UGC SPONSORED THREE DAY NATIONAL WORKSHOP ON RESEARCH METHODOLOGY

For Commerce, Management & Economics

16-18 September- 2015

Workshop Proceedings

Postgraduate & Research Department of Commerce

St. Thomas College, Palai

(Re-accredited with "A" Grade by NAAC)

Arunapuram P.O. Kottayam Dt. Kerala - 686574

Title

UGC Sponsored Three Day
National Workshop on Research Methodology
For Commerce, Management & Economics
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Postgraduate and Research Department of Commerce
St. Thomas College Palai

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The Organizer

St. Thomas College, Palai was founded in 1950 by H.E. Mar Sebastian Vayalil, the first Bishop of Catholic Eparchy of Palai, St. Thomas College prolongs its journey 'to be a centre of excellence through the formation of young people empowered to create a bright future for themselves and others, irrespective of caste, creed, religion or language through dissemination of knowledge, skills and noble values'. Being a pioneer in higher education scenario of Kerala, it has to its credit decades of distinguished service in the field of advanced education, sending out many graduate and postgraduate maxima cum laude to carve out their destinies in diverse spheres. UGC – NAAC has accredited the college at A level with commendable index point in 2015. Currently college expands its wings of knowledge through twenty one Departments out of which ten are well established research centres.

Being an unbeatable pool of resources in the arena of business education, the Research and Postgraduate Department of Commerce has an impressive dynamic history of more than five decades which were solely dedicated 'to be a centre of excellence in business studies by upholding moral and ethical values'. Apart from offering Certificate, Diploma, Graduation and Postgraduation programmes in commerce and allied subjects, the department excels among other research centres in Arts and Science colleges of the state of Kerala with good number of doctoral degrees produced under six research guides with remarkable experience and more than three dozens of research scholars. Active involvement of its teaching fraternity in research and the dissemination of know-how are commented splendidly and it is currently noted with its efforts for promoting genuine research.

Message from the Principal

Research is the Key with which we unlock the ever widening horizons of knowledge. A methodological approach to one's subject will surely enhance the academic acumen of the researcher. I hope that the National workshop on Research Methodology for Commerce, Management and Economics will gear the participants up to a systematic pursuit of various fields in their respective academic arenas. I wish all the success for the workshop. May this be an opportunity to rekindle the embers of knowledge in our minds. I wholeheartedly congratulate the Department of Commerce on taking this academic adventure.

Dr. Sunny Joseph
Principal

About the Workshop

The workshop aims to explore the basic dimension of research and the need for scholars to rethink the assumptions that underline historic paradigms of research in the field of Commerce, Management and Economics. It is designed to provide participants with hands-on approach to conduct research. On completion of the workshop, participants would develop the skills to review the literature, develop hypotheses, frame research design, identify sampling techniques and comprehend the role and relevance of the tools for data collection and analysis. The three days workshop will be exposing the participants to theoretical input on qualitative research techniques. It is a platform which gives the young researchers to meet many dynamic researchers of different Universities.

The Team

H.E.MAR. Jacob Muricken (Manager)
Msgr. Dr. Joseph Kollamparambil (Pro- Manager)
Dr. Sunny Joseph (Principal)
Rev. Dr. James John (Vice Principal)
Rev.Fr. Mathew Kurian Kavanadimalayil (Bursar)
Prof. K.V. John (Head of the Department)
Prof. Bobby Simon (Asst. Professor)
Prof. Tejil Thomas (Asst. Professor)
Prof. Binoy Chacko (Asst. Professor)
Prof. James Varghese (Asst. Professor)
Prof. Jinu Mathew (Asst. Professor)
Dr. Babu Jose (Asst. Professor & Convenor)

Managing Committees

Programme

1. Dr. Babu Jose
2. Prof. Tejil Thomas
3. Prof. James Varghees
4. Mr. Jobin Joseph
5. Miss. Athira Manoj

Registration

1. Prof. Binoy Chacko
2. Dr. Babu Jose
3. Mr. Suresh. T S
4. Mr. Alphin. T Kallani

Food & Accommodation

1. Prof. Bobby Simon
2. Prof. Jinu Mathew
3. Mr. Jobin Joseph
4. Mr.Josep Sebastian
5. Mr.Amal Ghosh
6. Mr. Alex Joseph
7. Mr. Akhil Krishnan
8. Miss. Anitha Mohanan
9. Miss. Nimmy Jose

Session Coordination

1. Prof. James Varghees
2. Prof. Jinu Mathew
3. Mr. Vishak Vijayan
4. Miss. Sruthy Anilkumar

Reception

1. Prof. K.V. John
2. Prof. Bobby Simon

3. Miss. Alphonsa Mathew
4. Miss. Arya Thomason
5. Mr. Mabil M Muricken
6. Mr. Alex Jose

Press and Communication

1. Prof. K.V. John
2. Prof. Binoy Chacko
3. Mr. Joseph Sebastian
4. Mr. Alphin T Kallani

Participating Institutions

1. BCM College, Kottayam
2. BVM Holy Cross College Cherpunkal
3. Central university of Rajasthan, Rajasthan
4. Chinmaya Vidyapeet, Ernakulam
5. CMS College Kottayam, kerala
6. Cochin University of Science and Technology, Kochi
7. DB College, Sasthamkotta, Kollam
8. Devamatha College Kuravilangadu
9. Farook College, Calicut
10. Girideepam Institute of Advanced Learning, Kottayam
11. Govt Arts College,Dharmapuri, Tamil Nadu
12. Govt. Arts College, Salam, Tamil Nadu
13. Govt. College for Women, Thiruvanandapuram
14. Govt. College Thiruvanandapuram
15. GVHSS North Edappally,Ernakulam
16. Henry Baker College Melukavu
17. K.E College, Mannanam
18. MA College Ramapuram
19. Madras School of Economics, Chennai
20. Mahatma Gandhi University, Kottyam
21. MES College Erattupetta
22. MES College, Perinthalmanna
23. Morning Star Home Science College, Angamaly

24. Newman College, Thodupuzha
25. NSS College Rajakumari
26. NSS College,Cherthala
27. PGRMSN College, Channanikad
28. Pondicherry University, Pondicherry
29. Rajagiri Centre for business Studies, Kochi
30. Sacred Heart College , Thevara, Cochin
31. Saint Gits College, Pathamuttom
32. SD College Alappuzha
33. St. Aloysius College, Edathua
34. St. Dominic's College, Kanjirapally
35. St. Peter’s College, Kolenchery, Kerala
36. St. Xavier’s College, Vaikom
37. The Cochin College, Kochi
38. TM Government College, Tirur
39. University College, Trivandrum
40. University Grants Commission, New Delhi
41. University of Hyderabad
42. University of Kerala, Thrivandrum
43. WMO Arts & Science College Muttil, Wayanad

Resource Person

Dr. Gabriel Simon Thattil
Professor of Commerce
School of Business Management and Legal Studies
University of Kerala

Dr. Gabriel Simon Thattil is a Professor of Commerce in the School of Business management and Legal Studies of Kerala University, India. He has M. Com, M. Phil, PGDHRM and Ph. D qualifications and 24 years of teaching and research experiences to his credit. He has produced 22 PhD and 38 M.Phil. His 40 research papers are published in national and international journals, he authored 3 books in the areas of Human Resource, Management and Knowledge Management. He is the resource person for academic activities in many organizations and also he is the member in professional bodies like All India Management Association, Kerala Management Association, All India Commerce Association, South India American Studies, and Indian Accounting Association. So far he has completed two major projects and two minor projects of UGC and currently serving as the coordinator of UGC SAP project. His area of interest for projects includes Banking, Rural Finance, Human Resource Management, Co- operation, Analysis of Financial Statement and Working result of enterprises.

Resource Person

Dr. Daniel Lazar
Associate Professor
Department of Commerce
Pondicherry University

Dr .D. Lazar is an Associate Professor of finance in the department of Commerce, school of management of Pondicherry University, India. He has M. Com, M. Phil, PGDBA, ACMA, PGDCA and Ph. D qualifications and 24 years of teaching and research experiences to his credit. His research papers are published in national and international journals, edited books in the areas of micro finance, and published monographs in the areas of finance and stock market through international publisher. He has undertaken externally funded research projects sponsored by UGC, ICSSR and private organization. Four international conferences on micro finance were organized under his directorship. Presented research papers in international conferences held at Rome, Mexico, and Singapore. Delivered lectures in various colleges, Universities in India, Bhutan and Mexico. He has won best researcher award from Loyola College, Chennai and third best research paper award from Indian Institute of Capital Market, Mumbai and all rounder prize for both curricular and co curricular activities from Loyola Institute of Business Administration (LIBA), Chennai. He has had academic visits to many foreign countries like USA, Italy, Mexico, Germany and Bhutan.

Resource Person

Dr. R. Kasilingam

Associate Professor
Department of Management Studies
Pondicherry University

Prof. R. Kasilingam is presently Associate Professor in the Department of Management Studies, Pondicherry University. He teaches MBA students and guiding PhD scholars in their doctoral research. He has about 11+ years of industrial experience (as sales officer, product and business manager) and 15+ years of teaching experience at PG level. He is a highly qualified and thorough professional with about 15 degrees and certifications to his credit (Ph.D., M.Phil., ICWAI., ACS., ML., MBA., MCA., etc.,). He is a university rank holder in his UG Degree and in the toppers list in the PG degree. He is also a Sun certified person. Dr. Kasilingam's professional affiliations are with MMA, ICWAI, Indian Accounting Association and also serves as the member of syllabus committee for Anna University of Technology, Chennai. He has authored a number of important manuscripts in the area of finance for several years with over 100 publications to his credit and also acts as a reviewer for an international journal and acted as resource person for more than 30 workshops at students' level and faculty level mainly on Data Analysis, Articles writing, and corporate strategies. Prof. R. Kasilingam is also an authorized resource person for conducting "SEBI Financial Education Program" in Tamilnadu and Puducherry, because of his extensive experience in the field of financial management education, the keenness of his mind, and the strong understanding of business management, financial planning, and the regional ethos. He has conducted more than 40 workshops for the different stakeholders of the society.

