}^{5YR} = \frac{1}{5}\left[R_{it+12} + R_{it+24} + R_{it+36} + R_{it+48} + R_{it+60}\right].$$

With A_{it}^{5YR} selected as the proxy for the expected industry return that is relevant to practitioners at the end of month t, we can define industry i's forecast error at the end of month t based on method g as this proxy value minus the CE estimate of method g at the end of month t. That is:

$$e_{igt} = A_{it}^{5YR} - CE_{igt}. \qquad (12)$$

The performance evaluation metrics employed in this study are some of the standard ones employed in many previous studies: mean absolute forecast error (MAE), mean squared forecast error (MSE) and average forecast error (denoted Bias in this study). That is, if method g produces N errors beginning with $t = \tau$ then:

$$Bias_{ig} = \frac{1}{N}\sum_{k=\tau}^{N+\tau-1} e_{igt},$$

$$MAE_{ig} = \frac{1}{N}\sum_{k=\tau}^{N+\tau-1} \left|e_{igk}\right|,$$

$$MSE_{ig} = \frac{1}{N}\sum_{k=\tau}^{N+\tau-1} e_{igk}^2,$$

where:

$Bias_{ig}$ is average forecast error. It is an estimate of the expected error of method g for industry i;

MAE_{ig} is mean absolute forecast error of method g for industry i; and

MSE_{ig} is mean squared forecast error of method g for industry i.

The forecast error methodology in (12) differs in an important respect from the methodology used by many earlier studies. Fama and French (1997), Gregory and Michou (2009), Gray et al. (2009) and many earlier studies did not evaluate feasible CE estimates. Instead, these studies' out-of-sample CE estimates combined

ISSN 2394 - 7780

beta estimates at time *t* with future market returns to produce their CE estimates. Such CE estimates are never available to practitioners because nobody has a crystal ball that can predict future market returns perfectly.

3.7 HYPOTHESIS STUDY DEVELOPMENT

The standard OLS CAPM beta technique depends on the historical relationship between stock returns and the markets' returns to predict future expected returns. However, future activities might not reflect unusual trading events that may have happened during the historical evaluation period. Therefore, the relationship between stock returns and the markets returns, if estimated with the standard OLS beta, is likely to be very imprecise Gray et al. (2005). It is possible that other beta estimation methods will produce beta estimates that are better in the forward-looking sense needed by the users of cost of equity estimates. This study will first test if the Blume-adjusted beta produces better estimates of the utility cost of equity. This leads to the first proposed alternative hypostudy:

H1: Utility industry cost of equity estimates based on the Blume-adjusted beta have a different mean absolute forecast error than the cost of equity estimates that are based on the standard OLS beta.

Using an outlier-adjusted beta is another technique to be investigated in this research. Gray et al. (2005) found that eliminating outliers increases the precision of the equity beta estimates. Martin and Simin (2003) showed that the OLS beta fails to reflect the optimal evaluation of the expected returns or cost of equity, especially when unusual events happen in equity returns or market returns. Therefore, it is posited that:

H2: Utility industry cost of equity estimates based on the 10% trimmed beta have a different mean absolute forecast error than the cost of equity estimates that are based on the standard OLS beta.

Fama and MacBeth (1973) pointed out that portfolio betas more than one tend to be higher than the correct beta. On the contrary, portfolio betas less than one tend to be lower than the correct portfolio beta. This suggests for a general industry constant beta estimate equal to one may be worth investigating. However, given that the utility industry is known to be a relatively low-risk industry, several constant betas less than one are also worth investigating. This leads to the next hypostudy.

H3: Utility industry cost of equity estimates based on a constant beta (0.60, 0.70, 0.80, 0.90 or 1) have a different mean absolute forecast error than the cost of equity estimates that are based on the standard OLS beta.

The shrunk5 beta estimate is a new shrinkage estimator developed for this study. Therefore, it is posited that:

H4: Utility industry cost of equity estimates based on the shrunk5 beta have a different mean absolute forecast error than the cost of equity estimates that are based on the standard OLS beta.

The shrunk10 beta is another new shrinkage estimator developed for this study. Therefore, it is posited that:

H5: Utility industry cost of equity estimates based on the shrunk10 have a different mean absolute forecast error than the cost of equity estimates that are based on the standard OLS beta.

Bornholt (2007) presents an alternative method for estimating cost of equity called the reward beta approach. This study develops a new and much-simpler reward beta estimator than that proposed in Bornholt (2007). This leads to the next hypostudy.

H6: Uitility industry cost of equity estimates based on the new reward beta have a different mean absolute forecast error than the cost of equity estimates that are based on the standard OLS beta.

3.8 STATISTICAL TESTS

Gray et al. (2009) use paired *t*-tests to determine whether an alternative beta estimation method produces better CE estimates than those produced by the standard OLS beta. Paired *t*-tests are also adopted in the current study to evaluate the usefulness of alternative utility industry CE estimates. The test tests the null hypostudy that there is no significant difference between the mean absolute forecast error generated by the standard OLS approach and the mean absolute forecast error generated by an alternative CE estimator.

The test can be described formally as follows. Let $\mu(|e_{OLS}|)$ denote the utility industry mean absolute forecast error based on the standard OLS beta, and let $\mu(|e_g|)$ denote the utility industry mean absolute forecast error based on an alternative method *g* ($g \neq \text{OLS}$). Then for each method *g* ($g \neq \text{OLS}$), the test's hypotheses can be formally written:

ISSN 2394 - 7780

$$\textit{Null hypostudy: } \mu(|e_{OLS}|) - \mu(|e_g|) = 0 .$$

$$\textit{Alternative hypostudy: } \mu(|e_{OLS}|) - \mu(|e_g|) \neq 0 .$$

This test is based on the individual absolute forecast error differences (the individual OLS-based absolute forecast errors minus the alternative's contemporaneous absolute forecast errors), and these have a sample average value equal to the difference between the OLS-based MAE and the alternative's MAE. The individual absolute forecast errors are constructed from the forecast errors that are calculated each month as the average utility industry return over the next five years minus the current CE estimate [see equation (12)]. Thus consecutive rolling forecast errors overlap by 59 months, which means that the test's standard errors need to be corrected for serial correlation. This is done by employing the Hansen-Hodrick (1980) correction for serial correlation up to 59 lags.

This paper uses *t*-tests at the 5% level of significance. In other words, an observed *t*-statistic is statistically significant when the *t*-statistic is less than -1.96 or more than $+1.96$.

Although this study uses mean squared error (MSE) as one of its performance measures, no attempt is made to formally test the differences between the MSE's of competing techniques. Such a test would investigate whether the mean of the squared errors differ or not. This possibility is not pursued in this study because such a hypostudy is a test about a particular combination of variance and expected value that seems of little direct relevance. This latter point is derived from the observation that for any random variable *Y*, $E[Y^2] = \text{var}(Y) + (E[Y])^2$.

4. EMPIRICAL FINDINGS

This paper reports the empirical findings and culminates with a performance comparison of several alternative techniques for estimating the utility industry cost of equity. Section 4.2 investigates the potential of the matching portfolio technique as a method to estimate the utility industry's cost of equity. Section 4.3 investigates the average industry biases that result from various market risk premium estimates, and justifies the selection of a 7% market risk premium estimate for subsequent analyses. Section 4.4 compares the performances of some variations of standard CAPM practice involving estimation period lengths other than five years and compares the performance of the raw returns OLS beta with the excess returns OLS beta. Section 4.5 reports the performance outcomes of the various alternative techniques for estimating the utility industry cost of equity.

4.1 MATCHING PORTFOLIOS: INDUSTRY SIZE AND BOOK-TO-MARKET EFFECTS

The discussion in Section 3.3 raised the possibility that industry size and book-to-market effects could be incorporated into industry cost of equity estimates through the use of a matching portfolio approach. This section investigates the viability of such an approach using the data on 48 US industries described in the last chapter. Table 1 reports industry summary statistics over the period July 1963 to December 2009 for these 48 industries, together with summary statistics for the US market proxy (the CRSP value-weighted US market index) in the last row. The OLS beta value for each industry is the excess returns OLS beta calculated using all the monthly observations in the sample.

The utility industry statistics indicate that this industry has only marginally smaller average returns than the market's average returns (0.82% per month versus 0.87% per month), suggesting a beta value averaging slightly less than one would have been appropriate. In contrast, the utility industry's estimated beta using OLS equals just 0.54. These results suggest that the OLS beta may lead to downwardly-biased CE estimates for the utility industry, and this possibility is investigated in later sections of this chapter.

Table 1: Industry Summary Statistics

This table reports mean monthly returns, the standard deviation of monthly returns, the number of monthly observations, the full-period OLS beta, the mean of the value-weighted average firm book-to-market equity (BE/ME), and the mean of average firm size (ME) for each industry over the period July 1963 to December 2009. The final row contains summary statistics for the CRSP value-weighted market index (VW Index).

Industries	Mean	St. Dev.	No. of Obs	OLS beta	BE/ME	ME ($m)
Agric	0.0108	0.063	558	0.85	0.60	598
Food	0.0105	0.045	558	0.70	0.53	1359

ISSN 2394 - 7780

Soda	0.0113	0.067	558	0.87	0.52	1262
Beer	0.0113	0.054	558	0.78	0.52	5959
Smoke	0.0137	0.063	558	0.67	0.52	8722
Toys	0.0080	0.074	558	1.19	0.53	266
Fun	0.0127	0.079	558	1.38	0.58	751
Books	0.0092	0.059	558	1.07	0.48	922
Hshld	0.0091	0.048	558	0.83	0.36	1614
Clths	0.0101	0.066	558	1.13	0.67	355
Hlth	0.0102	0.087	486	1.14	0.58	422
MedEq	0.0112	0.054	558	0.91	0.33	523
Drugs	0.0107	0.051	558	0.81	0.26	1698
Chems	0.0090	0.055	558	1.02	0.60	1306
Rubbr	0.0103	0.062	558	1.09	0.67	236
Txtls	0.0095	0.073	558	1.12	1.08	307
BldMt	0.0094	0.061	558	1.16	0.68	514
Cnstr	0.0100	0.074	558	1.31	0.74	405
Steel	0.0081	0.074	558	1.29	1.12	655
FabPr	0.0059	0.074	558	1.14	0.81	128
Mach	0.0094	0.062	558	1.21	0.64	647
ElcEq	0.0119	0.063	558	1.20	0.50	877
Autos	0.0080	0.068	558	1.11	1.05	1137
Aero	0.0115	0.069	558	1.14	0.73	2634
Ships	0.0093	0.069	558	1.03	0.79	853
Guns	0.0111	0.069	558	0.86	0.81	1382
Gold	0.0110	0.104	558	0.68	0.43	638
Mines	0.0116	0.071	558	1.09	0.69	726

Table 1(cont.)

	Mean	**St. Dev.**	**No. of Obs**	**OLS beta**	**BE/ME**	**ME ($m)**
Coal	0.0149	0.099	558	1.14	0.80	861
Oil	0.0108	0.054	558	0.77	0.73	2081
Utilities	0.0082	0.041	558	0.54	1.00	1518
Telcm	0.0080	0.047	558	0.76	0.82	2798
PerSv	0.0073	0.070	558	1.10	0.52	327
BusSv	0.0112	0.068	558	1.33	0.43	640
Comps	0.0098	0.072	558	1.23	0.36	1451
Chips	0.0100	0.076	558	1.42	0.50	795
LabEq	0.0102	0.073	558	1.34	0.44	331
Paper	0.0094	0.057	558	0.98	0.68	1236
Boxes	0.0098	0.057	558	0.95	0.56	824
Trans	0.0091	0.060	558	1.08	1.13	773

ISSN 2394 - 7780

Whlsl	0.0102	0.058	558	1.09	0.61	338
Rtail	0.0102	0.056	558	1.00	0.51	1222
Meals	0.0116	0.064	558	1.09	0.48	523
Banks	0.0090	0.061	558	1.04	0.77	833
Insur	0.0097	0.058	558	0.95	0.82	1511
RlEst	0.0060	0.077	558	1.19	0.93	199
Fin	0.0113	0.062	558	1.23	0.79	872
Other	0.0059	0.071	558	1.20	0.65	2079
VW Index	0.0087	0.045	558			

Size and book-to-market effects in US stock returns are the basis of the Fama-French three-factor model. The Fama-French size and book-to-market factors of the three-factor model are constructed from six portfolios of US stocks, where the components of each portfolio are determined by each firm's size and book-to-market equity. The returns of these portfolios are freely available from Kenneth French's website, and the average value-weighted annual returns for these six portfolios for the first post-formation year are reported in Panel A of Table 2. A strong book-to-market effect can be seen between the Small stock portfolios. The Small-Low portfolio has an average annual return of 11.41% versus an average return of 19.59% for the Small-High portfolio. A weaker book-to-market effect is also observable between the large stock portfolios.

If there are size and book-to-market effects in *industry* returns then a matching portfolio approach may be of use when estimating industry cost of equity. To investigate for the presence of size and book-to-market effects in industry returns, each of the 48 industries is sorted each month into one of six portfolios based on its size and book-to-market classifications for that month. This portfolio formation procedure has been described in Section 3.3. At the start of each month, industries are designated 'Small' ('Large') if their average firm size at that time is less than (not less than) the median of industry average firm size at that time. At the beginning of July each year, each industry is classified as 'Low', 'Medium', or 'High', depending on whether the industry's value-weighted average firm book-to-market ratio is in the bottom 30%, next 40%, or top 30% of all industries at that time. This book-to-market equity classification is retained for each of the following 11 months. The six size-BE/ME portfolios are then formed each month from the intersection of these two size and three book-to-market industry classifications.