Resource Person

Dr. Joji Alex N
Associate Professor
Rajagiri Centre for Business Studies
Kochi

Dr. Joji Alex N is an Associate professor in Marketing, Rajagiri Centre for Business Studies. He is a post-graduate in Business and Economics and teaches in the domain of marketing. He has presented papers in Marketing, Education and Strategy in national and international conferences. He is awarded his doctorate in management studies, which is titled-Compulsive buying behaviour and its relationship on credit default. He has more than a dozen publications to his credit in National/International Journals of repute. His present research interest includes brand management, and different aspects of consumer behaviour. He is intensely associated with the training and consultancy wing of Rajagiri Center for Business Studies and has undertaken various trainings, consultancy and research projects. He has been a Visiting International Scholar at the Western Michigan University, Kalamazoo, USA. He has six International publications in post PhD period and Eight publication in pre-PhD period. He attended many training programmes and very active in consultancy services.

Resource Person

Dr. Santhosh Kumar. S
Associate Professor
Department of Commerce
St.Peter's College, Kolencherry

Dr. Santhosh Kumar is an Associate Professor in PG and Research Department of Commerce, St. Peter's College, Kolencherry. He has topped the list during his academic life which includes gold medal for first rank with first class in M. Com Degree from University of Kerala. He has secured his M.Phil and PhD in commerce from University of Kerala and done Post Doctoral Research on a Fellowship from ICSSR. He has also obtained an MBA, GDFM and PGDIM from IGNOU, New Delhi. With More than 19 years of experience in teaching including 12 years of research experience to his credit, he has published more than 50 articles in various journal of National and International repute. He has presented research papers in many National and International conference including a paper on problems in implementation of MGNREGA for which he has been bagged with best paper award by Delhi School of Professional studies and Research, Delhi. Currently, he is a member to many academic societies, organizations and is member to editorial boards of reputed journals. He has also been a resource persons for various National and International Conference held across the length and breadth of the Nation.

Resource Person

Dr. B. Anand

Assistant Professor
Department of Economics
Central University of Rajasthan

Dr. Anand is an Assistant professor, Department of Economics, Central University of Rajasthan. He has completed his Master Degree and PhD from Pondicherry University and PDF from IIM Bangalore. His area of interest is Macroeconomics, Monetary Economics, Applied Econometrics and Indian Economy. He has three international publications and one edited book in his credit and presented eight research papers in National and International Conferences. His technical expertise in data analysis and models contains Econometrics, specifically, Cointegration Model, Vector Error Correction Model, Impulse Response Function and Variance Decomposition Model.

Resource Person

Dr. Sunil Paul

Assistant Professor
Madras School of Economics
Chennai

Dr. Sunil Paul is an Assistant Professor in Madras School of Economics, Chennai. He has completed his PhD from Pondicherry University. His area of interests includes Monetary Economics, Macro Economics and Applied Econometrics. He has ten years research experience as Project Executive in NORMA Social and Market Research, Thiruvanathapuram, Kerala, Research Assistant, Indian Institute of Management-Kozhikode and Project Fellow, Department of Economics, Pondicherry University. He was the faculty member in IBS Hyderabad. Dr. Sunil has five publications which contain two in Sage publication and one in Elsevier. He was the best research paper award winner of South Asian Journal of Macroeconomics and Public Finance in 2013. He has attended six international conferences and presented research papers and participated many workshops on the applications of econometrics and to measure the economic efficiency and methods. He is the resource person for FDP on Panel Data and time series econometrics in Popular Business Schyt66ool like Amrita School of Business in Coimbatore, Guest Speaker on course organized by Reserve Bank Staff College Chennai, Training Programmes for Senior level IES officers at Chennai, and National and international conferences on statistical software and Time series data analysis.

List of Participants

1. Akhil Krishnan, M.Com Student, Dept. of Commerce, St. Thomas College, Pala
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3. Alphonsa Mathew, M.Com Student, Dept. of Commerce, St. Thomas College, Pala
4. Anish Thomas, Asst. Professor, Deva Matha College Kuravilangad
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16. Divya Joseph, Asst. Professor, Department of Commerce, K.E College Mannanam
17. Dr K.C Biju, Asst. Professor, Department of Economics, St Thomas College Pala
18. Dr. A.V. Biju, Asst. Professor, Govt. College for Women Thiruvananthapuram
19. Dr. Joshy Andrews, Asst. Professor, Department of Commerce ,St. Aloysius College, Edathua
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31. Jesvin Jose, Asst. Professor, Department of Commerce, TM Government College, Tirur

32. Jikku Varghese, Lecturer, Girideepam Institute of Advanced Learning, Kottayam
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62. Revathi K Sivadas, Research Scholar, Sacred Heart College, Thevara, Kochi

63. Ronia Liza Mathew, Research Scholar, Cochin University of Science and Technology
64. Shabeerali Pulikkalakath, Asst. Professor of commerce, WMO Arts & Science College Muttil, Wayandu
65. Sheejamol Jacob, Lecturer, BVM Holy Cross College, Cherpunkal
66. Shika Ramesh, Guest Lecturer, Morning Star Home Science College, Angamaly
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77. Sunitha N Salam, Department of Commerce, MES College Erattupetta

78. Suresh Babu C, Vocational Instructor, GVHSS, North Edappally, Ernakulam
79. Suresh T S, M.Com Student, Dept. of Commerce, St. Thomas College, Pala
80. Syamraj K.P, Lecturer, MES College, Perinthalmanna
81. Tejil Thomas, Asst. Professor, Dept. of Commerce, St. Thomas College, Pala
82. Usha Vijayan, Head of the Department of Commerce, Chinmaya Vidyapeet, Ernakulam
83. Visakh Vijayan, M.Com Student, Dept. of Commerce, St. Thomas College, Pala

Programme

Inaugural Session

(I Day - 16-09-2015, Wednesday, 9.30- 10.15 am)

Prayer :

Words of Welcome : **Prof. K.V.John**
H.O.D., Department of Commerce

Presidential Address : **Dr. Sunny Joseph**
Principal

Inaugural Address : **Dr. Sheena Shukkur**
Pro- Vice Chancellor
Mahatma Gandhi University
Kottayam

Felicitations : **Dr. Gabriel Simon Thattil**
Professor of Commerce
University of Kerala

: **Dr. Daniel Lazar**
Associate Professor of Commerce
Pondicherry University

Vote of Thanks : **Dr. Babu Jose**
Convenor

Programme

Time	Session
Day I (16 Sept. 2015)	
09.30-10.15 AM	Inauguration
10.15 to 10.30	Break
10.30 – 12.00 Noon	Technical session –I
12.00– 01.30 PM	Technical session –II
01.30 – 02.00 PM	Lunch Break
2.00 pm – 3.30 PM	Technical session –III
3.30 to 05.00 PM	Technical Session – IV
Day II (17 Sept. 2015)	
9.00 - 10.30 AM	Technical Session V
10.30 to 12.00 Noon	Technical Session VI
12.00 – 01.30 PM	Technical session –VII
01.30 – 02.00 PM	Lunch Break
2.00 – 3.30 PM	Technical session –VIII
3.30 to 05.00 PM	Technical Session – IX
Day III (18 Sept. 2015)	
9.00 - 10.30 AM	Technical Session X
10.30 to 12.00 Noon	Technical Session XI
12.00 – 01.30 PM	Technical session –XII
01.30 – 02.00 PM	Lunch Break
2.00 – 3.30 PM	Technical session –XIII
3.30 to 04.00 PM	Valedictory Function

Programme

Valedictory Session

(III Day - 18-09-2015, Friday, 3.30- 04.00 pm)

Prayer :

Words of Welcome : **Prof. Tejil Thomas**
Asst. Professor
Department of Commerce

Presidential Address : **Prof. K.V.John** H.O.D.,
Department of Commerce

Valedictory Address : **Dr. K.K. Jose**
Professor,
Central University of Rajasthan
& Former Principal,
St. Thomas College, Palai

Feedback from the Participants

Vote of Thanks : **Prof. Bobby Simon**
Asst. Professor
Department of Commerce

National Anthem :

Technical Sessions

Technical session –I

(16/09/2015, 10.30 – 12.00 Noon)

Basic Approaches to Research

Dr. Gabriel Simon Thattil , University of Kerala

What exactly is research? Is it a Degree? Is it recognition or something that brings promotion in your career or increments to your salary or may be a good Job? Is it a ***Dr.*** status to your good name.

When there is a casual remark on a question as to' what are you doing?' ? The answer to which is 'I am doing research'; the implication is that one is doing PhD, so here research is pursuing a degree.

In fact research is a common sense approach to search for knowledge. It is different from search for Data and a mere search for Information. Gone are the days where we were in the information age or data age . Today we get tones of data on any phenomenon on your finger tips within seconds .Here we recognize the world wide web. Such data can easily be processed in to information but the real challenge is in creating knowledge.

Data is raw facts and figures or mere observed values and information is processed data, but what then is knowledge? it is the skillful use of information to resolve issues in a context through new ideas, concepts and theories or models. The evolution to this height is research. It is just a *search for knowledge* in a scientific an rational way. Here common sense approach dominates

Knowledge cannot erupt from vacuum , all inventions and discoveries of the world have come from simple pre existing

theories in nature . Knowledge creation requires acquiring what is existing, knowing how it was created, looking for contextual relevance in terms of time location and application and identifying knowledge Gaps. Research here is to fill the knowledge gap

Research basically addresses two questions

1. What is that you wanted to find out and
2. How is that you found it out

The answer to question number one will give you your ***research problem*** and the second your ***methodology***. Let us recognize the fact that right research Methods cannot come without identifying the real research problem- The issue that necessitated the research.

Understanding the research issue in its true and finest perspective is essential to develop a right methodology. Based on the Research Problem we develop the research design, identify sources of data, tools for collection, analysis and reporting.

The Basic Approach to research should help us to ponder over the exactness of the research problem and the process the researcher intends to pursue to unfolding and resolving the issue identified. Good survey of existing literature will lead to a right hypothesis and use of appropriate data and testing will help to establish the hypothesis. Challenges of identifying the variables and examining dependence need to be addressed. What do we do with the intervening variables and how exactly can we report our findings are all the more crucial. The use of Internet and software are useful and cannot be avoided, but we have to consider them as tools and not superior to the researchers human wisdom.

Research is Joyful learning and experimenting that leads to creative revelations.

Technical session –II
(16/09/2015, 12.00– 01.30 pm)
Recent Trends in Commerce and Management Research
Dr. Joji Alex N, RCBS, Kochi

What is Research?

1. Research is the systematic investigation into and the study of materials and sources in order to establish facts and reach new conclusions. To do research means to investigate systematically.

Research "For what?"

Research is for making 'Unknown to Known', replacing 'Prejudices to facts' and transforming 'Data to wisdom'.

Differentiation is the key

Vibrancy and robustness of the process is important in research.

Expectations in Management Research

High level of Aspiration is the centre focus of management research. A relevant Research Question is always expected. The exploration of unexplored idea (New Idea) or to have a novel approach to the study is important. Management research should add knowledge to existing theories. It also should enrich existing managerial practices and lead to its betterment.

What should be avoided?

- Wrong Business problem and research question raised?
- No grasp of the basic methodological issues
- Poorly conceived model
- No full time focused research
- No contribution for theory advancement and managerial solutions

Deciding What to Research?

- What is interesting in the field?
- What interests the researcher ?
- What is researchable? (Time frame/Budget support)
- What is relevant to the organization?
- What enriches the existing theory?
- What modifies the existing practice?

Selection of topic

Topics are to stand the test of time. Otherwise some other topics emerge, remain popular for some time and then ignored by scholars and potentially practitioners.

Review of Literature

A management researcher has to know which the current keywords in literature are. The following questions are to be answered by the researchers. Why have they taken a back seat? What have brought back certain other keywords? It is better to focus a journal to understand what type of issues it is focusing. Newspaper articles on major trends in the

markets, as it is the basis of an 'Unexplored Research Questions' can be used.

External validity

Generalizability is an important characteristic expected from management research of all the time.

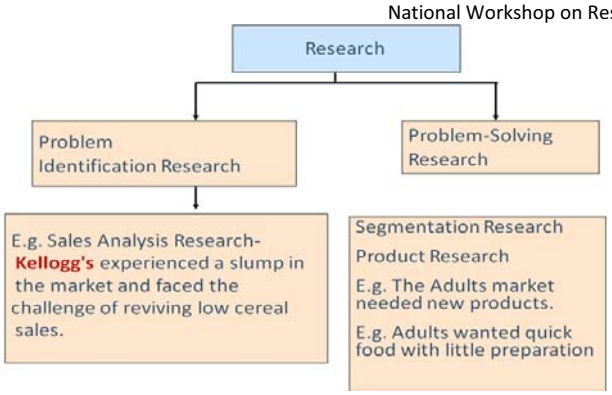
Realization for development of research

1. Knowledge of the state of the field
2. Problems faced in the discipline
3. Ability to establish cross disciplinary connections

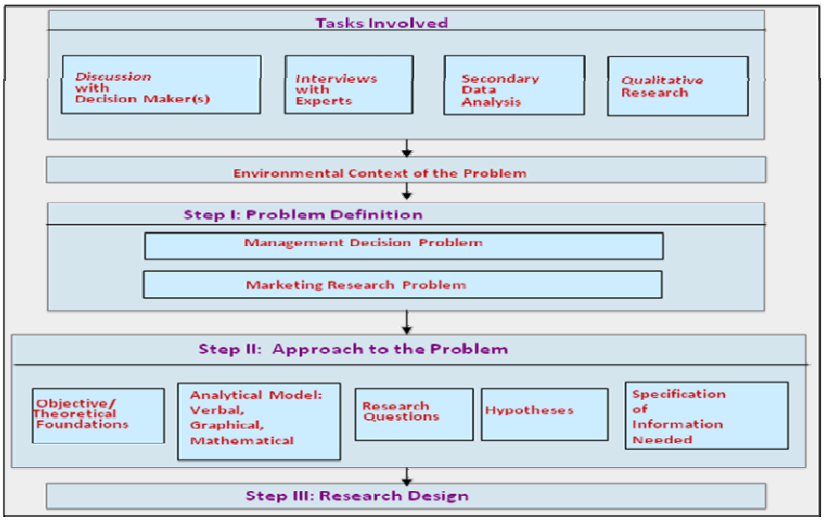
Research is procedural

1. Scientific realism(Classical realism)-Perception and reality are independent
2. Fallibilistic realism- Genuinely know the world, but lacks certainty. *Why?*
3. Critical realism- Critically evaluate knowledge

Classification of Research



The Problem Definition Process



Harley- Davidson 1

MDQ - Should Harley-Davidson invest to produce more motor cycles?

MRP - To determine if customers would be loyal buyers of Harley-Davidson in the long term?

Harley- Davidson 2

1. Who are the customers of H-D? Demographics and Psychographics?
2. Can different types of customers be distinguished? Can segmentation be meaningful?
3. Are all the customers having the same feelings having the H-D? Are they all motivated for the same reason?
4. Are customers loyal to H-D? what is the extent of brand loyalty?

Harley- Davidson 3

One RQ - Can the motorcycle buyers be segmented based on psychographic characteristics?

H1- There are distinct segments of motor cycle buyers

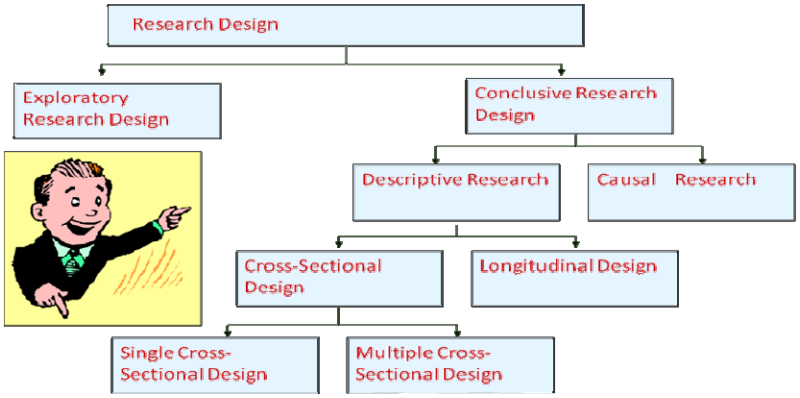
H2- Each segment is motivated to own a Harley for a different reason

H3-Brand loyalty is high among H-D customers in all segments

Harley- Davidson 4

Theory used: Brand Loyalty is the result of positive beliefs, attitude, affect and experience with the brand

A Classification of Research Designs



A Comparison of Basic Research Designs

	Exploratory	Descriptive	Causal
Objective:	Discovery of ideas and insights	Describe market characteristics or functions	Determine cause and effect relationships
Characteristics:	Flexible, versatile	Marked by the prior formulation of specific hypotheses	Manipulation of independent variables, effect on dependent variables
Methods:	Expert surveys Pilot surveys Case studies **Secondary data:** qualitative analysis qualitative research	**Secondary data:** quantitative analysis Surveys Panels Observation and other data	Experiments

Harley- Davidson 5

Qualitative (Exploratory) - Focus Group of owner's, would-be users, owners of other brands were conducted to understand their feelings towards H-D

Quantitative (Conclusive) - 16000 surveyed to get their psychological, sociological, demographic profiles of customers

Triangulation in research

- Is qualitative research exploratory
- What is the importance of qualitative research where Social Influence factor is high in purchase behavior?
- What when quantitative and qualitative research findings mismatches?
- Coke re-branding into New Coke?

Scenarios where triangulation is important

- Highly visible product like coke- others opinion matters
- The product becomes very important E.g Hospital
- Complex buying behavior E.g. Computer
- Good studies insist on triangulation

Limits in research

- No Aspiration (most important)

- Institutional (Is it against established Norms/Interests)
- Agenda of research (funding agency)

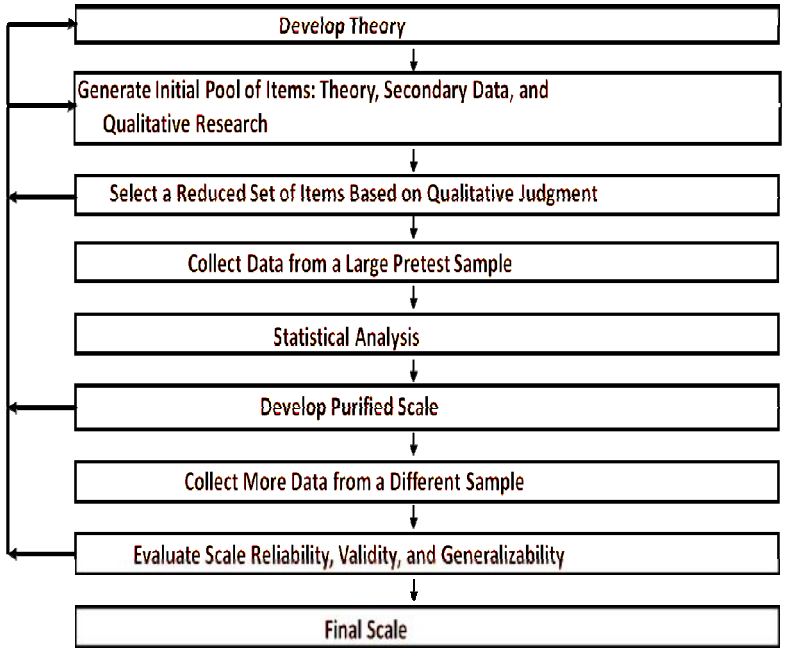
Importance of certain type of procedures

1. Relative Advantages and Disadvantages of Longitudinal and Cross-Sectional Designs

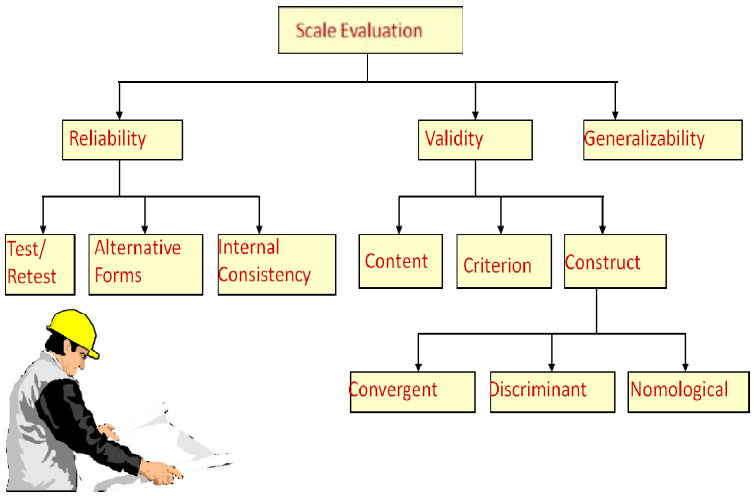
Evaluation Criteria	Cross-Sectional Design	Longitudinal Design
Detecting Change	-	+
Large amount of data collection	-	+
Accuracy	-	+
Representative Sampling	+	-
Response bias	+	-

Note: A "+" indicates a relative advantage over the other design, whereas a "-" indicates a relative disadvantage.