Panel B of Table 2 reports the average value-weighted annual returns for the first post-formation year for these six size-BE/ME portfolios of US industries. We can see a weak book-to-market effect between the Small portfolios. The Small-Low portfolio has an average annual return of 12.74% versus an average return of 14.02% for the Small-High portfolio. The evidence is mixed for the Large portfolios because average returns do not increase monotonically when going from left to right in Panel B. The problem is that Large-Medium has the lowest average return (10.78%). Moreover, the Large-Low average return (11.89%) is only 1.61% smaller than Large-High's average return. There is another problem to be considered. Practitioners typically need cost of equity estimates for use in the discount rate for projects that last five years or more. Consequently, we need to investigate for the presence of industry size and book-to-market effects over much longer periods post-formation than the one year used in Panel B.

Table 2: Industry size and book-to-market effects

The table reports statistics for size and book-to-market portfolios for the period July 1963 to December 2009. Panel A lists the average value-weighted annual returns for the first post-formation year for six size and book-to-market equity portfolios of all US stocks reported by Kenneth French. Panels B, C and D are based on corresponding size and book-to-market equity portfolios of US industries. Industries are classified 'Small' ('Large') if their average firm size that month is less than (not less then) the median of industry average firm size. At the beginning of July each year, each industry is classified as 'Low', 'Medium', or 'High', depending on whether the industry's value-weighted average firm book-to-market ratio is in the bottom 30%, next 40%, or top 30% of all industries at that time. This book-to-market classification is retained for each of the following 11 months. Panel B reports the average value-weighted annual returns for the first post-formation year for the six portfolios of US industries. Panel C reports the five-year average of the value-weighted annual returns for the

ISSN 2394 - 7780

first five post-formation years for the six portfolios of US industries. Panel D lists the number of months the utility industry was a member of each of the six portfolios of US industries.

	Book-to-Market		
	Low	**Medium**	**High**
Panel A: Average annual return over next year			
Small	0.1141	0.1704	0.1959
Large	0.1100	0.1176	0.1445
Panel B: Average annual return over next year			
Small	0.1274	0.1282	0.1402
Large	0.1189	0.1078	0.1350
Panel C: Five-year average annual return over next five years			
Small	0.1149	0.1280	0.1355
Large	0.1151	0.1203	0.1190
Panel D: Frequency of utility industry membership			
Small	0	0	0
Large	36	36	486

Panel C of Table 2 reports the five-year average value-weighted annual return for the first five post-formation years for the six size-BE/ME portfolios of US industries. We can still see a small book-to-market effect between the Small portfolios. The Small-Low portfolio's five-year average return of 11.49% is 2.06% smaller than the five-year average return of Small-High. On the other hand, there is no evidence of a book-to-market effect between the Large portfolios. Going from left to right in Panel C, average returns begin at 11.51%, rise to 12.03%, and then fall to 11.90%.

The absence of evidence of a book-to-market effect between the Large portfolios is particularly important for the utility industry because the utility industry is always classified as Large. Panel D of Table 2 reports the number of months the utility industry was a member of each of the six size-BE/ME portfolios. As can be seen from Panel D, the utility industry's average firm size is such that it is classified into one of the Large portfolios in every month of the sample period. The absence of a medium term book-to-market effect for industries such as the utility industry that are classified as Large suggests that there is little to be gained from pursuing a matching size-BE/ME portfolio approach to estimate the utility industry's CE. Consequently, the matching portfolio approach is not pursued any further in this study.

4.2 SELECTING THE MARKET RISK PREMIUM ESTIMATE

An industry's bias is defined in Section 3.9 as its average forecast error, and one of the determinants of forecast error is the estimate (denoted MRP) of the market risk premium. Let average industry bias denote the average bias of the 48 industries in the sample. Table 3 compares the average bias across all industries that results from choosing market risk premium estimates ranging from 3% to 10% in steps of 1%. In case it matters whether or not OLS betas are calculated from excess returns or from raw returns, the average biases from both cases are provided in the table. The first thing that is clear from Table 3 is that a decision to choose raw returns over excess returns to calculate the OLS beta has no material effect on average bias. As might be expected, the choice of estimate for the market risk premium has a dramatic effect on average industry bias. For instance, an MRP of 3% provides an average bias of 4% per year. This means that using 3% as the estimate of the market risk premium produces cost of equity estimates that are 4% too low on average across all industries. On the other hand, a 10% MRP would produce cost of equity estimates that are 3.3% too high on average across all industries.

Table 3: Average Industry Bias

Average industry bias is the average of the bias of the 48 industries, where bias is average forecast error. For each US industry, forecast error at time *t* is the difference between that industry's average annual return over the following five years and the OLS predicted cost of equity at time *t*. The OLS predicted value for various estimated values of the market risk premium uses rolling OLS beta estimates that are calculated each month (beginning with June 1968) from the most recent five years of past monthly returns. Results are provided based on both excess return and raw return OLS betas.

Market risk premium estimate	**Average Industry Bias**	
	Excess return	**Raw return**

ISSN 2394 - 7780

	OLS beta	OLS beta
0.03	0.040	0.040
0.04	0.030	0.030
0.05	0.019	0.019
0.06	0.009	0.009
0.07	-0.002	-0.002
0.08	-0.012	-0.012
0.09	-0.023	-0.023
0.10	-0.033	-0.033

An MRP of 7% results in the lowest average bias in Table 3, and for this reason henceforth all predictions in this study will be based on using MRP = 0.07. As discussed in Section 3.8, this method of determining a value for MRP is used because it favours CE estimates based on the OLS beta. Such favouritism means that we can rule out the choice of MRP as the likely cause of any evidence of OLS underperformance that we may find in our investigations into alternative CE estimators. In addition, it is comforting to note that an MRP of 7% (in the context of using the annualized Treasury bill rate as the risk-free rate) is a plausible value that practitioners could have selected independently.

4.3 VARIATIONS OF STANDARD CAPM PRACTICE

Standard CAPM practice involves estimating beta with five years of past monthly returns using OLS. Before proceeding to the main test results in the next section, some minor variations of standard CAPM practice are considered first to see if they offer any improvements over the standard approach. In this section we investigate the effect on the performance of the CE estimates that result from varying the estimation period length of the raw return beta estimator and of the excess return beta estimator. Table 4 reports the performance of standard OLS beta estimates based on past returns of varying estimation period lengths ranging from 2 years of past monthly returns to 10 years of past monthly returns, and where these beta estimates are based on excess returns and on raw returns. Performance is measured by mean absolute forecast error (MAE) and by mean square forecast error (MSE). Panel A reports performance for the utility industry, and Panel B lists the performance for all 48 industries.

Regarding alternative estimation lengths, visual inspection of both panels of the Table shows that the length of time used to estimate betas has almost no impact on either MAE or MSE. The effects observed are so slight that formal testing is not undertaken.

Table 4: Performance of various OLS beta estimates

The table reports the performance of standard OLS beta estimates based on past returns of varying estimation period lengths ranging from 2 years of past monthly returns to 10 years of past monthly returns, and where these beta estimates are based on excess returns and on raw returns. Performance is measured by mean absolute forecast error (MAE) and by mean square forecast error (MSE). Forecast error at time *t* for a particular OLS beta estimator is the difference between the average annual return over the following five years and the CAPM method cost of equity prediction at time *t* for that particular beta. Panel *A* reports performance for the utility industry, and Panel *B* lists the performance for all 48 industries.

	MAE		MSE	
Estimation length	**Excess return OLS beta**	**Raw return OLS beta**	**Excess return OLS beta**	**Raw return OLS beta**
Panel A : Utility industry				
2-years	0.0461	0.0460	0.00339	0.00338
3-years	0.0458	0.0457	0.00355	0.00354
4-years	0.0470	0.0469	0.00368	0.00366
5-years	0.0473	0.0472	0.00369	0.00368
6-years	0.0467	0.0467	0.00362	0.00361
7-years	0.0461	0.0461	0.00354	0.00353
8-years	0.0458	0.0458	0.00348	0.00347
9-years	0.0455	0.0455	0.00344	0.00342
10-years	0.0451	0.0451	0.00338	0.00337

ISSN 2394 - 7780

Panel B: 48 Industries Average

2-years	0.0801	0.0801	0.0112	0.0112
3-years	0.0796	0.0796	0.0111	0.0111
4-years	0.0791	0.0791	0.0110	0.0110
5-years	0.0787	0.0787	0.0109	0.0109
6-years	0.0784	0.0784	0.0108	0.0108
7-years	0.0781	0.0780	0.0107	0.0107
8-years	0.0779	0.0778	0.0106	0.0106
9-years	0.0776	0.0776	0.0105	0.0105
10-years	0.0774	0.0773	0.0104	0.0104

Similarly, there are no material differences in either MAE or MSE between the results from the raw returns beta and the results from excess returns beta. Recall that the conventional CAPM beta estimate is based on five years of monthly returns. Given that Table 4 shows that other estimation lengths provide no significant benefits, and that it does not matter whether raw returns or excess returns are used to calculate the OLS beta, then the remainder of this study uses the raw returns OLS beta based on five years of past monthly returns as the standard OLS beta benchmark when comparing current CAPM practice with other alternatives.

4.4 PERFORMANCE COMPARISONS

This section evaluates the predictive performances of the competing utility industry CE estimates that result from employing the various beta estimators described in Section 3.5. Recall that while we have two performance metrics (MAE and MSE), formal testing of whether one technique is an improvement over the OLS approach will involve testing whether an alternative's MAE is significantly different from the MAE of the standard OLS approach. The 'MAE Difference' for method *g* is the OLS MAE minus the MAE for method *g*.

Table 5 reports the performance of the utility industry CE estimates that result from the alternative beta estimators. The OLS beta has an MAE of 4.92% and an MSE of 0.00399. The 10% trimmed beta has a slightly smaller MAE of 4.89% and an MSE of 0.00390. Its MAE Difference is an insignificant 0.04% (*t*-statistic 0.73).

Table 5: Performance comparison of alternative methods

The table reports the predictive performances of the utility industry CE estimates that result from alternative beta estimation methods. The OLS beta each month uses the most recent five years of monthly returns. See the text for the definitions of the other betas. The utility industry's mean absolute forecast error (MAE) and mean squared forecast error (MSE) for each method are presented. The MAE Difference for method *g* is the OLS MAE minus the MAE for method *g*. A paired *t*-test is used to test whether an alternative method produces a significantly different MAE to the standard OLS MAE based on β_{OLS}. The Hansen-Hodrick (1980) correction for serial correlation up to 59 lags is employed in the *t*-test to adjust for overlapping observations. The *t*-statistics are shown in parentheses.

Alternative beta estimates	MAE	MAE Difference	MSE
β_{OLS}	0.0492		0.00399
$\beta_{Trimmed}$	0.0489	0.0004 (0.73)	0.00390
β_{Blume}	0.0439	0.0054 (2.50)	0.00334
$\beta_{ig} = 1$	0.0388	0.0104 (1.76)	0.00286
$\beta_{ig} = 0.90$	0.0389	0.0103 (2.10)	0.00281
$\beta_{ig} = 0.80$	0.0400	0.0093 (2.34)	0.00285
$\beta_{ig} = 0.70$	0.0419	0.0074 (2.28)	0.00299
$\beta_{ig} = 0.60$	0.0448	0.0045 (1.51)	0.00324

ISSN 2394 - 7780

$\beta_{Shrunk5}$	0.0435	0.0057 (2.69)	0.00314
$\beta_{Shrunk10}$	0.0412	0.0080 (3.01)	0.00292
β_{Reward}	0.0385	0.0107 (2.19)	0.00244

The Blume-adjusted beta produces an MAE of 4.39% and an MSE of 0.00334. Its MAE Difference is a significant 0.54% (*t*-statistic 2.50). The Blume-adjusted MAE amounts to an 11% improvement over the OLS MAE (i.e., 0.0054/0.0492 = 0.11).

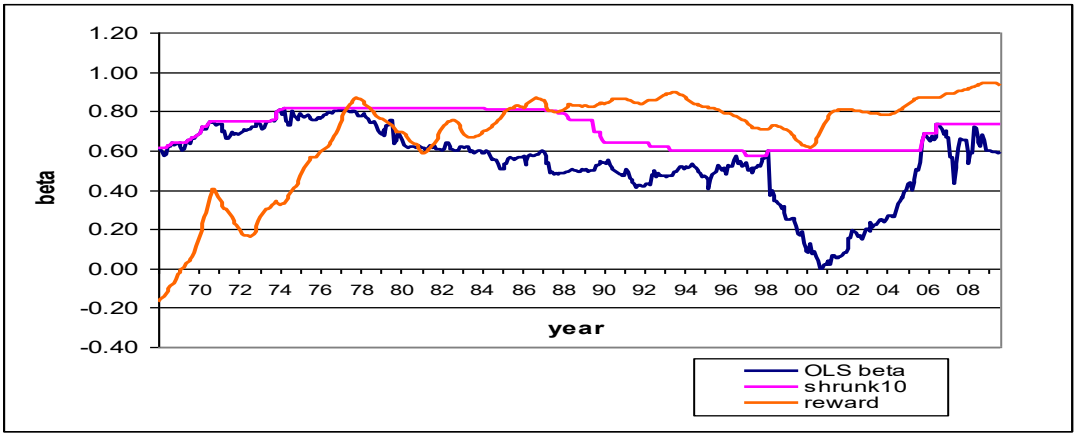
Next consider the performances of the various constant betas. The constant beta estimate of one has an MAE of 3.88% and an MSE of 0.00286. Its MAE Difference is an insignificant 1.04% (*t*-statistic 1.76). Although this difference is statistically insignificant, the reduction in MAE of 21.1% (0.0104/0.0492) compared to the OLS MAE is nevertheless large enough to be economically significant. A constant beta estimate of 0.9 has an MAE of 3.89% and an MSE of 0.00281. Its MAE Difference is a significant 1.03% (*t*-statistic 2.10), which amounts to a 20.9% improvement over the OLS MAE (0.0103/0.0492 = 0.209). Of the remaining constant betas tested, a constant beta of 0.8 has a significant MAE Difference of 0.93% (*t*-statistic 2.34) while a constant beta estimate of 0.7 has a significant MAE Difference of 0.74% (*t*-statistic 2.28).

The Shrunk5 beta produced an MAE of 4.35% and an MSE of 0.00314. Its MAE Difference is a significant 0.57% (*t*-statistic 2.69). The Shrunk10 beta has an MAE of 4.12% and an MSE of 0.00292. Its MAE Difference is a significant 0.80% (*t*-statistic 3.01), which amounts to a reduction of 16.3% over the OLS MAE (0.0080/0.0492 = 0.163). The final method tested is the reward beta approach. The reward beta has an MAE of 3.85% and an MSE of 0.00244. Its MAE Difference is a significant 1.07% (t-statistic 2.19). This amounts to a reduction of 21.7% over the OLS MAE (0.0107/0.0492 = 0.217).

The best performances in Table 5 can be summarized as follows. Considering first the constant betas, the constant betas of 0.8 and 0.9 produced economically and statistically significant results. Overall, the Shrunk10 beta produced the largest *t*-statistic, while the reward beta produced the largest reduction in MAE compared to the OLS beta. Both of the latter two estimators are superior to standard CAPM practice based on the OLS beta. Both of these estimators are recommended for estimating the utility industry's cost of equity. The choice between them will ultimately depend on the user's view of the stability of the true beta through time. The reward beta implicitly assumes that the utility industry's true beta does not change because the reward beta uses all the available sample years in its calculation. On the other hand, the Shrunk10 beta is based on the most recent 15 years of data and so it implicitly assumes that the utility industry's true beta may vary slowly through time.

A number of interesting features are evident in the time series of the Shrunk10 beta, the reward beta, and the OLS beta that are displayed in Figure 1. The OLS beta dramatically falls to zero after the end of the 1997-1999 'internet bubble' and finishes with a December 2009 value of 0.60. The reward beta begins with a negative value and does not reach a value of 0.8 until 1977. Perhaps the low values at the start of the sample suggest that the reward beta estimator needs considerably more than five years of data before it produces reliable estimates. The reward beta is larger than the OLS beta from 1982 onwards, and finishes with a value of 0.93. On the other hand, the Shrunk10 beta ranges from 0.56 to 0.81, finishing in December 2009 with a value of 0.74.

Figure 1: Utility beta estimates over time



ISSN 2394 - 7780

The relatively poor performance of the OLS beta in Table 5 raises a question over whether the OLS beta provides any useful information. Recall that the Blume-adjusted beta is a positive linear transformation of the standard OLS beta, and that the Blume-adjusted beta has a significantly better MAE than does the OLS beta. Perhaps there is some other positive linear transformation of the OLS beta that leads to an even larger reduction in MAE. We wish to identify which positive linear transformation of the OLS beta minimizes MAE. The analysis can be extended to the other (non constant) beta estimators. That is, for the OLS beta, the Shrunk5 beta, the Shrunk10 beta and the reward beta, which positive linear transformation minimizes MAE? These minimum MAE betas (denoted β_{igt}^{MAE} for method *g*) have the form:

$$\beta_{igt}^{MAE} = a_1 + a_2\beta_{igt},$$

where a_1 and a_2 are both nonnegative and are chosen to minimize the MAE for that particular method. The resulting best a_1 and a_2 for the utility industry are reported in Table 6, along with the corresponding MAEs, MSEs, and MAE Differences. Note that there are no *t*-tests conducted because the form of these minimum MAE betas is determined by the sample itself, making the standard *t*-test statistically invalid for these betas.

The interesting thing about the utility industry OLS beta (and the shrunk5 beta) is that it is better to completely ignore them (and to replace them with the constant 0.954). The constant value of 0.954 is very close to the reward beta's December 2009 value of 0.93 from Figure 1, and is much larger than the full-period OLS beta value of 0.54 reported in Table 1. This evidence reinforces the view that the OLS beta leads to utility CE estimates that are too low.

It is also interesting to note that had we allowed the value of a_2 to be unconstrained then minimizing MAE would have produced a negative value of a_2 using the OLS beta. This suggests that the lower the value of the OLS beta the higher the subsequent expected return! In contrast, both the shrunk10 beta and the reward beta do appear to contain useful information because a_2 is not zero for these two cases.

Table 6: Performance of various minimum MAE betas

The table reports the predictive performance of the OLS beta and various minimum MAE betas for estimating the utility industry cost of equity. The OLS beta each month uses the most recent five years of monthly data. The minimum MAE beta in month *t* for industry *i* and method *g* is the given by $\beta_{igt}^{MAE} = a_1 + a_2\beta_{igt}$, where a_1 and a_2 are those positive values that minimize MAE for that particular industry and method *g*. See the text for definitions of β_{igt}. The utility industry's mean absolute forecast error (MAE) and mean squared forecast error (MSE) for each method are presented. The MAE Difference for method *g* is the OLS MAE minus the MAE for method *g*.

Alternative beta estimates	a_1	a_2	**MAE**	**MAE Difference**	**MSE**
β_{OLS}			0.0492		0.00399
β_{OLS}^{MAE}	0.954	0	0.0388	0.0105	0.00282
$\beta_{Shrunk5}^{MAE}$	0.954	0	0.0388	0.0105	0.00282
$\beta_{Shrunk10}^{MAE}$	0.452	0.740	0.0384	0.0108	0.00278
β_{reward}^{MAE}	0.114	1.224	0.0351	0.0141	0.00209

5. CONCLUSIONS

The standard approach to estimating the cost of equity involves using the OLS beta in the CAPM. This paper investigated the relative performances of a number of methods that can be used to estimate the US utility industry's cost of equity. These methods were based on alternative beta estimators: the OLS beta, a new outlier-adjusted beta (10% trimmed beta), the Blume-adjusted beta, two new shrinkage estimators (Shrunk5 and Shrunk10), a new version of the reward beta estimator, and a number of constant betas.

ISSN 2394 - 7780

The utility industry presents a challenge for the standard CAPM approach. For example, while the utility industry's full period OLS beta (0.54) reported in Table 1 is the lowest out of the 48 industries in the sample, its average monthly return is only slightly less than that of the market index. This indication that the standard CAPM approach may produce utility industry CE estimates that are too low was verified by this study.

The results of the current study show that a number of methods produce significantly better CE estimates than do those produced by the standard CAPM approach. Two methods can be particularly recommended to replace the OLS beta in utility industry CE estimation. The reward beta produced the largest reduction in utility industry mean absolute error and mean square error relative to the OLS beta out of all the alternatives considered. The Shrunk10 beta produced a highly significant reduction in MAE and had the largest *t*-statistic.

Of the constant betas, the values of 0.90, 0.80, and 0.70 all produced significantly better CE estimates than those produced using the OLS beta. The Shrunk5 beta and the Blume-adjusted beta both improved the utility industry CE estimates compared to standard practice, but the improvements were not as significant economically as some of the other techniques. CE estimates based on the 10% trimmed beta, on the other hand, did not lead to any significant improvements over current practice. This latter result is not surprising for two reasons. Firstly, while outliers may be a problem for individual stocks, the averaging process involved in deriving industry portfolio returns will reduce their impact on industry CE estimates. Secondly, the utility industry is one of the most stable industries, and so it is less likely to produce extreme return outcomes compared to the average industry.

While the previous studies of Fama and French (1997) and Gregory and Michou (2009) had suggested that there is little to be gained from using the Fama-French three-factor model to estimate industry CE estimates, consideration was given to adjusting utility industry CE estimates for size and book-to-market effects using a matching portfolio approach. However, this possibility was not pursued after some preliminary analysis showed that a book-to-market effect is not observable in the industry returns of those industries (such as the utility industry) with large average firm size.

The techniques identified in this study that improve on standard CAPM practice should not be assumed to apply equally well to every industry. It seems highly likely, for example, that the ranking of CE estimation techniques for cyclical industries may be quite different from the ranking for defensive industries. This is a worthy topic for future research. Another important line of research would be to see if those CE estimation techniques that performed well for the US utility industry will also perform well for the utility industries of other countries.

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ISSN 2394 - 7780

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INCENTIVES FOR CORPORATE SOCIAL RESPONSIBILITY EFFORTS THROUGH CHARITY TO BUSINESS STRATEGY

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"No success or achievement in material terms is worthwhile unless it serves the need or interests of the country and its people-J.R.D. Tata"

Gandhi ji believed that "Wealth without social responsibility, pleasure without conscience, religion without sacrifice, politics without principle, knowledge without character, science without humanity and business without ethics will destroy society."

ABSTRACT

In twenty hanging –first century, the role of the corporate sector is changeling recent years Corporate Social responsibility (CSR) has witnessed an astounding ascendancy and resurgence at the global level. The concept of CSR recognizes an organization's commitment to operate in a socially responsible manner. It takes into consideration the social and environmental implications of corporate financial decisions. Corporate Social Responsibility reporting has been one of the features that has received extensive attention from scholars. Now a day's an aim of corporate sector is not restricted to earning profit but also to contribute to the society. Indian business houses are doing it since its inception but its reporting is not done on regular basis. The said study is an attempt to examine the reporting of CSR by the automobile sector of India. The said research paper is an attempt to evaluate the communication of Corporate Social Responsibility of three autonomies and comparing their practices with the global practices. The said study is following explorative research design. In India Corporate Sustainability Report is not considered as necessary by the corporate. Not only is this but there lack of consistency in the Corporate Sustainability Report. As in India the verge of adopting convergent International Accounting Standard to report of financial statement for corporate. Now this study may serve the purpose of transparent reporting of actions of the corporate. This study aims to address this gap by conducting an exploratory study on how top management perceives and reports CSR. Using the technique of content analysis this study looks at the various areas of reporting along with chairman's speech.

INTRODUCTION

Introduction of new financial statement disclosure format will make financial reporting more transparent, relevant and easy to understand from every stakeholder's viewpoint. The Scenario of Disclosure of Corporate Social Responsibility in India is not only fairly transparent, relevant and of course consistent. Reporting of Corporate Social Reasonability has not received importance at all. Many organizations in India today discharge their responsibility towards society efficiently and effectively but do not report to its stakeholders or shareholders at all. There is no legal frame work in India for disclosure of Corporate Social Responsibility as well as there is no legal framework for the areas in which corporate social responsibility is to discharge. Many organizations adopt various practices of discharging Corporate Social Responsibility but not reporting to the world. Reporting of CSR should be made to the shareholders and other stakeholders by the organization which may create a positive image in the mind of society and nearby community also. Qualitative reporting standard or guidelines in the financial reporting as well as in the CSR is the call of the time. At present there are two trends in the disclosure of CSR. Almost all the organization who are reporting to the stakeholders consider Environmental aspects and Health issues of the Employees and nearby society.

CONCEPT OF CORPORATE SOCIAL RESPONSIBILITY

In Nineteenth Century profits is the main objective of the business. Now day's managers of 21st century accept the fact that maximum profit is not the only objective of the business unit but the reasonable profit and over all development of employees and other stakeholders of the outside world is equally important. After LPG implementation Indian Corporate has become more and more conscious and active towards discharge of corporate social responsibility. The conservative approach towards the organization has been shifted first from profit to customer satisfaction but by launching and developing variety of improved products though research and development other stake holders are also considered lately by the organizations. At present the organizations in the Indian scenario accept their responsibility towards the society but not to the fullest. Not only this, the re-posting aspect is also very poor across the corporate sector. The relevancy transparency and appropriateness in the social reporting discharge is missing as well as and over the period of time its consistency is also not maintained. The governing body of the organization plays an important role in the corporate social responsibility disclosure.

ISSN 2394 - 7780

The major gap in the social responsibility discharge is found in terms of the definition of the society. The term society has been interpreted by each organization differently which results into different direction of the social welfare activity. First the welfare activities are made for the employees themselves and later on it has been extended towards the family members. Basic needs of Health, Education, Drinking Water, Self-Employability and Development of Vicinity had been adopted in late nineties by many organizations. Adoption of broad view of the society is also suffering from defect of consistency and other aspects.

Ahmadabad is to be treated as most beneficial city in the country who obtained advantage of the discharge of CSR by various business houses and specially a visionary person Kasturbhai Lalbhai. The emphasis on the basic needs like Education, Health and Community development has been considered by them before fifty years. The basic philosophy for the CSR is that the organization has created wealth from natural resources and though society. Hence, it is the responsibility of the organization is the responsibility of the organization is to give back to societies who are deprived.

In India, Tata Group is to be treated as pioneer in executing social responsibility. Tata group is executing various social activities since the inception of the organization. In India there is a trend or tradition of disclosing social activities of the organization though the Annual Report only. Since last five years few companies started reporting separately for the corporate social responsibility. There is lack of attempt of creating positive image in the mind stakeholders about the company and its governance body.