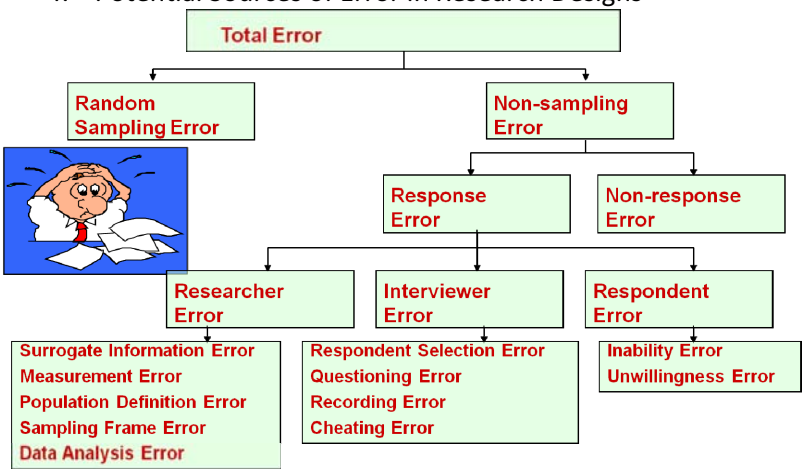
2. Development of a Multi-item Scale


Develop Theory
Generate Initial Pool of Items: Theory, Secondary Data, and Qualitative Research
Select a Reduced Set of Items Based on Qualitative Judgment
Collect Data from a Large Pretest Sample
Statistical Analysis
Develop Purified Scale
Collect More Data from a Different Sample
Evaluate Scale Reliability, Validity, and Generalizability
Final Scale

3. Scale Evaluation



4. Potential Sources of Error in Research Designs



Measurement Accuracy

The 'true score model' provides a framework for understanding the accuracy of measurement.

$$X_O = X_T + X_S + X_R$$

Where,

X_O = the observed score or measurement

X_T = the true score of the characteristic

X_S = systematic error (Valid if this is Zero)

X_R = random error (Reliable if this is zero)

Process vs. Result

The question, which one is more important, process or result stands relevant in current research. There can be different arguments for and against both the

sides. But what is necessary it to justify the process, because, result is only an outcome which explains confirmation or deviation from existing theories /practices.

Role of technology

The modern technology can be used efficiently is modern management research. Reviewing e-journals is of great relevance. The data collection can be made easier and analysis can be completed within a short span of time, by the help of the technology. The writing of bibliography too is a hectic task which is simplified by technology.

Conclusion

The final question is where we are heading towards. The final answer should be the research output.

Technical session –III

(16/09/2015, 2.00 pm – 3.30 pm)

Review of Literature and Identification of Research Gap

Dr. Daniel Lazar, Pondicherry University

Review of Literature: A literature review is a description or a scholarly paper of the literature including sustentative findings, theoretical and methodological contributions relevant to a particular field or topic. In other words it is an account of what has been published on a topic by accredited scholars and researchers. The purpose of a review is to analyze critically a segment of a published body of knowledge through summary, classification, and comparison of prior research studies, reviews of literature, and theoretical articles. A systematic review is a literature review focused on a research question, trying to identify, appraise, select and synthesize all high quality research evidence and arguments relevant to that question. The purposes of the review are: i) to define and limit the problem you are working on, ii) to place your study in an historical perspective, iii) to avoid unnecessary duplication, iv) to evaluate promising research methods, v) to relate your findings to previous knowledge and suggest further research.

Review of literature enlarges the knowledge about the topic and it helps the researcher to gain and demonstrate skills in information seeking or descriptive and critical appraisal or assessment. Information seeking is the ability to scan the literature efficiently to identify a set of useful articles and books. This type of review should not list but it is expected to add comment and bring out themes and trends. Critical appraisal is the ability to apply principles of analysis to identify unbiased and valid studies. A critical assessment should state where the weaknesses and gaps are. It is important to note that review of literature should not be simply a description of what others have published in the

form of a set of summaries, but it should take the form of a critical discussion, showing insight and an awareness of differing arguments, theories and approaches.

In order to achieve best result from literature review, it should be organized around and related directly to the thesis or research question, results should be synthesized into a summary of what is and is not known, it can identify areas of controversy in the literature and it has to formulate questions that need further research. According to Caulley (1992) of La Trobe University, the literature review should: i) compare and contrast different authors' views on an issue ii)group authors who draw similar conclusions, iii) criticise aspects of methodology, iv) note areas in which authors are in disagreement v) highlight exemplary studies, vi) highlight gaps in research, vii) show how your study relates to previous studies, viii) show how your study relates to the literature in general iv) conclude by summarizing what the literature says.

At the end of review of literature, the researchers are expected to identify the gap in the literature called as research gap. It is the missing element in the existing research literature and this research is going to fill with the research approach. Identification of research gap make research publishable because it would show that the research has a deep understanding of the status of the body of knowledge in the chosen field and it will show that the researcher conducted a research which fulfills that gap in the literature.

Technical Session – IV

(16/09/2015, 3.30 to 05.00 pm)

Formulation of Hypothesis and Testing of Hypothesis

Dr. Daniel Lazar, Pondicherry University

A hypothesis is a proposition that is empirically testable. It is an empirical statement concerned with the relationship among variables. A null hypothesis is an assertion about the value of a population parameter. It is an assertion that we hold as true unless we have sufficient statistical evidence to conclude otherwise. The alternative hypothesis is the negation of the null hypothesis. In hypothesis testing, rejecting a true null hypothesis is known as a type I error and accepting a false null hypothesis is known as a type II error. Researcher should not try to completely avoid either type of error instead he or she should plan, organize and settle for some small, optimal probability of each type of error.

There three types of hypothesis tests: i) Tests of hypothesis about population means, ii) Tests of hypotheses about population proportions and iii) Tests of hypotheses about population variances.

Testing population means: when the null hypothesis is about a population mean, the test statistics can be either Z or t. The cases in which the test statistic is Z: when standard deviation is known and the population is normal and standard deviation is known and the sample size is at least 30 (The populations need not be normal). The cases in which the test statistic is t: The population is normal and standard deviation is unknown but the sample standard deviation is known.

Testing population proportions: It can be tested using the binomial distribution or normal approximation to calculate the p-value. The binomial distribution can be used whenever binomial probabilities can be calculated. In otherwords, for

calculations using tables, the samples size n and the population proportion p should have been tabulated. Whjen the sample size n is too large (>500) to calculate binominal probabilities, then the normal approximation method is to be used.

Testing population variances: The test statistics for testing hypothesis about the population variances is chi square test. The chi square table cannot be used for calculating p values, only the range of possible values can be inferred like t tables.

Technical Session V

(17/09/2015, 9-10.30 am)

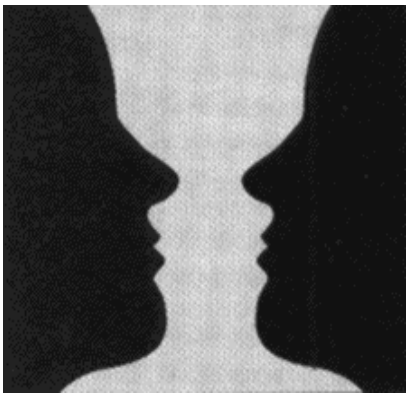
Data and Data Collection (Sampling Concepts and Considerations)

Dr. Santhosh Kumar. S,

St.Peter's College, Kolencherry

Dr. Santhosh Kumar session was more theoretical and made a practical session on the selection of sample and how to frame the sample design, different types of research and its needs. His sessions could be summarized in such a manner as given below.

- Need for Scientific Methods in Research
- Why do Sampling?
- Concepts relating Sampling
- Sampling Designs
- Sampling Size
- Cases for Sample Design
- Concluding Remarks
- We term this picture as ***ambiguity*** because it can be perceived in more than one way.



Knowledge Illusion

- Is small pox caused by the
  - wrath of a goddess
    Or
  - due to infection?
- Illusion may be the departure from reality or from truth.

Scientific Research

- The world is not directly understandable.
- We sometimes disagree with others about the things we see in the world around us.
- We find that things in the world sometimes are at odds with our present understanding.
- **The scientific method** attempts to provide a way in which we can reach agreement and understanding.

Need for Scientific Research

- A rational application of a perfect scientific method would always result in agreement and understanding.
- In effect a perfect method would not leave any room for rational agents to disagree.

Two Phases of Logic

Induction Deduction

Induction

- A form of argument in which the premises give grounds for the conclusion, but do not necessitate it.
- From particular to general.
- Swan in India is white; Swan in Europe is white; Swan in US is white.
- So all Swans are white.

Induction has to do with probability

Deduction

- Form of inference such that the conclusion must be true if the premises are true.
- From general to particular.
- All men have two legs: John is a man.
- It is then logical to deduce that John has two legs
- Deduction has to do with necessity

Falsification or Refutation

- **Falsifiability** is an important concept in the philosophy of science associated with **Karl Popper** and **Ernest Gellner**.
- It amounts to the apparently paradoxical idea that a proposition or theory *cannot be scientific* if it does not admit consideration of the *possibility of its being false*.
- Falsifiable" does not mean "false".
- For a proposition to be falsifiable, it must be possible in principle to make an observation that would show

the proposition to be false, even if that observation has not been made.

Population and Sampling Frame

- ***Population*** refers to any group of people or objects that form the subject of study in a particular survey.
    - Smokers in Kerala
    - Soft drink users in Kerala
    - Ph.D. Awardees in University of Kerala
    - Registered Voters in Kerala
- ***Sampling frame*** comprises of all elements of population with proper identification that is available to us for selection at any stage of sampling.

Sample, Sampling Unit and Sampling

- ***Sample*** is subset of a population. It comprises of only some elements of the population.
- A ***sampling unit*** is a single member of a sample.
- ***Sampling*** is the process of selecting an adequate number of elements from the population so that the study of the sample will help in understanding the characteristics of the population and to generalize the results.

Sample Vs. Census

- Sample saves time and cost.
- There are situations where a sample is the only option.
- A study of sample instead of complete enumeration may, at times, produce more reliable results.

- Census is appropriate when the population size is small.

Sampling Design

- Refers to the process of selecting samples from a population
- Two types of sampling designs;
    - Probability Sampling
        - each and every element of the population has a known chance of being selected in the sample.
    - Non-probability Sampling
        - The elements of the population do not have any known chance of being selected in the sample

Probability Sampling Design

Simple Random Sampling

- List all the elements of the population where from the samples to be drawn.
- These are put in a box and shuffled properly.
- Selecting a slip from the box and reading identification number.
- The process can be continued until the required sample size is reached (with or without replacing the chosen slips).
- Alternative way of selecting the samples is by using random number tables.
- Sample may not be representative.

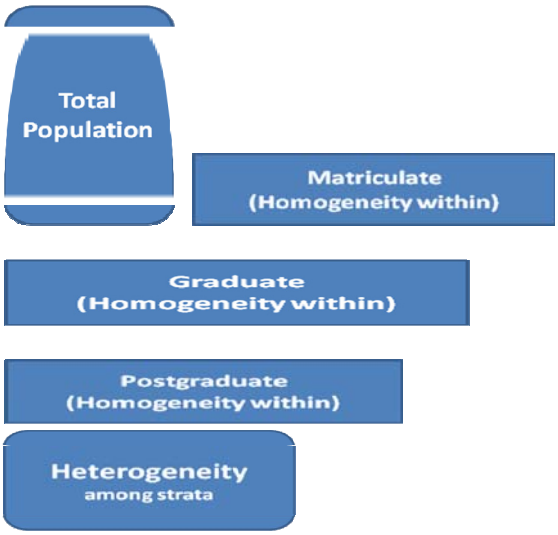
Systematic Sampling

- The entire population is arranged in a particular order (date/ascending/descending).
- Sampling interval (K) is calculated by N/n
- A random number (I) is selected from 1 to K
- The first element to be selected from the ordered population is 'I', the next element would be I + K, and the subsequent one would be I + 2K and so on.
- First unit of the sample is selected at random (PS) and having chosen this, we have no control over the subsequent units of sample (NPS).
- Also called mixed sampling

Stratified Random Sampling

- Involves dividing the entire population into **strata** or groups which are **mutually exclusive and collectively exhaustive**.
- Elements in a strata are **homogeneous**.
- More efficient compared to simple random sampling
- The elements are selected using a simple random sampling independently from each group.
- Increases the representativeness of the sampling.
- Criteria for stratification should be related to the objectives of the study.

Stratified Random Sampling



Cluster Sampling

- The entire population is divided into various **clusters** in such a way that the elements within the clusters are **heterogeneous**. However, there is **homogeneity** among clusters.
- Just the opposite of stratified random sampling.
- Cluster is treated as the sampling unit.
- In stratified sampling, a random sample is drawn from each of the strata, whereas in cluster sampling only the selected clusters are studied.
- One version of cluster sampling is **area sampling**
- It is the least representative of the population out of all the types of probability samples.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Dr. Sheena Shukkur
Pro -Vice Chancellor
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15 09 2015


21st Century Paradigm
Global connectivity through Telecom Innovations
Data mining
Data explosion
Information Networking
Need for Customized knowledge
Need for Skilled Manpower


16 09 2015


16 09 2015


16 09 2015


B outcomes not
C Relationships not proved
D Doubted rationality
16 09 2015


16 09 2015


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DR. R. KASILINGAM
Pondicherry University
16 09 2015


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DR. K.K. JOSE
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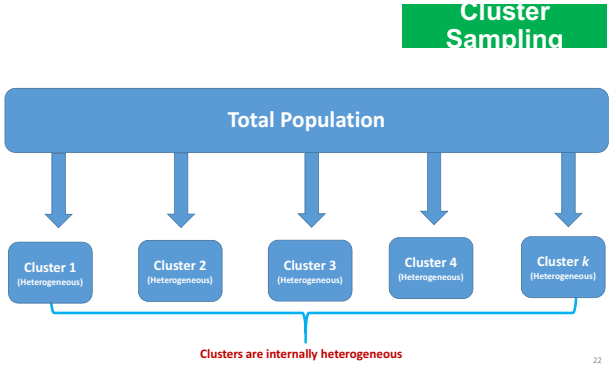
16-18 September 2015 at Library Hall
Chief Guest
DR. K.K. JO
Professor of
Central University
18 09 2015

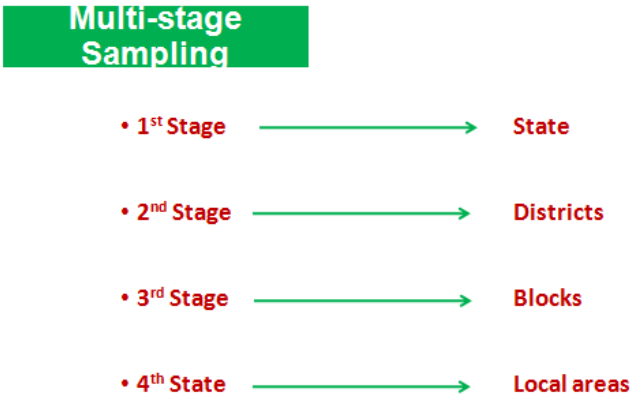
Cluster Sampling



Multi-stage Sampling

- Involves selection of units in more than one stage
- First, selection of primary large sample units
- Then, selection of secondary large sample units from the primary large sample units chosen, and so on;
- **At last**, the **final sample units** are selected from the penultimate sample stage units.

Multi-stage Sampling



Non-probability Sampling

Convenience Sampling

- Convenience of the researcher is the selection criterion of sampling units.
- Often used on the pre-test phase of a research study.
- Commonly used in exploratory research
- Generalisation is not possible as no effort is made for a representative sample.

Judgmental Sampling

- A type of nonrandom sample that is selected based on the opinion of an expert.
- Judgment of an expert is used to identify a representative sample.
- Generalisation is not possible as representativeness of the sample is doubtful.

Snowball Sampling

- Generally used when it is difficult to identify the members of the desired population.
- Under this design each respondent, after being interviewed, is asked to identify one or more in the field.
- The main problem is in making the initial contact.
- It may be difficult to get a representative sample.

Quota Sampling

- Sample includes a minimum number from each specified subgroup in the population.
- The sample is selected on the basis of certain demographic characteristics such as age, gender, occupation, income etc.
- It does not require a sample frame.
- The sample units are selected at the convenience or judgment of the researchers.

Quota sampling is the non probability version of stratified sampling.

Sample Size

- Determined based on the estimation of population parameters using the pilot survey data.
- Researcher has to decide the primary variables of measurement.
- Choose the level of significance.
- Leave the process to an expert, if you are not well-versed.

Sample Size

- Sample size

$$n = \left(Z^2 . N . \sigma_p^2\right) + (N-1)e^2 + Z^2 . \sigma_p^2$$

- N = Size of population
- n = Size of sample
- Z is confidence level at 5 per cent i.e. 1.96
- σ^2 = standard deviation of population calculated on the basis of trial samples
- e = Margin of error.

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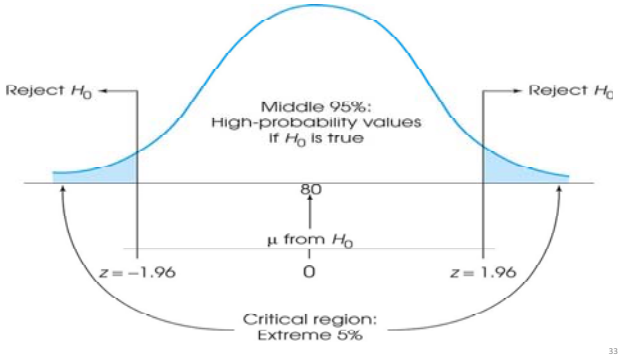
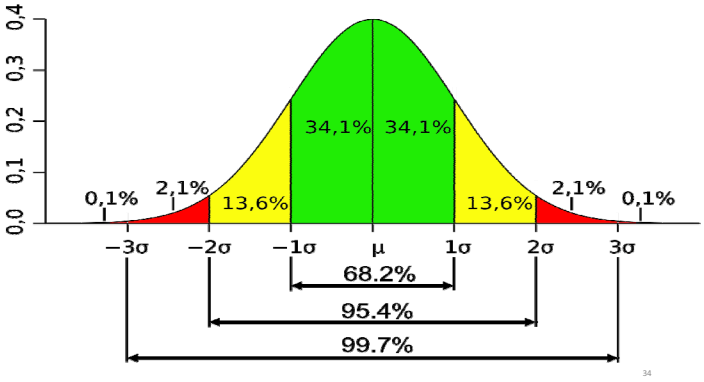
Sampling Vs. Non-Sampling Error

- There are two types of errors that may occur while we are trying to estimate the population parameters from the sample.
- **Sampling error** arises when a sample is not representative of the population.
- A **Non-sampling error** usually arises due to varied reasons
    - Incorrect responses by respondents
    - Incorrect collection of responses
    - Incorrect transfer of data from Qs/IS to Spread Sheet/SPSS/other Softwares
    - Errors in coding, tabulation and computation
    - Sampling Frame Error





Estimate of Sampling Error

A sampling error is usually measured in terms of the standard error for a particular statistic. It is the square root of the variance. The standard error can be used to calculate confidence intervals within which the true value for the population can reasonably be assumed to fall. The value of that statistic will fall within a range of plus or minus two times the standard error of that statistic in 95 percent of all possible samples of identical size and design.