RATIONALE OF STUDY

In the present study disclosure of corporate social responsibility has been examined. Auto sector is in the tremendous growth in the country since last five years. Auto sector is the key sector for the controlling of the carbon emission in the atmosphere. Product development and innovation reduces the carbon emission in auto sector to greater extent. Not only this the sector is using batteries and oil for manufacturing vehicles as well as testing vehicle to the greater extent. Hence it is of utmost important to know how auto companies have made an attempt to protect environment. Community service in the form of driver's training program as well as development of nearby area is also necessary. Attempt has been made to what extent such initiatives are useful to the other stake holders of the company. CSR disclosure in auto sector in India is irregular as well as not satisfactory. It is the need of time to evaluate CSR disclosure from the view point of relevancy, consistency and transparency. The research has considered two companies viz. Tata Motors and Asoka Leyland. Both the organizations have captured more than two third markets for buses and trucks in the country. Tata is also in the passenger vehicle manufacturing. Hence the study reflects the initiatives presented by the market leaders. The reporting aspects of the auto sectors confirm the adoptability of corporate social responsibility by the respective companies. Truck manufacturing is to treated as first hand responsible towards the development of driving skill, guidance for product maintenance and education for traffic rules. Now it is the time to check that how organization has contributed for society and how it has been reported. An attempt is made to know how auto companies consider their real consumers. The present study may provide frame work for the evaluation of CSR disclosure.

LITERATURE REVIEW

Stakeholders (Freeman, 1984) refers to the group that are likely to feel a significant impact –positive or negative ; social; environmental; economic; or financial-from corporate action and therefore have a key 'stake' in the corporation. Key corporate stakeholders include investors (stakeholders), suppliers, customers, employees, government regulations and members of the communities where the corporation operates or that are affected by corporate activitity.

Balzarova Michela, Hass Rainer (2009) has examined the CSR standards and guidelines in the Agribusiness sector indicating that companies have been increasingly offered guidance on how to get away from single bottom line and realize social environmental responsibility both in and beyond compliance with existing laws. One should consider all the stakeholders (multi stakeholders) in CSR activities which increase the credibility, acceptability and feasibility of initiatives and acceptance of the organizations in the society quickly.

Guthrie, J., and L Parker (1990), using content analysis, examined the annual reports of 150 companies in three countries; the U.S., U.K. and Australia. They found that 98 % of the U.K. companies, 85 % of the U.S. Companies and 56% of the Australian companies had CSR disclosures in their annual reports. The disclosures covered six themes: human resources, community involvement, environment, energy and products and others. In terms of the method of disclosure, Guthrie and Parker found that companies in the U.S. and U.K. favored a mixture of monetary and non-monetary quantitative disclosures, while Australian companies used mostly declarative CSR disclosures. The study also found that U.K. companies mostly disclosed CSR information in

ISSN 2394 - 7780

the Directors' report. In Australia, however, CSR disclosures were made in various sections of the annual report.

Savage, A.A. (1994) examined the CSR disclosures practices of 115 companies in South Africa. He found that as many as 50 % of the companies had some CSR Disclosures, with human resource disclosures being the most popular. This is closely followed by disclosures on community involvement and environmental performance. The extent of disclosure, however, is low.

Shanker A. N. and Pandya N.M. (2011) have observed that there is vast disparity in terms of reporting style pattern and areas covered for social responsibility disclosure. The length of the next , quality of presentation is different from industry to industry. The significant difference has also been traced out with the content analysis in the themes of CSR activities and \ in their reporting also.

CSR is as a concept means being ethical towards stakeholders that is not harming or hurting any stakeholders (Sethi, 1979; Carroll, 1979; Wad dock, 2004; Wood, 1991; Jones, 2005). CSR represents voluntary company activities (Van Marrewjik, 2003). It means at minimum being legally complaint to the rules of the land (Sethi, 1979; Carroll, 1979;). CSR has a dominant goal to better the condition of various stakeholders (Riordanet. al., 1997; Steiner, 1972; Wad dock, 2004; Sethi, 1979; Carroll, 1979; Fukukawa and Moon 2004).

A corporate organization must address, what Ellington (1998) calls the triple bottom line-companies being responsive not just to financial/economic interests, but to society and 'the environment'. CSR needs to focus on the social environmental and financial success of a company- the triple bottom line (or 'TBL', '3BL', or People, Planet and Profit or 3Ps). The concept of TBL demands that a company's responsibility be to 'stakeholders' rather than shareholders.

INDIA AND CSR

Today, businesses have realized that, in order to continue thriving, they have to adopt a more holistic and inclusive business model, which has direct correlation with the business performance. A large number of corporate contribute voluntarily to several social causes. This range from small philanthropic acts to larger social causes- promotion of basic education & vocational training, adoption of villages, social causes like up-liftment of weaker sections and assisting physically challenged persons (Ratnam, 2006).

Often, Indian companies have set up separate Foundations or Trusts to use the funds most effectively, e.g. the Azim Premji Foundation, the Infosys- Foundation and the Mahindra Foundation Trust. Also in the privatized public sector, social obligations remain an integral part of the business of enterprises such as BHEL (Bharat Heavy Electrical Ltd.), Nalco (National Aluminum Corporation Ltd.) , SAIL (Steel Authority Of India Ltd.), NTPC (National Thermal Power Corporation Ltd.) and ONGC (Oil and Natural Gas Commission). Traditionally, charity and philanthropy in India have been an essential part of what now-a-days is called Corporate Social responsibility (CSR).

The Tata Group, on e of the oldest and largest Indian Conglomerates, has been in the business for the last 140 years and draws respect for its adherence to strong values and business ethic. It is one of the forerunners in the field of CSR among Indian Corporate Houses. Some Institutions like Tata Memorial Hospital, the Indian Institute of Science, the Tata Memorial Sports Club etc. they have into social welfare for long now. The Group spends Rs. 800-1000 crore a year on Corporate Social Responsibility.

Tata Steel is a pioneer in the concept of CSR. The company has received a number of awards in recognition of its CSR Efforts. The most recent testimony to Tata Steel's contribution is the Energy & Resources Institute (TERI) Award conferred on it in recognition of corporate leadership for good corporate citizenship and sustainable initiatives. It is the only Indian company to have pledged to translate the global compact principles on human rights, labour and environment into practice and was conferred the Global Business Coalition Award for Business Excellence in the Community for HIV /AIDS.

In recent times, a number of foundations set up by leading Indian firms, including Infosys, Wipro, Tatas, TVS, and Dr. Reddy's Laboratory, have taken a keen interest in corporate activism to improve healthcare, education , living conditions and reduce poverty. They support hundreds of non-governmental organizations and have built orphanages, hospitals and schools.

Other corporate houses have also played an active role in CSR. Prominent among them are Colgate-Palmolive with its support to the Meljol and Make a Wish Foundation for street kids. The Pratham Foundation for Education of underprivileged children are amongst other initiatives. Currently BHEL has been working in the area of rural development, where the company has adopted 56 villages located in different parts of the country.

ISSN 2394 - 7780

Social welfare activities are undertaken regularly by the company, benefiting over 80,000 people of these villages.

The subject of CSR is gaining importance given the increasing number of companies engaged in CSR activities. The number of foundations set up by the private sector or private individuals is also on the rise (Planning Commission), 2007. Prime Minister Dr. Manmohan Singh, at a meeting of the CII in May, 2007, urged the Indian industry to rise to the challenge of making our growth processes both efficient and inclusive. On CSR, he further informed that it is not an imported western management notion but is a part of our cultural heritage. Mahatma Gandhi called it trusteeship.

Private companies, PSUs, Small & Medium Enterprises (SMEs) and even co-operatives are increasingly participating in CSR activities. The Ministry of Corporate Affairs (MCA), dealing with the Companies Act, has set up a National Foundation for Corporate Governance (NFCG) as a non-profit trust, it provides a platform to deliberate issues relating to good corporate governance practices and to facilitate exchange of experiences and ideas between corporate leaders, policy makers, regulators, law enforcing agencies and NGOs. Ministry of Corporate Affairs, Department of Public Enterprises, Ministry OF Small Scale Industries, etc. should promote CSR.

Today there is a new army of volunteers who are emerging from office, cabins and boardrooms and spilling out on to the streets. IBM, for example, encourages volunteerism amongst its employees through its 'On Demand Community Programme'. Fifteen % of IBM employees volunteer with various NGOs and IBM projects, including CRY, Association of People with Disabilities and Parikarama, for which employees provide skill building activities, mentoring , administration support and technology training (Menon, 2006).

Most companies have labour and environmental policy guidelines in place. This is not supporting given that Indian State of Law require that companies meet minimum standards. Policies on working conditions include minimum wage requirements, health and safety, equal opportunities, non-employment of child labour and employee welfare in general. In the area of environmental policy , most of companies , especially those industries with a direct impact on the natural environment –extractive industries –have policies and management systems in place. However, there is wide discrepancy between the perceptions of workers and management about company compliance with labour regulations.

A.Mahendran, Managing Director – Godrej Sara Lee Limited and Director –Godrej Beverages and Foods Limited says, "We believe that CSR is not about funding …. That is secondary. We insist on employees and even employees spouses spending time working for causes such as the Children's Toy Foundation and working with senior citizens in various old-age homes across Chennai. As corporate citizen, it is important to invest in the trust of society, your customers and even more importantly , your employees. Mahendran says, 'Developing employee's Emotional Quotient is very important. We believe that volunteering helps increase an employee's emotional bonding to the organization."(Menon, 2006) pp10.

KPIT –Cummins has a club called 'Let Us Give' membership to which is voluntary. Anli G. Kukarni, and because 'while the organization contributes in terms of money and support , the employees contribute in terms of resources and more importantly, time. The company works in among others , the field of IR education and health , especially in rural areas and the members of the voluntary club spend their free time, including weekends, in villages , red –light areas and other places traditionally considered NGO territory.

Large public sector companies are investing up to 5 % of their profits towards social uplift community development. ONGC have committed resources by adopting a few villages to implement President Abdul Kalam's idea of PURA (Provision of Urban Amenities in Rural Areas). NTPC has established a trust to work for the cause of physically challenged people (Ratnam, 2006). CSR is more than philanthropy does not necessary refer to giving and receiving. To quote Venu Srinivasan , chairman , The Confederation of Indian Industry (CII) National Summit on CSR 2007, and Manging Director TVS motors and Sundram Clayton, 'an effective CSR initiative must engage the less privileged on a partnership basis.'

Over 80% companies in India are engaged in CSR –oriented activities, making a 17 % jump since 2004. Significantly, a recent study by the Nottingham University Business School has ranked India Number One, in terms of CSR penetration among the seven Asian countries surveyed, even through India had the lowest per capita GNP (Gross National Product).

Almost every large corporation is increasingly investing to improve its performance on sustainability parameters. The trend is being fuelled by the belief that working for communities as stakeholder in the businesses has a direct correlation with the business performance. While some may still call the efforts 'patchy'

ISSN 2394 - 7780

considering size of the country, it is estimated that 40-50 large companies in India have a formal machinery to undertake development work to build sustainable communities in their respective regions. Many more are getting added to the list. ' As more and more companies come into the public domain, there will be pressures on them to build sustainability in their business models, says Price Water House Coopers(PWC) executive director Bharti Gupta Ramola.

CII and the TVS Group have collaborated to form the CII-TVS Centre Of Excellence for Responsive Corporate Citizenship. The outfit, based in Chennai, will provide consultancy services and technical assistance on social development and CSR.

Though Indian companies are no stranger to corporate social responsibility (CSR), the discipline itself has metamorphosed in the last 100 years or so. According to a survey by The Energy & Resources Institute (TERI), CSR in India , much like elsewhere in the world, has evolved to its current sustainability platform through four different stages. In the first stage, Ethical Model approach (During 1930-50), businesses were encouraged to manage their business entity as a trust held in the interest of the community. The post-independence Statist Model (1950-70) was more aggressive with state ownership and legalities deciding corporate responsibilities. The Liberal Model (1970-90) maintained that it was sufficient for business to obey the law and generate wealth. It was only in the late 1990s that a quasi sustainable model came upon the business horizon- what TERI terms as the Stakeholder Model.

Before Corporate Social Responsibility found a place in corporate lexicon, it was already textured into Birla Group's value systems. As early as the 1940s, Shri G.D. Birla espoused the trusteeship concept of management. This entails that the wealth that one generates and holds is to be held as in a trust for our multiple stakeholders. With regard to CSR, this means investing part of our profits beyond business, for the larger good of society. Birla's social work today straddle over 3,700 villages, reaching out to more than 7 million people annually. Its community work is a way of telling the people among whom the company operates that We Care. While carrying forward the philosophy, his grandson, Aditya Birla weaved in the concept of 'sustainable livelihood', which transcended cheque book philanthropy. In his view, it was unwise to keep on giving endlessly. Instead, he felt that channelizing resources to ensure that people have the wherewithal to make both ends meet would be more productive.

Right from its inception, Infosys has lived by its motto-'*Powered by intellect Driven by values*' says Mr. M. Alok Bajpai, Associate Vice-President, Infosys Technologies Ltd. (Bajpai,2006). Infosys Foundation, the philanthropic arm of Infosys Technologies Ltd. , came into existence on 4th December 1996 with the objective of fulfilling the social responsibility of the company by supporting and encouraging the underprivileged sections of society. Infosys commits one per cent of its profits to social causes.