Technical Sessions VI- IX

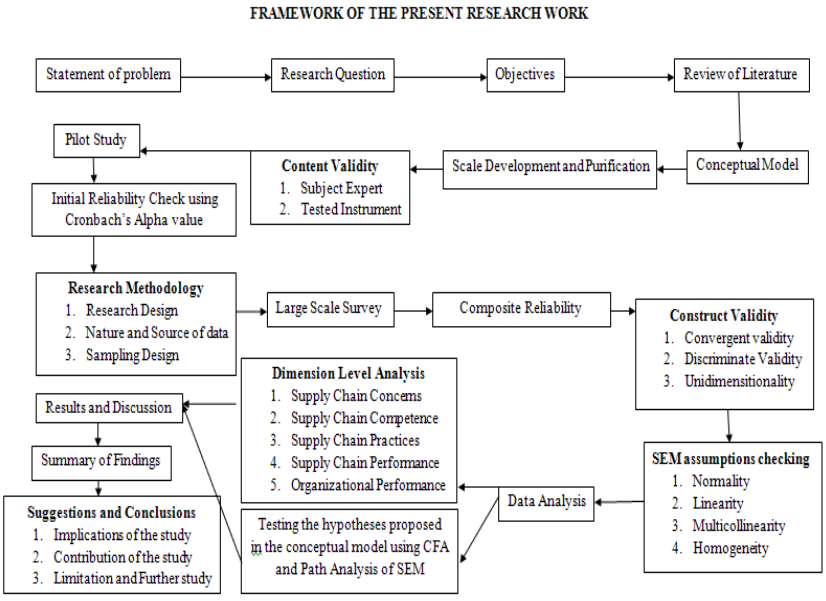
(17/09/2015- 10.30 to 05.00 pm)

Dr. R. Kasilingam, Pondicherry University

Contents

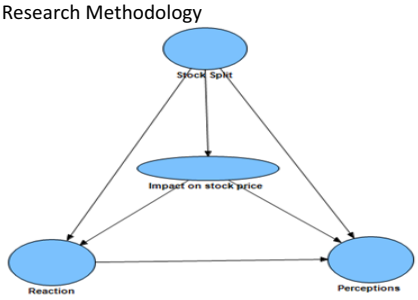
8 One way-ANOVA
9 Regression
10 Format of a project report

1. Conceptual Frame work of Research

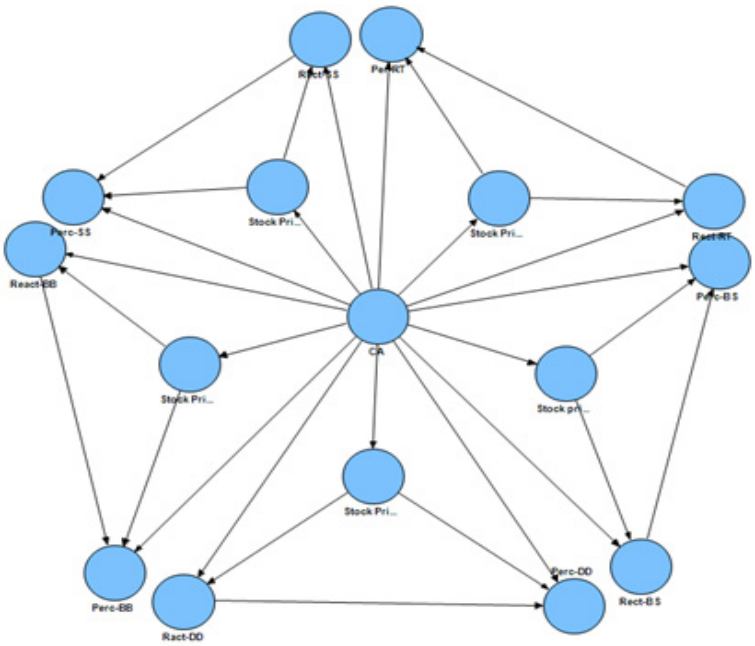


2. Conceptual Models

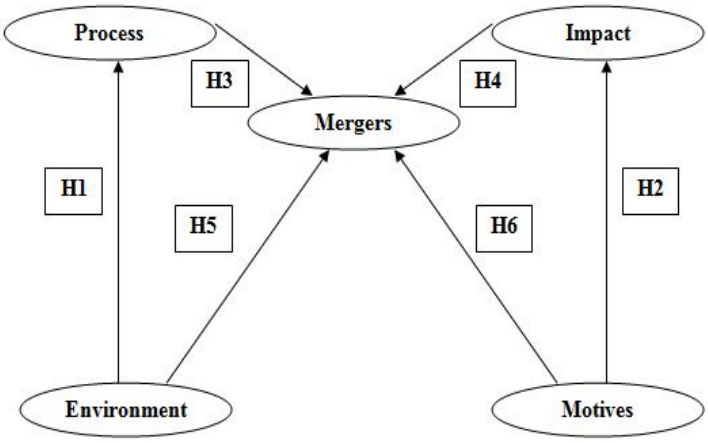
2.1 Investor's Investment Behavioural Model of CA: A pyramid Model



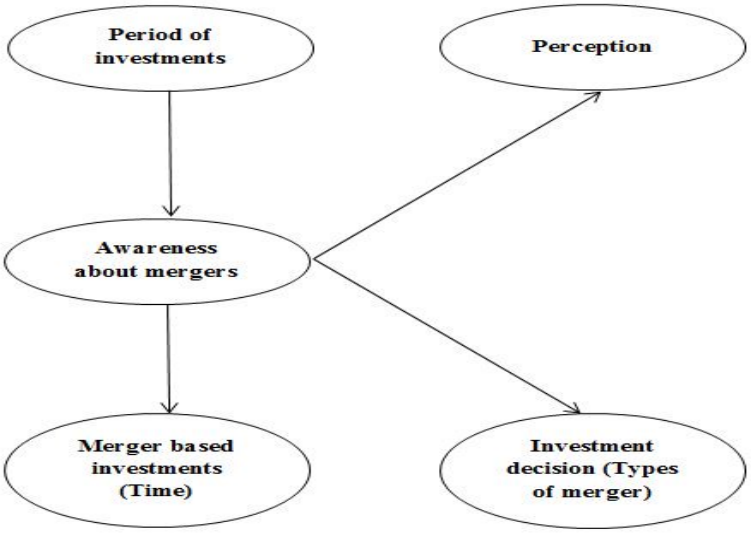
2.2 Investor's investment behavioural model of CAs- A Pentagon model



2.3 Conceptual Model – 'M' model



2.4 Awareness Model – Kasilingam Model (K Model)

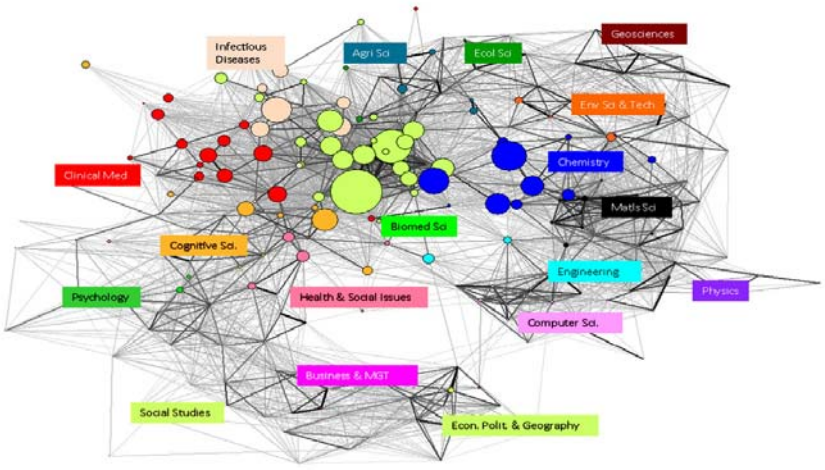


3. Review of Literature

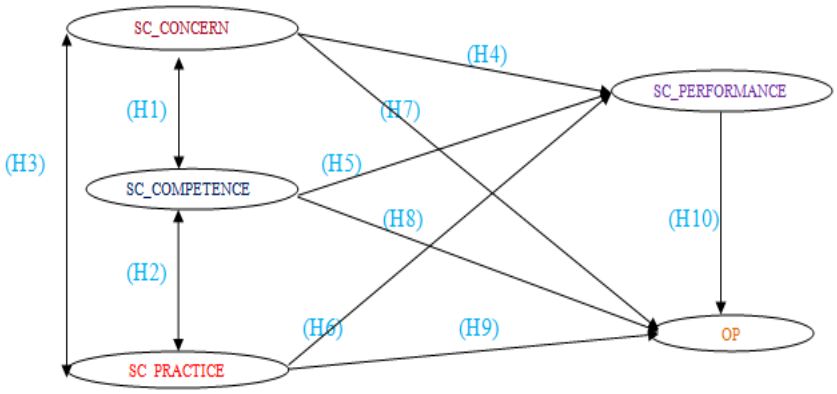
Sl.No	Authors	Objectives	Variables and Constructs used	Methodology	Findings
1	Chow et al(2008)	To study the association of supply chain management components and organizational performance through structural equation modeling	Supply chain concerns, Supply chain competence and organizational performance	Perceptions of middle-line managers in the US and Taiwan	Supply chain competencies have positive effects on organizational performance and Supply chain practices and competencies are significantly associated in both the US and Taiwan.

3.1 Research Gap

- Different supply chain components are studied separately
- There are studies on impact of supply chain components on Organizational performance
- There are studies on the linkage supply chain performance and Organizational performance
- There is no study on impact of supply chain components on supply chain performance and in turn its impact on organizational performance.