The Azim Premji Foundation aims at making a tangible impact on identified social issues by working in active partnership with the Government and other related sectors of society '. The foundation says it ' dedicates itself to the cause of Universalization of Elementary Education in India'. The organization has over the years been instrumental in improving the quality of general education, particularly in rural schools.

The mission of ONGC stated that the company would have an 'abiding commitment to health, safety and environment to enrich quality of community life.' And this mission was reflected in its CSR activities. ONGC is committed to allocate funds equivalent to 0.75% of net profits of the previous year, towards socio-economic development programmes, every year. (T.O.I.; April 28, 2006; page 3). It has undertaken a large rural education program titled 'A library for every school 'under which 5500 libraries have been set up in government schools spread across many villages. Other activities include the reconstruction of old school building, setting up of rural Science Centres and Schemes to provide support to dying traditional art and culture forms.

NALCO,s mission is to achieve growth in business with global competitive edge providing satisfaction to the customers, employees, shareholders & community at large. In its journey of 25 years towards corporate excellence, NALCO has given top priority to social sector development. The company firmly believes that its ultimate reward is happiness in the human heart. NALCO spends 1 % of its net profit every year on periphery development, in its areas of operation. It has come to represent a better quality of life for communities residing in the vicinity of its plants and facilities. The company has comprehensively addressed the problems of rehabilitation of displaced families with adequate compensation, housing and employment to the extent feasible. Besides undertaking various constructional activities, the company also organized Health Camps, Animal Heath Camps, Science Exhibitions, Rural sports, and provision of Water Supply through tanker to periphery villages.

ISSN 2394 - 7780

SAIL has been practicing CSR right from its inception. It espoused its responsibility to the society as the principal motive for its existence & operation. It's actions are guided by its central philosophy –making a meaningful differences in people's lives. Born with the ethos of nation building, SAIL has ensured that wherever it operates, its employees as well as people in the nearby area have access to safe drinking water, health care, education & roads. (TOI, April 28, 2006; Pp3).

NTPC was the first Public Sector Undertaking (PSU) and in that way the pioneer, in having such policy in 1993. International funding agencies as also the Government of India recognizes and acknowledges the experiences gained by NTPC in this significant task.

In fact, corporate philanthropy is giving way to CSR (Bhowmik, 2004). CSR is a corporate strategy for survival and not undertaken for mere 'feel good factor'. (Gopinath & Murlidhar, 2006) CSR is not about building a corporate image ; it is about building character (Shanmugam,2006).

CRITICISMS

One allegation about CSR is that it is just a brand-building exercise. Getting associated with a cause might create an apparent impact, but that does not generate any tangible profits for the organization.

Community programmes or social development initiatives, in most cases were philanthropic and/or ad hoc in nature and not integrated into core business activities such as marketing and brand management. There is a need for Indian corporate to graduate from thinking in terms of just charity, to the concept of responsibility. There is also an urgent need to integrate CSR with business strategy i.e. to link company's core business and strengths on the one hand with resources available with the organization internally and needs of the external environment, on the other.

There is virtually no incentive in India for companies that work towards creating jobs, following sustainable environmental practices or supporting developmental projects, said ITC Chairman Y.C. Deveshwar, on the sidelines of the second sustainability Summit: Asia 2007.(Business Standard, Dec 12, 2007, page 6).

INCENTIVES FOR CSR EFFORTS

The ministry of corporate affairs has become proactive on Corporate Social Responsibility (CSR), is a voluntary activity by a company to serve bigger goals of society beyond its routine functions.

The history of CSR is traced back in India in age old saying of Vasudhaiva Kutumbkam and more recently the Gandhian trusteeship theory in 1990's when industrial houses like Tata's , Birla's and other houses shared their profits with charitable trusts for the welfare of society at large. Gandhiji believed that wealth without social responsibility, pleasure without conscience, religion without sacrifice, politics without principle , knowledge without character, science without humanity, management without system and business without ethics will destroy society.

CSR is the commitment of business to contribute to sustainable economic development working with employees, their families, the local community and society at large to improve the quality of life in ways that are good for business and good for development. Each and every business organization is ethically and socially accountable for being concerned about the interests of the stake holders as employees, customers, suppliers, competitors, shareholders, government, community as well as environment.

India Inc. has taken initiatives in the space of CSR for the welfare of the society. FICCI, for the last 10 years, has been indentifying industry's CSR initiatives through an annual CSR award. The question here is whether the voluntary activity of CSR can be spurred through fiscal incentives?

There are already fiscal measures in our Income Tax Act. If corporate donates funds to an approved NGO for social projects. It is eligible for 50% deduction of that amount and 100% if it funds a non-profit organization registered under section 25 of The Companies Act. Creation of the FICCI-Aditya Birla Centre for Excellence in CSR, paid for by the companies of the Aditya Birla group is an example. Similarly, if a company contributes to an approved scientific research association, it can get up to 125% deduction. In this backdrop, is it desirable to provide more such exemptions to attract larger number of corporate into the CSR net? If yes, government may provide weighted deduction of 150% or 125% to motivate enough for encouraging corporations to make such voluntary CSR contributions. For this, however, a new clause in either section 35(2aa) or section 35 (2ab) has to be inserted.

Yet another approach will be that instead of a tax based incentive mechanism, a fund may be set up to catalyze innovation, disseminate learning and encourage more companies to come forward. The fund could be set up

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with contributions to the government. Industries and donors to be managed by industry and or their representative bodies with an independent investment committee.

CONCLUSION

While the government has been evolving a large number of welfare schemes for the people, these benefits rarely reach the best most deserving industries, on the other hand , have expertise in man management , financial management and business planning – and can easily provide the missing ingredients of leadership and organization and establish the 'last mile connectivity' to reach the benefits to the deserving people.

CSR is not about Philanthropy. It is not just about visiting orphanages & giving money to the destitute. It is about building inclusion (Shanmugam, 2006). Today there is increasingly realization among many that CSR is good for business. Further, there is growing evidence that the larger the firm the greater its social responsibility (Ratnam, 2006).

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EFFECT OF BULKY AND CONCENTRATED ORGANIC MANURES ON PHYSICO CHEMICAL PROPERTIES OF SOIL IN DOLICHOS BEAN PRODUCTION

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ABSTRACT
The experiment was conducted to Sustainable Water Management for Dolichos bean Production in organic systems by organic amendments in the drought-prone area in Salem district (Tamilnadu). The experiment was laid out in a randomized block design with 14 treatments in 3 replications. The treatment schedule included various levels of bulky (25 and 75 % N) and Zconcentrated organic manures (25 and 75 % N), inorganic fertilizers along with absolute control. The bulky organic manures used were FYM and vermicompost and the concentrated manures used were neem cake and groundnut cake. The nutrient content of bulky and concentrated organic manures used in the study were FYM (0.80, 0.41 and 0.74 % NPK), vermicompost (1.60, 2.20 and 0.67 % NPK), poultry manure (3.47, 1.33 and 3.1 NPK), neem cake (5.2, 1.0 and 1.4 % NPK) and castor cake (4.1, 1.9 and 1.4 % NPK). The quantity of organic manures required was computed on the basis of nitrogen equivalent to substituting the recommended dose of chemical fertilizer (32:72 kg NP ha^{-1}) in the garden bean. Among the organic manures and concentrated oil cakes applied, 75 percent N supplied through vermicompost @ 2.41 t ha^{-1} along with 25 percent N supplied through neem cake @ 0.22 t ha^{-1} followed by 75 percent N supplied through poultry manure @ 0.61 *t ha^{-1} along with neem cake @ 0.22 t ha^{-1} were identified. which recorded the maximum level of water holding capacity of soil, yield attributes and economics of Garden bean.*

Keywords: Dolichos Bean, organic manures, Sustainable water management and Water holding capacity.

INTRODUCTION
For improving the Water holding capacity of soil, bulky organic manures should be necessarily applied. FYM, vermicompost, poultry manure and pressmud are some of the commonly available organic manures which are widely used by the farmers. Organic manures which are tried in the present investigation are FYM, poultry manure, oil cakes and vermicompost. Among the varied organic inputs, Farm yard manure is considered as a repository of plant nutrients. The role of FYM is multidimensional, varying from building up of organic matter, good soil aggregation, permeability of soil and related physical properties to long lasting supply of several macro and micronutrients, besides, improving water holding capacity of soil (Gupta et al., 1983). Vermicompost produced using earthworm is another rich and recognized source of macro and micro-nutrients and contributes much towards improving the fertility of soil. Vermicompost contains major and minor nutrients in available form along with enzymes, antibiotics, vitamins, beneficial microorganisms and other plant hormones and have definite advantage over other organic manures in respect of quality and shelf life of produce (Meerabai and Raj, 2001). Kale et al., (1992) found that the application of vermicompost to fields improved the water holding capacity of soil.

MATERIAL AND METHODS
The seeds of Dolichos bean cv.Konkan Bushan were dibbled singly at a spacing of 30 x 60 cm apart. The first irrigation was given immediately after sowing followed by life saving irrigation and subsequent irrigations were given once in a week. Incidence of sucking pests were managed by spraying with Neem seed kernal extract at 5%. Weeding was done where and when found necessary. Quantity of organic manures required was computed on the nitrogen equivalent basis. Recommended dose of N (36 kg ha^{-1}) was supplied in two different combinations like supply of 25% and 75% N through Bulky and 25% and 75%N through concentrated organic manures. The bulky organic manures used were FYM, Poultry Manure and vermicompost (VC) and the concentrated manures used were neem cake (NC) and castor cake (GC). 25 and 75 per cent N was calculated as 0.84 and 2.25 t ha^{-1} of FYM; 0.8 and 2.41 t ha^{-1} of VC; 0.25 and 0.61 t ha^{-1} of poultry manure; 0.22, and 0.78 t ha^{-1} of NC; 0.20 and 0.65 t ha^{-1} of CC to substitute the recommended dose of N (36 kg ha^{-1}). Bulky organic manures were applied as basal and concentrated cakes were top dressed in 2 split doses. First application was done at 20 days after sowing. The second was applied on 45th day of sowing. Recommended dose of inorganic fertilizers were applied only in the conventional farming treatment.

Experimental Design and Treatment Details
The experiment was laid out in a Randomized Block Design with three replication and fourteen treatments, viz.,

ISSN 2394 - 7780

T_1	-	**Control**
T_2	-	Inorganic fertilizers (36:72 kg NP ha $^{-1}$)
T_3	-	25 % N as Farm Yard Manure (0.84 t ha $^{-1}$) +75 % N as Neem cake (0.78 t ha $^{-1}$)
T_4	-	75 % N as Farm Yard Manure FYM (2.52 t ha $^{-1}$)+ 25 % N as Neem cake(0.22 t ha $^{-1}$)
T_5	-	25 % N as Farm Yard Manure (0.84 t ha $^{-1}$) + 75 % N as Castor cake (0.65 t ha $^{-1}$)
T_6	-	75 % N as Farm Yard Manure (2.52 t ha $^{-1}$) +25 % N as Castor cake (0.20 t ha $^{-1}$)
T_7	-	25 % N as Vermicompost (0.80 t ha $^{-1}$) +75 %N as Neem cake (0.78 t ha $^{-1}$)
T_8	-	75 % N as Vermicompost (2.41 t ha $^{-1}$)+25 % N as Neem cake (0.22 t ha $^{-1}$)
T_9	-	25 % N as Vermicompost (0.80 t ha $^{-1}$) +75 % N as Castor cake (0.65 t ha $^{-1}$)
T_{10}	-	75 % N as Vermicompost (2.41 t ha $^{-1}$) +25 % N as Castor cake (0.20 t ha $^{-1}$)
T_{11}	-	25 % N as Poultry manure (0.25 t ha $^{-1}$) +75 % N as Neem cake(0.78 t ha $^{-1}$)
T_{12}	-	75 % N as Poultry manure (0.61 t ha $^{-1}$) +25 % N as Neem cake (0.22 t ha $^{-1}$)
T_{13}	-	25 % N as Poultry manure (0.25 t ha $^{-1}$) +75 % N as Castor cake (0.78 t ha $^{-1}$)
T_{14}	-	75 % N as Poultry manure (0.61 t ha $^{-1}$) + 25 % N as Castor cake(0.22 t ha $^{-1}$)

RESULTS

Organic Carbon, Bulk Density and Water Holding Capacity of Soil

Perusal of data on soil physico chemical properties revealed that all the organic manures along with bio fertilizers influenced significantly when compared with control and inorganic fertilizers. (Table 1)

Regarding the data on organic carbon in soil, irrespective of sources the highest content of 0.46 per cent was recorded in all the treatments where application of bulky along with concentrated organic manures were applied. These treatments were found to be influencing this parameter at the same level. The least value (0.42 per cent) for organic carbon was recorded in control and in inorganic fertilizers treatment.

Application of organic manures had significantly influenced the parameter bulk density. Among the treatments, the least value for bulk density was recorded in all the treatments where bulky and concentrated organic manures (1.50 mg m^{-3}) were incorporated. The highest value (1.56 mg m^{-3}) for bulk density was recorded in control and treatment that received inorganic fertilizers.

Table.1. Effect of bulky and concentrated organic manures on physico chemical properties of soil

Treatments	Soil carbon (%)	Bulk density (mg m^{-3})	Water holding capacity (%)
T_1 - Control	0.42	1.56	24.0
T_2 - Inorganic fertilizers (36:72 NP kg ha^{-1})	0.42	1.55	24.2
T_3 - FYM @ 10 t ha^{-1} + NC @ 2.25 t ha^{-1}	0.46	1.52	24.4
T_4 - FYM @ 15 t ha^{-1} + NC @ 1.50 t ha^{-1}	0.46	1.51	24. 3
T_5 - FYM @ 10 t ha^{-1} + CC @ 2.0 t ha^{-1}	0.46	1.50	24.6
T_6 - FYM @ 15 t ha^{-1} + CC @ 1.50 t ha^{-1}	0.46	1.51	24.6
T_7 – VC @ 5 t ha^{-1} + NC @ 2.25 t ha^{-1}	0.46	1.50	24.6
T_8 - VC @ 7.5 t ha^{-1} + NC @ 1.50 t ha^{-1}	0.46	1.50	24.6
T_9 - VC @ 5 t ha^{-1} + NC @ 2.0 t ha^{-1}	0.46	1.50	24.5
T_{10} - VC @ 7.5 t ha^{-1} + NC @ 1.5 t ha^{-1}	0.45	1.51	24.5
T_{11} - PM @ 7.5 t ha^{-1} + NC @ 2.25 t ha^{-1}	0.46	1.51	24.6
T_{12} - PM @ 10 t ha^{-1} + NC @ 1.5 t ha^{-1}	0.46	1.50	24.6
T_{13} - PM @ 7.5 t ha^{-1} + NC @ 2.0 t ha^{-1}	0.46	1.50	24.4
T_{14} - PM @ 10 t ha^{-1} + NC @ 1.5 t ha^{-1}	0.46	1.51	24.5
SED	-	-	-
CD (P=0.05)	NS	NS	NS

The highest value (24.6 per cent) for water holding capacity was recorded where the treatments were imposed with bulky and concentrated organic manures. The lowest value for water holding capacity was recorded in control (24.0 per cent) as shown in Table 1.

ISSN 2394 - 7780

DISCUSSION

Regarding the physico chemical properties, numerically higher values for organic carbon, **water holding capacity** and lower values for Bulk density were registered under 75 per cent N supplied through oil cakes. But the values among all the treatments were statistically not significant since it was tried for one season. If the practice is continued for few more years there must be a change in the physico chemical properties. Application of manures, irrespective of sources and rates recorded significantly higher organic carbon and this might be due to increased yield of roots and plant residues and external application of organic manures as reported by Yadav et al., (2000). The differences in the organic carbon content with the application of different sources of nutrients might be due to the result of differential rate of oxidation of organic matter by microbes (Trehan, 1997). The decrease in soil pH after organic matter addition might be because of the production of CO_2 and organic acids during decomposition of organic materials. Consequently, if there is decrease in soil pH directly it is related with increase in EC. This is in accordance with Shelke et al. (2001) and Mali et al. (2004). The decreased bulk density might be due to incorporation of organic manures with lower bulk density (Umamaheswari., 2009).

In any management technology, the benefit cost analysis need to be focussed to assess its suitability for adoption. Considering the sale of tomato, garden bean and baby corn cultivated through inorganic manure at Rs.35 per kg and the organic tomato, garden bean and baby corn as Rs. 70 per kg (CIKS organic outlet, Salem), the highest return per rupee invested was obtained through application of inorganic fertilizers due to higher yield statistics. Among the organic manure treatments, application of vermicompost @ 10.50 t ha^{-1}-with neem cake @ 0.73 t ha^{-1} recorded the highest income and benefit cost ratio followed by poultry manure @ 2.16 t ha^{-1} with neem cake @ 0.73 t ha^{-1}. (Siddeswaran and Shanmugam. 2013) also have reported higher returns due to organically grown vegetables.

The soil physico-chemical properties yield quality and cost benefit analysis of garden bean under different treatments imposed with bulky and concentrated organic manures showed that the treatment combination of 75 per cent N supplied through vermicompost 10.73 t ha^{-1}along with 25 percent N supplied through 0.73 t ha^{-1} of neem cake followed by 75 per cent N supplied through poultry manure @ 2.16 t ha^{-1} along with 25 per cent N supplied through 0.73 t ha^{-1} of neem cake are recognized for valuable returns and were forwarded for further studies in garden bean.

CONCLUSION

Among the treatments comprising organic manures and concentrated oil cakes, 75 per cent N supplied through vermicompost 2.41 t ha^{-1} along with 25 per cent N supplied through neem cake @ 0.22 t ha^{-1} followed by incorporation of poultry manure @ 0.61 t ha^{-1} 25 per cent N supplied through neem cake @ 0.22 t ha^{-1} recorded the maximum values for growth, yield and yield attributes. Numerically higher values for water holding capacity of soil organic carbon and bulk density were observed in the treatment combination, 75 per cent N through bulky organic manures along. with 25 per cent N through oil cakes. Within the treatments, insignificant variation was observed for these traits.

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INFLUENCE OF ORGANIC AMENDMENTS ON YIELD AND ECONOMICS OF DOLICHOS BEAN CV KONKAN BUSAN

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ABSTRACT
The experiment was conducted to Sustainable Water Management for Dolichos bean Production in organic systems by organic amendments in the drought-prone area in Salem district (Tamilnadu). The experiment was laid out in a randomized block design with 14 treatments in 3 replications. The treatment schedule included various levels of bulky (25 and 75 % N) and Zconcentrated organic manures (25 and 75 % N), inorganic fertilizers along with absolute control. The bulky organic manures used were FYM and vermicompost and the concentrated manures used were neem cake and groundnut cake. The nutrient content of bulky and concentrated organic manures used in the study were FYM (0.80, 0.41 and 0.74 % NPK), vermicompost (1.60, 2.20 and 0.67 % NPK), poultry manure (3.47, 1.33 and 3.1 NPK), neem cake (5.2, 1.0 and 1.4 % NPK) and castor cake (4.1, 1.9 and 1.4 % NPK). The quantity of organic manures required was computed on the basis of nitrogen equivalent to substituting the recommended dose of chemical fertilizer (32:72 kg NP ha^{-1}) in the garden bean. Among the organic manures and concentrated oil cakes applied, 75 percent N supplied through vermicompost @ 2.41 t ha^{-1} along with 25 percent N supplied through neem cake @ 0.22 t ha^{-1} followed by 75 percent N supplied through poultry manure @ 0.61 t ha^{-1} along with neem cake @ 0.22 t ha^{-1} were identified. which recorded the maximum level of yield attributes and economics of Garden bean.

Keywords: Dolichos Bean, organic manures, yield and economics

INTRODUCTION
For improving the Water holding capacity of soil, bulky organic manures should be necessarily applied. FYM, vermicompost, poultry manure and pressmud are some of the commonly available organic manures which are widely used by the farmers. Organic manures which are tried in the present investigation are FYM, poultry manure, oil cakes and vermicompost. Among the varied organic inputs, Farm yard manure is considered as a repository of plant nutrients. The role of FYM is multidimensional, varying from building up of organic matter, good soil aggregation, permeability of soil and related physical properties to long lasting supply of several macro and micronutrients, besides, improving water holding capacity of soil (Gupta et al., 1983). Vermicompost produced using earthworm is another rich and recognized source of macro and micro-nutrients and contributes much towards improving the fertility of soil. Vermicompost contains major and minor nutrients in available form along with enzymes, antibiotics, vitamins, beneficial microorganisms and other plant hormones and have definite advantage over other organic manures in respect of quality and shelf life of produce (Meerabai and Raj, 2001). Kale et al., (1992) found that the application of vermicompost to fields improved yield and benefits cost of vegetable crops.

MATERIAL AND METHODS
The seeds of Dolichos bean cv.Konkan Bushan were dibbled singly at a spacing of 30 x 60 cm apart. The first irrigation was given immediately after sowing followed by life saving irrigation and subsequent irrigations were given once in a week. Incidence of sucking pests were managed by spraying with Neem seed kernal extract at 5%. Weeding was done where and when found necessary. Quantity of organic manures required was computed on the nitrogen equivalent basis. Recommended dose of N (36 kg ha^{-1}) was supplied in two different combinations like supply of 25% and 75% N through Bulky and 25% and 75%N through concentrated organic manures. The bulky organic manures used were FYM, Poultry Manure and vermicompost (VC) and the concentrated manures used were neem cake (NC) and castor cake (GC). 25 and 75 per cent N was calculated as 0.84 and 2.25 t ha^{-1} of FYM; 0.8 and 2.41 t ha^{-1} of VC; 0.25 and 0.61 t ha^{-1} of poultry manure; 0.22, and 0.78 t ha^{-1} of NC; 0.20 and 0.65 t ha^{-1} of CC to substitute the recommended dose of N (36 kg ha^{-1}). Bulky organic manures were applied as basal and concentrated cakes were top dressed in 2 split doses. First application was done at 20 days after sowing. The second was applied on 45th day of sowing. Recommended dose of inorganic fertilizers were applied only in the conventional farming treatment.

Experimental Design and Treatment Details
The experiment was laid out in a Randomized Block Design with three replication and fourteen treatments, viz.,

ISSN 2394 - 7780

T_1	-	**Control**
T_2	-	Inorganic fertilizers (36:72 kg NP ha $^{-1}$)
T_3	-	25 % N as Farm Yard Manure (0.84 t ha $^{-1}$) +75 % N as Neem cake (0.78 t ha $^{-1}$)
T_4	-	75 % N as Farm Yard Manure FYM (2.52 t ha $^{-1}$)+ 25 % N as Neem cake(0.22 t ha $^{-1}$)
T_5	-	25 % N as Farm Yard Manure (0.84 t ha $^{-1}$) + 75 % N as Castor cake (0.65 t ha $^{-1}$)
T_6	-	75 % N as Farm Yard Manure (2.52 t ha $^{-1}$) +25 % N as Castor cake (0.20 t ha $^{-1}$)
T_7	-	25 % N as Vermicompost (0.80 t ha $^{-1}$) +75 %N as Neem cake (0.78 t ha $^{-1}$)
T_8	-	75 % N as Vermicompost (2.41 t ha $^{-1}$)+25 % N as Neem cake (0.22 t ha $^{-1}$)
T_9	-	25 % N as Vermicompost (0.80 t ha $^{-1}$) +75 % N as Castor cake (0.65 t ha $^{-1}$)
T_{10}	-	75 % N as Vermicompost (2.41 t ha $^{-1}$) +25 % N as Castor cake (0.20 t ha $^{-1}$)
T_{11}	-	25 % N as Poultry manure (0.25 t ha $^{-1}$) +75 % N as Neem cake(0.78 t ha $^{-1}$)
T_{12}	-	75 % N as Poultry manure (0.61 t ha $^{-1}$) +25 % N as Neem cake (0.22 t ha $^{-1}$)
T_{13}	-	25 % N as Poultry manure (0.25 t ha $^{-1}$) +75 % N as Castor cake (0.78 t ha $^{-1}$)
T_{14}	-	75 % N as Poultry manure (0.61 t ha $^{-1}$) + 25 % N as Castor cake(0.22 t ha $^{-1}$)

RESULTS

Pod Yield per Hectare

The pod yield per hectare has shown significant difference among all the treatment when compared with control (Table 1). The pod yield was highest (6.46 t ha^{-1}) in T_2 which was followed by T_8 (5.50 t ha^{-1}) and T_{12} (5.35 t ha^{-1}). The treatment T_3 and T_4 were however, on par with each other. The treatment, T_1 recorded the lowest pod yield of 2.72 tonnes per hectare.

Table.1. Effect of bulky and concentrated organic manures on yield per hectare in garden bean

Treatments	Pod yield (t / ha^{-1})
T_1 - Control	2.72
T_2 - Inorganic fertilizers (36:72 NP kg ha^{-1})	6.46
T_3 - FYM @ 10 t ha^{-1} + NC @ 2.25 t ha^{-1}	3.63
T_4 - FYM @ 15 t ha^{-1} + NC @ 1.50 t ha^{-1}	3.64
T_5 - FYM @ 10 t ha^{-1} + CC @ 2.0 t ha^{-1}	3.01
T_6 - FYM @ 15 t ha^{-1} + CC @ 1.50 t ha^{-1}	3.21
T_7 – VC @ 5 t ha^{-1} + NC @ 2.25 t ha^{-1}	5.26
T_8 - VC @ 7.5 t ha^{-1} + NC @ 1.50 t ha^{-1}	5.50
T_9 - VC @ 5 t ha^{-1} + NC @ 2.0 t ha^{-1}	4.43
T_{10} - VC @ 7.5 t ha^{-1} + NC @ 1.5 t ha^{-1}	5.08
T_{11} - PM @ 7.5 t ha^{-1} + NC @ 2.25 t ha^{-1}	5.10
T_{12} - PM @ 10 t ha^{-1} + NC @ 1.5 t ha^{-1}	5.35
T_{13} - PM @ 7.5 t ha^{-1} + NC @ 2.0 t ha^{-1}	4.32
T_{14} - PM @ 10 t ha^{-1} + NC @ 1.5 t ha^{-1}	4.13
S.ED	**0.02**
CD (P=0.05)	**0.05**

Economics of Various Treatment Combinations

It was found out that the treatment T_2 (Inorganic fertilizer in recommended dose) recorded the highest gross income (1,08,086) as well as net income (69,741). The return per rupee invested was also observed to be higher (2.8) in this treatment combination. The next best treatment was T_8 with the value of 2.6 as return per rupee invested. T_1 (control) recorded the least (1.3) return per rupee invested when compared to all the other treatments as shown in table 2.