3.2 Conceptual Framework



3.3 Hypotheses

H1	Supply chain competencies and supply chain concerns are associated.
H2	Supply chain practices and supply chain competencies are associated.
H3	Supply chain practices and supply chain concerns are associated.
H4	The level of supply chain concerns positively influence the degree of supply chain performance

4. Research Methodology

- Research design- Descriptive
- Nature of data: Supply chain concerns, competence, practices, performance, Organizational performance and Profile of manufacturing industries.
- Source of data- Primary data

- Data collection instrument : Structured Questionnaire

4.1 Sampling Design

- Sample unit = Manufacturing Industries in Union Territory of Pondicherry.
- Sample technique = Simple random sampling
- Sample frame: Dept of Industry and commerce
- Sample size = 255 $n_0 = \frac{Z^2 \quad \sigma^2}{e^2}$ (Israel, 2009)
- Where, Z=1.96 , σ = 8.12, e = 1 = 253.29

4.2 Sample Size

$$n = \left(\frac{\sigma * 1.96}{\mu * 0.05}\right)^2$$

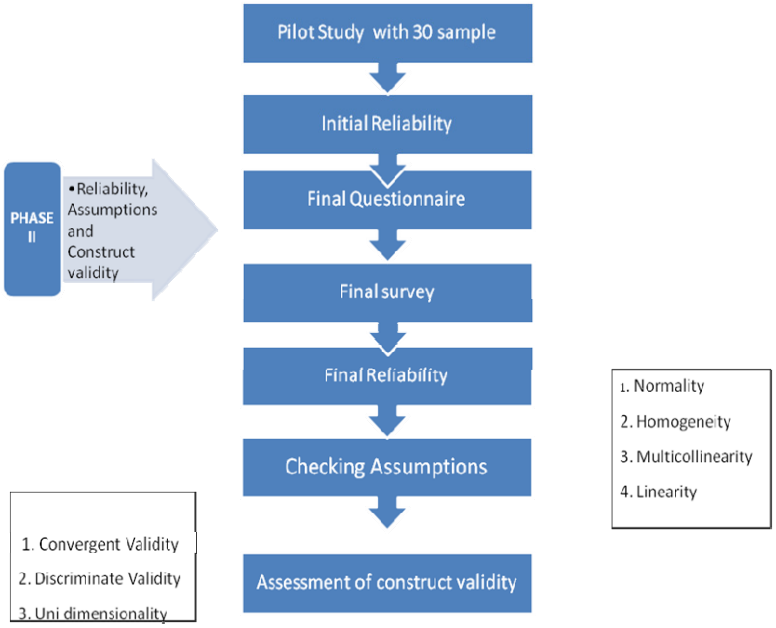
4.3 Research tools used:

- Simple Mean,
- Chi-square test,
- Independent Sample T-Test,
- Analysis of Variance (ANOVA),
- Factor Analysis,
- Cluster Analysis,

- Discriminate Analysis,
- Correspondence Analysis,
- Canonical correlation,
- Structural Equation Modeling (SEM)- Confirmatory Factor Analysis (CFI) and Path or Structural Model.

4.4 Software packages

- SPSS,
- LISREL,
- Microsoft-Excel and
- STATA

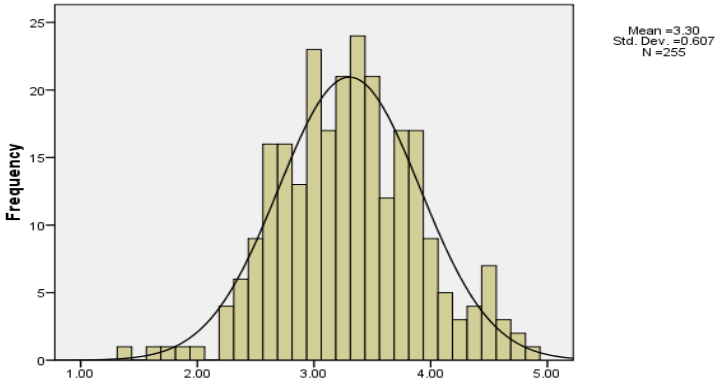


4.5 Reliability Test for Data Collection Instrument

Sl.No	Variables	Cronbach's-Alpha value
		Pilot Study
1	Supply Chain Concerns	0.6863
2	Supply Chain Competence	0.8447
3	Supply Chain practices	0.6990
4	Supply Chain Performance	0.7524
5	Organizational Performance	0.7234

4.6 Normality

		CON	COM	PRA	PER	OP
N		255	255	255	255	255
Normal Parameter	Mean	2.9708	3.3521	3.2062	3.3034	3.2162
	Std. Deviation	0.69022	0.55976	0.65503	0.60684	0.70241
Most Extreme Differences	Absolute	0.069	0.066	0.066	0.059	0.061
	Positive	0.069	0.066	0.066	0.059	0.054
	Negative	-0.067	-0.053	-0.041	-0.038	-0.061
Kolmogorov-Smirnov Z		1.099	1.061	1.046	.947	.979
Asymp. Sig. (2-tailed)		0.179	0.210	0.224	0.332	0.294



4.7 Homogeneity

Constructs	Levene Statistic	df1	df2	Sig.
CON	1.952	11	243	0.054
COM	1.204	11	243	0.285
PRA	1.502	11	243	0.131
PER	0.956	11	243	0.488
OP	1.449	11	243	0.152

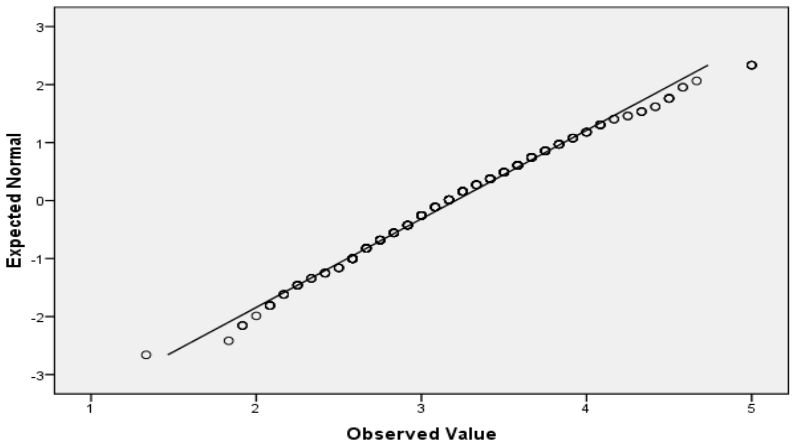
4.8 Multicollinearity

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	0.171	0.284		.603	0.547		
	CON	0.188	0.055	0.184	3.420	0.001	0.919	1.088
	COM	0.236	0.074	0.188	3.167	0.002	0.760	1.316
	PRA	0.150	0.066	0.140	2.278	0.024	0.707	1.415
	PER	0.368	0.069	0.318	5.362	0.000	0.759	1.318

a. Dependent Variable: OP

4.9 Linearity

Equation	Model Summary				
	R Square	F	df1	df2	Sig.
Linear	0.035	6.438	1	253	0.002
Logarithmic	0.016	4.068	1	253	0.024
Inverse	0.008	2.087	1	253	0.150
Quadratic	0.022	6.859	2	252	0.034
Cubic	0.017	5.035	3	251	0.021
Compound	0.027	6.925	1	253	0.021
Power	0.019	4.873	1	253	0.042
S	0.011	2.911	1	253	0.089
Growth	0.023	6.925	1	253	0.022
Exponential	0.024	6.925	1	253	0.035
Logistic	0.024	6.925	1	253	0.045



4.10 Construct Validity

- Convergent Validity
- Discriminate Validity
- Unidimensionality validity

4.11 Assessment of Composite Reliability

CONSTRUCT	INDICATORS	RELIABILITY (α)	CONSTRUCT RELIABILIY (ρc)
Supply Chain Concerns	9	0.7153	0.75
Supply Chain Competence	14	0.8595	0.84
Supply Chain practices	12	0.7458	0.73

Supply Chain Performance	8	0.7694	0.75
Organizational Performance	8	0.7854	0.75

$$\rho_c = \frac{(\sum_{i=1}^{p} \lambda_i)^2 \text{variance } A}{(\sum_{i=1}^{p} \lambda_i)^2 \text{variance } A + \sum_{i=1}^{p} \theta_\delta}$$

4.12 Assessment of Unidimensionality and Convergent Validity

CONSTRUCT	INDICATORS	X^2(DF)	p-VALUE	Goodness of Fit Index (GFI)	RMR	AVE
Supply Chain Concerns	9	81.49(27)	0.000	0.93	0.052	0.47
Supply Chain Competence	14	206.97(77)	0.000	0.90	0.054	0.46
Supply Chain Management practices	12	353.58(54)	0.000	0.81	0.080	0.55
Supply Chain Performance	8	50.20(20)	0.002	0.93	0.041	0.54
Organizationa	8	71.86(20)	0.000	0.93	0.042	0.49

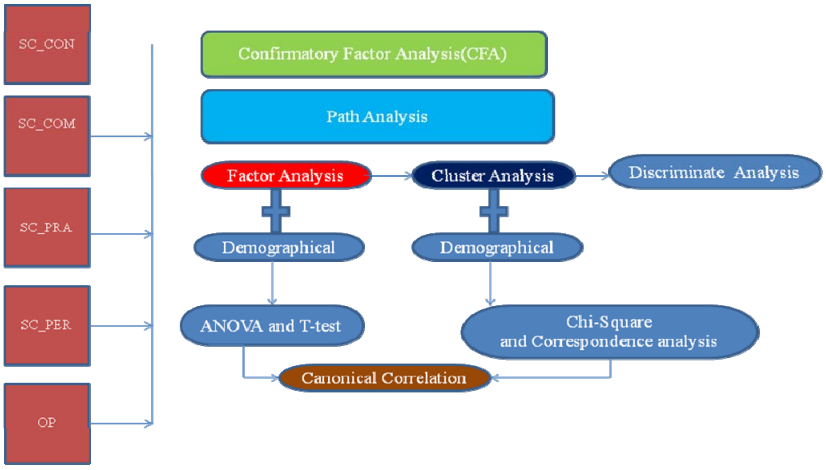
l Performance						

$$\mathbf{AVE} = \frac{\sum_{i=1}^{n} L_i^2}{n}$$

4.13 Discriminant Validity

CONSTRUCT	VE	SQUARE CORRELATION
Organizational Performance versus Supply Chain Performance	0.595	0.5429
Organizational Performance versus Supply Chain practices	0.59	0.4489
Organizational Performance versus Supply Chain Competence	0.53	0.2601
Organizational Performance versus Supply Chain concern	0.46	0.3844
Supply Chain Performance versus Supply Chain Competence	0.45	0.5476
Supply Chain Performance versus Supply Chain concern	0.51	0.1521
Supply Chain Performance versus Supply Chain Practices	0.48	0.4489
Supply Chain Practices versus Supply Chain concern	0.58	0.5476

Supply Chain Practices versus Supply Chain Competence	0.47	0.1521
Supply Chain concern versus Supply Chain Competence	0.51	0.1521



5. Chi-Square Test

- Chi-Square can be used for three purposes namely

  As a test of independence

  To test the Homogeneity

  To test the goodness of fit
- Cross tab is used to test whether there is a significant association between two variables.
- The two variables must be of type category.