Table.2. Benefit cost ratio

Treatments	Cost of cultivation (Rs)	Gross Income (Rs)	Net Income (Rs)	BCR
T_1 - Control	14400	18720	4320	1.3
T_2 - Inorganic fertilizers (36:72 NP kg ha^{-1})	38745	108086	69741	2.8
T_3 - FYM @ 10 t ha^{-1} + NC @ 2.25 t ha^{-1}	38425	76850	38425	2.0
T_4 - FYM @ 15 t ha^{-1} + NC @ 1.50 t ha^{-1}	38425	76850	384252`0	2.0
T_5 - FYM @ 10 t ha^{-1} + CC @ 2.0 t ha^{-1}	38240	68832	30592	1`8

ISSN 2394 - 7780

T_6 - FYM @ 15 t ha^{-1} + CC @ 1.50 t ha^{-1}	38240	72656	34416	1.9
T_7 – VC @ 5 t ha^{-1} + NC @ 2.25 t ha^{-1}	38745	92988	54243	2.4
T_8 - VC @ 7.5 t ha^{-1} + NC @ 1.50 t ha^{-1}	38745	100737	61992	2.6
T_9 - VC @ 5 t ha^{-1} + NC @ 2.0 t ha^{-1}	38425	84535	46110	2.2
T_{10} - VC @ 7.5 t ha^{-1} + NC @ 1.5 t ha^{-1}	38425	88377	49952	2.3
T_{11} - PM @ 7.5 t ha^{-1} + NC @ 2.25 t ha^{-1}	38993	89683	50690	2.3
T_{12} - PM @ 10 t ha^{-1} + NC @ 1.5 t ha^{-1}	38745	96862.5	58117.5	2.5
T_{13} - PM @ 7.5 t ha^{-1} + NC @ 2.0 t ha^{-1}	38425	80892.5	42467	2.1
T_{14} - PM @ 10 t ha^{-1} + NC @ 1.5 t ha^{-1}	38425	80692	42267	2.1

DISCUSSION

In any management technology, the benefit cost analysis need to be focussed to assess its suitability for adoption. Considering the sale of tomato, garden bean and baby corn cultivated through inorganic manure at Rs.35 per kg and the organic tomato, garden bean and baby corn as Rs. 70 per kg (CIKS organic outlet, Salem), the highest return per rupee invested was obtained through application of inorganic fertilizers due to higher yield statistics. Among the organic manure treatments, application of vermicompost @ 10.50 t ha^{-1} with neem cake @ 0.73 t ha^{-1} recorded the highest income and benefit cost ratio followed by poultry manure @ 2.16 t ha^{-1} with neem cake @ 0.73 t ha^{-1}. (Siddeswaran and Shanmugam. 2013) also have reported higher returns due to organically grown vegetables.

The soil physico-chemical properties yield quality and cost benefit analysis of garden bean under different treatments imposed with bulky and concentrated organic manures showed that the treatment combination of 75 per cent N supplied through vermicompost 10.73 t ha^{-1} along with 25 percent N supplied through 0.73 t ha^{-1} of neem cake followed by 75 per cent N supplied through poultry manure @ 2.16 t ha^{-1} along with 25 per cent N supplied through 0.73 t ha^{-1} of neem cake are recognized for valuable returns and were forwarded for further studies in garden bean.

CONCLUSION

Among the treatments comprising organic manures and concentrated oil cakes, 75 per cent N supplied through vermicompost 2.41 t ha^{-1} along with 25 per cent N supplied through neem cake @ 0.22 t ha^{-1} followed by incorporation of poultry manure @ 0.61 t ha^{-1} 25 per cent N supplied through neem cake @ 0.22 t ha^{-1} recorded the maximum values for growth, yield and yield attributes.Among the organic treatments, treatment supplied with vermicompost @ 2.41 t ha^{-1} + neem cake @ 0.22 t ha^{-1} recorded higher income and return per rupee invested. This was followed by treatment involving poultry manure @ 0.61 t ha^{-1} + neem cake @ 0.22 t ha^{-1}.

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ASSESSMENT OF PHYSICO-CHEMICAL PARAMETERS IN THE OPEN WELL WATER OF SOME VILLAGES OF PIRAWA BLOCK IN JHALAWAR DISTRICT (RAJASTHAN)

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ABSTRACT
The study was carried out to assess the open well water samples of Pirawa Block of Jhalawar District. With the help of standard methods, we assessed the seasonal results of Pirawa Block. Sampling was done during three seasons (summer, rainy and winter) throughout the one year from 30 villages of this block (November, 2010 to October, 2011). The physico-chemical parameters like pH, turbidity, total dissolved solids, total hardness and concentrations of ions like chloride, fluoride, nitrate and sulphate were analyzed to know the present status of the open well water quality. The results were compared with the drinking water standards of ISI (10500-91) and WHO (1973). It was found that the open well water was contaminated at few sampling sites. The remaining sampling sites shows physicochemical parameters within the water quality standards and the quality of water is good and it is fit for drinking purpose.

Keywords: Open well water, Drinking water, Physiochemical parameters, Water quality standards.

I. INTRODUCTION

Water is important to the mechanics of the human body and the body cannot work without it. Water quality is essential for the well being of all people, the quality of water can be affected by different pollutants such as, chemical, biological and physical [1] - [18]. Contaminates such as bacteria, viruses, heavy metals, nitrate and salt have found their way into water supplies, the water pollution occurs when a body of water is adversely affected due to the addition of large amounts of materials to the water [19] - [21]. The sources of water pollution are categorized as being a point source or non- point source of pollution, point sources occurs when the polluting substance is emitted directly into the waterway while, a non-point source occurs when there is runoff of pollutants into a water way[52].

Groundwater with low pH values can cause gastrointestinal disorder and this water cannot be used for drinking purposes. Contamination of groundwater by heavy metals has been given much attention due to their low biodegradability and toxic effects [22] - [26]. Study of chemical budget of major ions gains importance since it explains the origin of the ions in groundwater and the level of the contamination by natural as well as anthropogenic sources [27] - [29].

Groundwater occurs as a part of the hydrological transformations of permeable structured zones of the rocks, gravel and sand. Groundwater can be obtained from aquifers and hypopheric zones. Fractured crystalline bedrocks are excellent sources of potable water in many parts of the world. Groundwater satisfies the domestic, agricultural and industrial need of the people [30] - [37]. In today's world, the demand of water is swiftly increasing due to substantial increase in population, industrialization and urbanization [38]. This demand is fulfilled by surface water and groundwater. Both the water resources largely bank on ice melting and rainfall. In this scenario, to provide safe drinking water is a very big accountability for the governments. Today, a big part of the population does not have pure water to drink. Easily and regularly available clean drinking water is still a harsh task to achieve not only in deserts but also in most of the mega cities and small towns [39].

Hence a continuous monitoring on groundwater becomes mandatory in order to minimize the groundwater pollution and have control on the pollutants. This study involves the determination of physical and chemical parameters of open well water of Pirawa Block at different villages. The objective of this study is to assess the present water quality, through analysis of some selected water quality parameters like pH, turbidity, total dissolved solids, total hardness & concentrations of ions like chloride, fluoride, nitrate, sulphate and compare the results with the standards values recommended by ISI and WHO.

II.EXPERIMENTAL

A. Study area

Jhalawar district located in the south-east of Rajasthan, between the longitudes of 750 27' 35" to 760 56' 48" East and latitudes of 230 45' 20" to 240 52' 17" North, adjoining the neighbouring state of Madhyapradesh. Pirawa is a Town and Tehsil in Jhalawar District of Rajasthan. According to census 2011 information the sub-district code of Pirawa Block (CD) is 00683. Total area of pirawa tehsil is 1,029 km² including 1,019.53 km² rural area and 9.00 km² urban area. Groundwater in weathered basalt occurs under water table condition.

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Thickness of weathering in basalt ranges maximum up to 20 meter. Ground water in compact basalt occurs under water table condition in the joints and fractures.

B. Methodology

Open well water samples were collected from 30 villages of Pirawa Block in 2010-2011. Samples were collected in clean polythene bottles pre-washed with dilute hydrochloric acid and rinsed three to four times with the water samples before the samples were stored at a temperature below 40° C prior to analysis in the laboratory. The physico-chemical parameters such as pH, turbidity, total dissolved solids, total hardness & concentrations of ions like chloride, fluoride, nitrate, sulphate were determined by using standard methods [40]. Specific reagents were used for the analysis and double distilled water was used for preparation of solutions. Location of Sampling Stations of Pirawa Block in Jhalawar District is shown in the Fig.1.

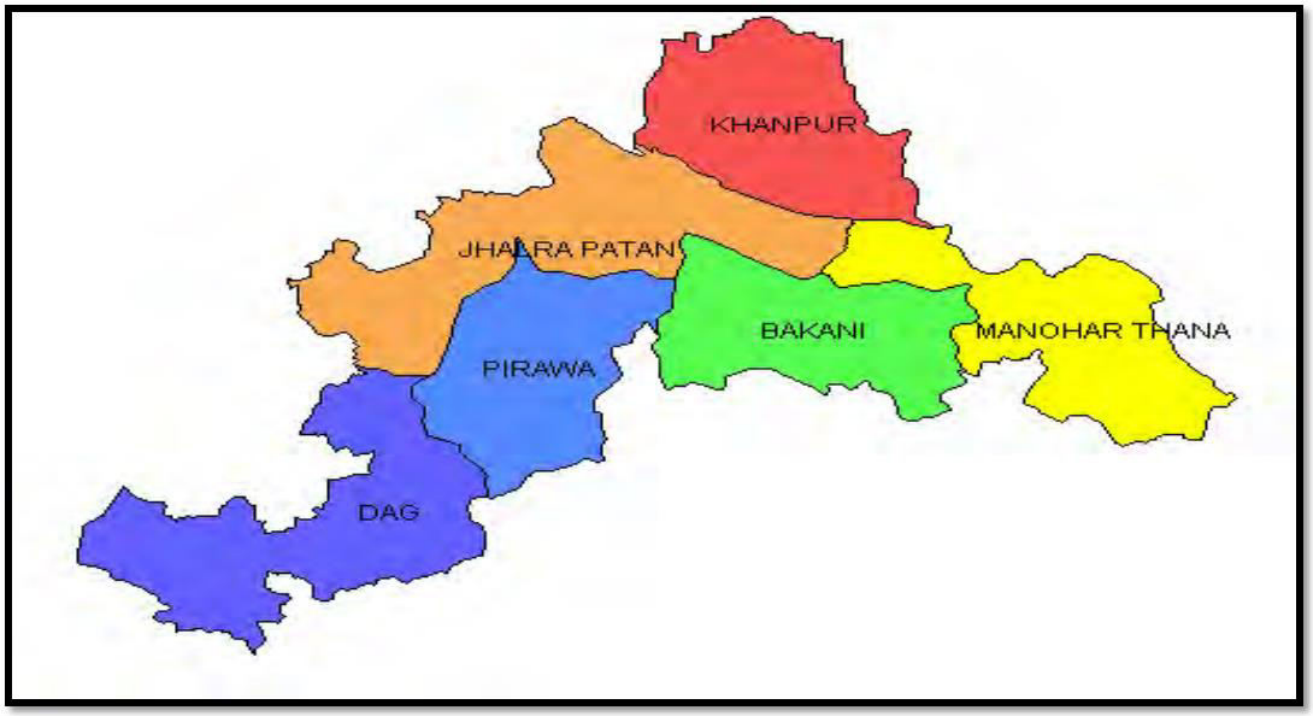

Fig. 1: Location of Sampling Stations of Pirawa Block in Jhalawar District

III. RESULT AND DISCUSSIONS

Results of three seasons physico- chemical parameters are shown in Table 1and minimum, maximum and average concentration of various physico-chemical parameters are represented in Fig. 2.

Table 1: Physico-Chemical Parameters of Open Well Water of Pirawa Block.

S.No.	Sample No.	Villages	Season	pH	Turbidity (NTU)	TDS (mg/l)	TH (mg/l)	Cl^- (mg/l)	F^- (mg/l)	NO_3^- (mg/l)	SO_4^{-2} (mg/l)
1	S_1	Banor	Summer	7.36	7.4	810	389.5	232.4	0.49	35.8	18.6
			Rainy	7.01	9.8	880	421.2	254.8	0.56	51.3	22.3
			Winter	7.15	8.9	920	412.5	245.6	0.53	46.7	20.5
2	S_2	Chachhlad	Summer	8.02	0.9	970	538.7	269.5	1.06	56.5	27.8
			Rainy	8.36	2.1	1030	529.9	260.8	0.98	72.6	38.6
			Winter	8.14	1.7	1000	510.8	255.6	0.92	68.4	33.7
3	S_3	Dablabhoj	Summer	8.22	3.5	890	425.2	198.9	0.94	70.6	19.6
			Rainy	8.49	2.9	860	390.8	214.6	0.99	69.9	22.8
			Winter	8.45	2.4	770	410.8	207.3	0.89	64.3	26.7
4	S_4	Dharoniya	Summer	8.62	5.1	820	392.9	182.8	1.12	42.6	48.4
			Rainy	8.54	4.8	870	418.8	175.6	1.05	59.5	36.7
			Winter	8.69	4.5	900	405.7	194.5	0.99	51.7	42.9
5	S_5	Dubaliya	Summer	7.83	11.9	530	329.5	60.3	0.54	26.4	9.7
			Rainy	7.62	12.4	610	269.7	83.4	0.63	41.5	16.8
			Winter	7.79	13.1	580	320.5	75.9	0.59	32.7	12.5

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6	S_6	Fatehgarh	Summer	6.86	14.4	690	342.0	120.8	0.39	20.6	12.3
			Rainy	7.11	15.9	700	356.8	91.3	0.31	35.8	18.9
			Winter	7.09	16.2	610	351.8	111.7	0.35	27.3	22.8
7	S_7	Gadiya	Summer	8.46	15.7	810	310.0	100.3	0.42	31.3	33.4
			Rainy	8.61	17.8	920	329.7	124.8	0.51	46.9	21.6
			Winter	8.73	13.3	780	338.1	117.9	0.47	39.5	26.7
8	S_8	Gelani	Summer	8.41	9.7	550	322.5	91.3	0.54	21.9	38.6
			Rainy	8.49	11.3	450	352.2	112.6	0.51	32.5	22.3
			Winter	8.33	10.8	590	341.8	100.2	0.46	27.4	29.5
9	S_9	Hemra	Summer	7.73	1.5	660	354.8	88.3	0.28	20.4	8.5
			Rainy	7.94	2.7	580	333.5	109.5	0.35	25.5	16.7
			Winter	7.89	2.9	610	348.7	99.4	0.32	33.8	11.8
10	S_{10}	Kadodiya	Summer	7.84	3.6	740	472.3	110.6	0.19	39.3	25.4
			Rainy	8.02	4.9	810	494.5	133.8	0.27	54.3	15.3
			Winter	7.97	5.9	780	488.7	121.2	0.23	46.8	20.6
11	S_{11}	Kalitalai	Summer	7.64	12.4	790	388.4	140.5	0.96	52.3	15.3
			Rainy	7.92	16.9	850	412.2	172.3	1.09	41.5	26.2
			Winter	7.85	13.4	910	405.3	165.6	1.01	47.4	20.3
12	S_{12}	Kanwari	Summer	7.83	12.4	880	467.5	202.9	0.92	70.8	9.6
			Rainy	7.75	15.2	930	504.9	191.6	0.89	69.7	18.7
			Winter	7.63	17.4	910	498.3	210.5	0.83	61.8	12.8
13	S_{13}	Kotri	Summer	7.25	0.9	960	488.3	174.9	0.96	49.6	28.7
			Rainy	7.41	1.2	850	465.7	150.8	0.87	57.8	12.2
			Winter	7.59	0.7	880	476.7	169.2	0.93	55.4	18.9
14	S_{14}	Mageespur	Summer	7.24	3.7	990	518.0	267.9	1.13	66.7	29.5
			Rainy	7.38	4.8	1030	508.9	255.7	1.34	58.6	22.3
			Winter	7.31	3.9	1070	491.2	241.8	1.09	67.9	26.7
15	S_{15}	Mathaniya	Summer	8.22	8.4	790	434.0	66.8	1.03	20.1	18.7
			Rainy	8.57	9.7	750	410.5	75.5	0.94	23.5	27.9
			Winter	8.35	10.1	710	422.9	89.7	0.99	25.4	22.4
16	S_{16}	Naulai	Summer	8.49	10.3	880	474.3	71.2	1.02	31.4	32.8
			Rainy	8.55	11.5	840	467.3	86.5	1.18	12.4	41.3
			Winter	8.39	11.8	900	442.7	77.7	1.11	27.9	38.4
17	S_{17}	Odiyakheri	Summer	7.64	6.7	930	396.5	134.6	1.24	28.3	24.7
			Rainy	7.79	8.3	1020	421.2	112.8	1.32	36.2	35.3
			Winter	7.73	7.4	960	410.8	125.9	1.27	31.5	28.8
18	S_{18}	Osav	Summer	8.56	6.4	700	380.1	69.8	1.26	32.3	14.7
			Rainy	8.72	10.3	780	401.6	86.4	1.35	41.4	25.8
			Winter	8.67	9.4	800	399.4	78.7	1.31	37.5	19.9
19	S_{19}	Raipur	Summer	8.86	11.4	1100	545.7	242.9	1.19	61.3	21.6
			Rainy	8.99	13.9	1160	574.9	255.7	1.27	58.7	32.9
			Winter	8.94	12.8	1120	560.8	267.8	1.24	52.8	26.5
20	S_{20}	Salotiya	Summer	7.86	6.5	1280	580.4	252.8	0.69	72.5	26.4
			Rainy	7.72	7.2	1190	612.1	273.6	0.83	65.3	14.3
			Winter	7.83	7.9	1130	597.2	267.8	0.77	70.5	18.7
21	S_{21}	Salri	Summer	7.72	7.8	1000	520.8	200.8	0.49	55.5	11.6
			Rainy	7.88	8.4	1060	549.6	245.6	0.57	67.8	21.9
			Winter	7.93	7.6	1090	541.4	231.7	0.53	66.7	16.8
22	S_{22}	Samariya	Summer	7.86	6.5	690	405.7	92.4	0.18	21.4	14.5
			Rainy	7.95	9.8	630	367.5	118.6	0.26	32.9	22.8
			Winter	7.99	7.2	700	399.4	105.3	0.23	29.8	19.4
23	S_{23}	Samlikham	Summer	7.91	3.1	880	459.7	122.8	0.52	31.4	22.3
			Rainy	7.78	4.2	810	442.2	100.3	0.49	27.5	34.4
			Winter	7.86	2.5	850	451.2	115.7	0.43	20.6	28.6

ISSN 2394 - 7780

24	S_{24}	Sarkheri	Summer	7.54	9.7	1080	551.2	232.9	1.26	65.8	25.6
			Rainy	7.31	13.8	1130	520.6	253.4	1.12	62.3	16.9
			Winter	7.42	10.9	1190	562.8	241.7	1.21	59.1	11.5
25	S_{25}	Samla	Summer	7.17	11.6	1070	488.5	262.4	0.42	61.4	31.3
			Rainy	6.98	10.4	1010	516.2	255.3	0.34	55.8	34.5
			Winter	7.11	10.3	1040	508.6	244.8	0.39	59.7	42.8
26	S_{26}	Sherpur	Summer	7.32	18.7	920	441.7	156.5	0.79	47.9	44.9
			Rainy	7.24	20.4	850	454.3	172.4	0.74	39.8	39.8
			Winter	7.09	17.1	890	448.3	165.2	0.76	43.7	35.7
27	S_{27}	Sirpoi	Summer	7.43	16.8	810	390.5	98.8	0.51	42.5	27.8
			Rainy	7.52	20.4	740	399.2	112.9	0.42	31.2	20.6
			Winter	7.58	17.3	780	396.5	105.7	0.48	37.9	16.7
28	S_{28}	Soyla	Summer	7.59	0.8	990	510.1	180.4	0.53	40.7	34.4
			Rainy	7.64	1.4	930	491.5	200.5	0.45	51.8	21.2
			Winter	7.51	1.2	960	501.4	195.7	0.49	47.5	28.5
29	S_{29}	Sunel	Summer	7.48	6.4	1060	534.4	222.1	0.91	54.8	32.8
			Rainy	7.54	7.1	1100	510.2	244.3	0.96	45.6	22.5
			Winter	7.41	6.5	1070	528.1	237.8	0.93	51.7	26.6
30	S_{30}	Sunwas	Summer	8.74	6.2	1020	500.6	178.3	1.24	57.9	16.8
			Rainy	8.59	7.3	970	531.1	202.9	1.39	48.3	9.4
			Winter	8.65	6.8	990	518.4	198.6	1.05	55.8	13.7
31	WHO	-	-	7.0 – 8.5	5.0	1000	500	250	1.5	50	200
32	ISI	-	-	6.5 – 8.5	10.0	500	300	250	1.0	45	200

A. **pH:** pH values ranged between 6.86 to 8.99 during one year samplings. The average value of pH was 7.89. The sampling points S_4, S_7, S_{15}, S_{16}, S_{18}, S_{19} and S_{30} showed higher pH values than prescribed limit given by WHO. The minimum value of pH was found in sample S_6 and the maximum value of pH was detected in sample S_{19}.

B. **Turbidity:** Turbidity values ranged between 0.7 NTU to 20.4 NTU during one year samplings. It was notice that S_5, S_6, S_7, S_8, S_{11}, S_{12}, S_{15}, S_{16}, S_{18}, S_{19}, S_{24}, S_{25}, S_{26} and S_{27}. Open well water samples have more turbidity as compare to WHO permissible limit. The average value of turbidity was 8.76 NTU. The minimum value of turbidity was monitored in sample S_{13} and the maximum value of turbidity was viewed in sample S_{27}.

C. **Total Dissolved Solids (TDS):** The data table reveals that the TDS values in one year varied from 450 mg/l to 1280 mg/l. The average value of TDS was 879.11 mg/l. The sampling points S_2, S_{14}, S_{17}, S_{19}, S_{20}, S_{21}, S_{24}, S_{25}, S_{29} and S_{30}. Showed higher TDS values than prescribed limit given by WHO. The minimum value of TDS was found in sample S_8 and the maximum value of TDS was observed in sample S_{20}.

D. **Total Hardness (TH):** TH values were varied from 269.7 mg/l to 612.1 mg/l and these values were within permissible limits prescribed by WHO except samples S_2, S_{12}, S_{14}, S_{19}, S_{20}, S_{21}, S_{24}, S_{25}, S_{28}, S_{29} and S_{30}. The average value of TH was 447.81 mg/l. In sample S_5 minimum value of TH was observed and in sample S_{20} maximum value of TH was surveyed.

E. **Chloride (Cl^-):** Chloride values ranged from 60.3 mg/l to 273.6 mg/l and the average value of chloride was 166.90 mg/l. All samples were lesser values than the prescribed WHO and ISI standards except samples S_1, S_2, S_{14}, S_{19}, S_{20}, S_{24} and S_{25}. The minimum value of chloride was examined in sample S_5 and the maximum value of chloride was scrutinized in sample S_{20}.

F. **Fluoride (F^-):** The data table reveals that the fluoride values in one year varied from 0.18 mg/l to 1.39 mg/l for all open well water samples and they all were within permissible limits recommended by WHO standards. The minimum value of fluoride was observed in sample S_{22} and the maximum value of fluoride was found sample S_{30}. The average value of F^- was 0.77 mg/l.

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G. **Nitrate (NO_3^-):** Nitrate values ranged from 12.4 mg/l to 72.6 mg/l and the average value of nitrate was 45.96 all of the studied samples of one year. All samples were lesser values than the prescribed WHO standards except samples S_1, S_2, S_3, S_4, S_{10}, S_{11}, S_{12}, S_{13}, S_{14}, S_{19}, S_{20}, S_{21}, S_{24}, S_{25}, S_{28}, S_{29} and S_{30}. The minimum value of nitrate was examined in sample S_{16} and the maximum value of nitrate was scrutinized in sample S_2.

H. **Sulphate (SO_4^{-2}):** All values of sulphate were under recommended standards in one year. Sulphate values varied between 8.5 mg/l to 48.4 mg/l. The minimum value of sulphate was found in sample S_9 and the maximum value of sulphate was detected in sample S_4. The average value of sulphate was 24.22 mg/l.

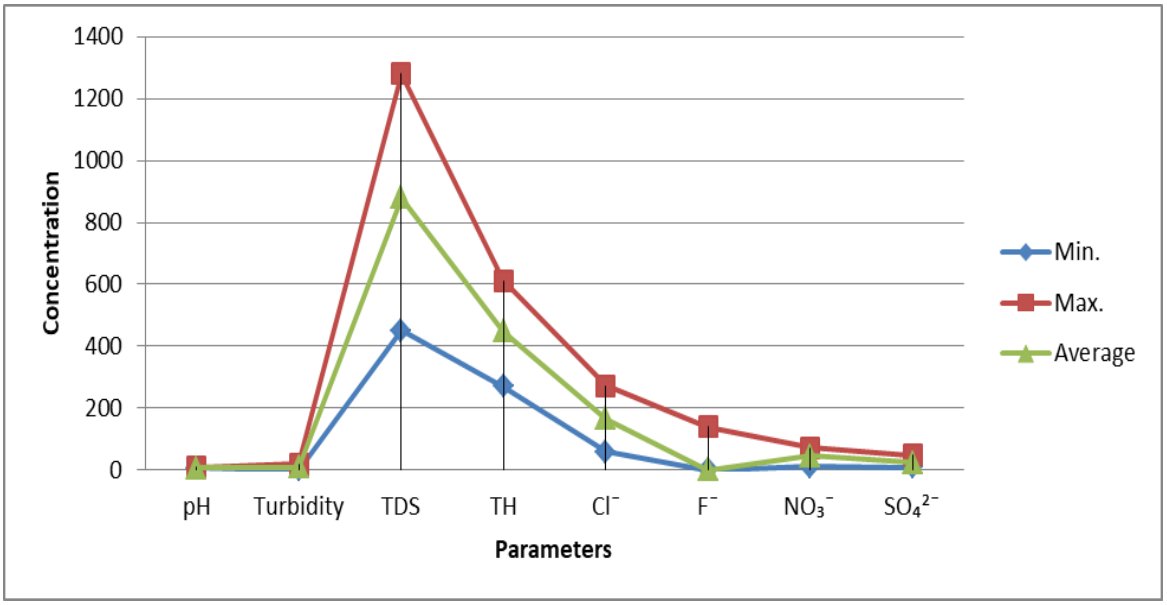

Fig. 2: Minimum, Maximum & Average Concentration of Various Parameters in Pirawa Block

IV. CONCLUSION

From the analysis, it is evident that the values of F^- and SO_4^{-2} are within permissible standard limits but all the studied samples were high pH, TDS, Turbidity, TH, Cl^- and NO_3^- which suggest the poor water quality in these water samples. Hence, it suggested that open well water source in the study area be monitored before the use for domestic and drinking purposes.

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