- The total number of observation used in this test must be large i.e., n>=30.
- It is frequency based test
- Null hypothesis: H0- There is no significant association between the two variables.
- In SPSS, if the significant value is less than 0.05 then reject null hypothesis and accept alternate hypothesis.

6. One Sample T Test

Purpose:

The One-Sample T Test compares the mean score of a sample to a known value. Usually, the known value is a population mean.

Assumption:

- The variable must be metric.
- The variable is normally distributed.

Hypotheses:

Null hypothesis H0: There is no significant difference between the sample mean and the population mean.

7. Independent Sample T- Test

Purpose:

The Independent Samples T Test compares the mean scores of two groups on a given variable.

Hypotheses:

Null hypothesis H0: The means of the two groups are not significantly different.

Alternate hypothesis H1: The means of the two groups are significantly different.

Assumptions:

Independent sample t-test assumes that the dependent variable is normally distributed.

8. One Way-ANOVA

Purpose:

One way ANOVA is used to compare the means of more than two groups

Assumption:

- The variables must be normally distributed
- Samples are independent.
- Variances of populations are equal.
- The sample is a simple random sample (SRS).

Hypothesis:

Null hypothesis H0- There is no significant difference between the variables.

Alternate hypothesis H1-There is significant difference between the variables.

9. Regression

Purpose:

The general purpose of regressions is to learn more about the relationship between one independent and one dependent variable.

Assumption:

- The variables must be linear.
- The variables must be normally distributed.

The common regression equation is y=a + bx

10. Format of a Project Report

Acknowledgement

Abstract

Contents

List of tables

List of figures

Abbreviations

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1.2 Company

1.3 Product

1.4 Need for the study

1.5 Objectives

1.6 Scope of the Study

1.7 Significance of the Study

1.8 Limitation

Chapter-2 (REVIEW OF LITERATURE)

2.1 Introduction-operational definition

2.2 Review relating concepts

2.3 Review relating to variables

Chapter-3 (RESEARCH METHODOLOGY)

3.1 Research Design

3.2 Nature and sources of data

3.3 Questionnaire design and development

3.4 Pilot study

3.5 Reliability and validity of the questionnaire

3.6 Sample design

3.6.1 Sample unit

3.6.2 Sample frame

3.6.3 Sample size

3.6.4 Sampling technique

3.7 Period of the study

3.8 Tools, techniques and formula used

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Chapter-4 (DATA ANALYSIS AND INTERPRETATION)

4.1 Profile of the respondents

4.2 Concept or variable wise analysis

Chapter-5 (SUMMARY OF FINDINGS, RECOMMENDATIONS, SCOPE FOR FURTHER STUDIES, IMPLICATION OF THE STUDY AND CONCLUSION)

5.1 General findings and Specific findings

5.2 Recommendations

5.3 Educational and societal implications

5.4 Directions for future research

5.5 Conclusion

Bibliography (Follow either APA or Harvard Style**)**

Books

Published articles

Secondary sources

Working papers

Reports

Appendix / Annexure

Questionnaire

Sample frame

Big Table

Technical Session X & XI

(18/09/2015- 9.00 – 12.00pm)

Analysis of Time Series Data

Dr. Anand B, Central university of Rajasthan

The technical session of Dr. B .Anand was started with making the participants familiar with Time Series data and its analysis by using E-Views. The session begins with the introduction of data and the special characteristics of time series data, why the data series are became time series data, the problems are properties of time series data.

How Econometrics models became very relevant in the data analysis was explained with the help of data, variables and economic theories. What are the important points to be there in the mind while selecting the econometrics models were also explained in the sessions. Important diagnostic testing for the selection of models was also discussed.

The practical session for the estimation of suitable Econometrics models with E-Views was more effective in the workshop. Different variables and data series were analyzed and the results were explained with Wald test. Basic theory for the effective interpretation of regression results and assumptions of the model and effectiveness of the model in the real research were put in to vary serious discussion. The important area covered by Dr. Anand is briefly explained below.

Time Series: Basic Concepts

Types of data

- Cross sectional- Observations on individuals, households, countries etc. at one point of time.
- Time series – Observations on income, consumption, interest, rates etc. over a number of time periods (yearly, quarterly, month)

Panel - Observations on the same cross section of individuals, households etc. over a number of time periods.

Cross sectional Data

Data on one or more variables collected at a single point on time.

For example: A survey of consumer expenditure

A cross section of stock returns at the stock exchange

Time series Analysis: Key Concepts

- What is a Stochastic Process?
- A collection of random variable ordered in time.
- Let y be a random variable

If it is continuous and If it is discrete

- Most of the economic time series are discrete random variable. Each observation is a realization of all the possible outcome
- For instance, GDP of Rs. 257.1 billion for 2014 is a realization of all the possible outcome

What is a Stationary Stochastic process?

y_t is a stationary process if its Mean: $E(Y_t) = \mu$

Variance: $\text{var}(Y_t) = E(Y_t - \mu)^2 = \sigma^2$

Autocovariance $\gamma_k = E[(Y_t - \mu)(Y_{t+k} - \mu)]$

- Which means, if a time series is stationary, its mean, variance and autocovariance are time invariant.
- Such time series will tend to return to its mean (mean reversion)

What is a nonstationary time series data?

- a time-varying mean or a time varying variance or both.

➢ Why is stationary time series is so important?

- Each set of time series data will be confined for a particular episode
- As a consequence generalization will be impossible
- What is white noise process ?

➢ What is white noise process ?

$$E(y_t) = \mu = 0$$

$$E(y_t - \mu)^2 = \sigma^2$$

$$y_t = \rho_1 y_{t-1} + u_t$$

$$\rho_1 = 0 \qquad t = 1, 2, 3, \ldots, n$$

➢ **What is a non-stationary stochastic process?**

- A variable is non-stationary, if it has time varying mean or time varying variance or both

➢ Random Walk model

Three types

I) Random walk without drift (no intercept term)

II) Random walk with drift

III) Random walk with drift and deterministic trend

Random walk without a drift

$y_t = y_{t-1} + u_t$

where is a white noise process

$y_1 = y_0 + u_1$

$y_2 = y_1 + u_2$

$= y_0 + u_1 + u_2$

$y_t = y_0 + \sum u_t$

$E(y_t) = E(y_0 + \sum u_t) = y_0$

Also, it can be shown that

$E(y_t - y_0)^2 = t\sigma^2$

Persistence of random shocks or infinite memory.

- However, note that $\Delta y_t = u_t$ [$Y_t = Y_{t-1} + u$] is a stationary process

$y_t = \beta_0 + y_{t-1} + u_t$

$\Delta y_t = \beta_0 + u_t$

If $\beta_0 < 0$ y_t trends downward

If $\beta_0 > 0$ y_t trends upward

$y_1 = \beta_0 + y_0 + u_1$

$y_2 = \beta_0 + y_1 + u_2$

$= \beta_0 + \beta_0 + y_0 + u_1 + u_2$

$= 2\beta_0 + y_0 + u_1 + u_2$

$y_t = t\beta_0 + y_0 + \sum u_t$

$E(y_t) = t\beta_0 + y_0$

$E(y_t - t\beta_0 - y_0)^2 = t\sigma^2$

Random walk with drift and deterministic trend

$y_t = \beta_1 + \beta_2 t + \beta_3 y_{t-1} + u_t$

$\beta_1 \neq 0 \quad \beta_2 \neq 0 \quad \beta_3 = 1$

$y_t = \beta_1 + \beta_2 t + y_{t-1} + u_t$

$\Delta y_t = \beta_1 + \beta_2 t + u_t$

- **Difference Stationary & Trend Stationary**
- Let y_t follows
- $y_t = \beta_1 + \beta_2 t + \beta_3 y_{t-1} + u_t$
- Pure random walk implies
- $\beta_1 = 0; \quad \beta_2 = 0; \quad \beta_3 = 1$

- or $\Delta y_t = u_t$
- Therefore, y_t is non-stationary, but Δy_t is stationary; hence y_t is DS process

$$y_t = \beta_1 + \beta_2 t + \beta_3 y_{t-1} + u_t$$
$$\beta_1 \neq 0 \quad \beta_2 \neq 0 \quad \beta_3 = 0 \quad then$$
$$y_t = \beta_1 + \beta_2 t + u_t \quad This \quad is \quad called \quad a \quad TSP$$

$$y_t = \beta_0 + \beta_1 t + u_t$$
$$E(y_t) = \beta_0 + \beta_1 t$$
$$Var \quad (y_t) = E(y_t - E(y_t))^2$$
$$= E(u_t)^2 = \sigma^2$$

What is an Integrated Stochastic Process?

The RWP implies non-stationarity but its first difference is stationary

$y_t = y_{t-1} + u_t$

$\Delta y_t = u_t$

hence, y_t is an integrated series or it is integrated of order 1, written as $y_t \sim I(1)$.

If y_t is non-stationary and only $\Delta^2 y_t$ is stationary then $y_t \sim I(2)$ process.

- A time series y_t integrated of order d is denoted as $y_t \sim I(d)$ process.
- If a time series is stationary to begin with it is said to be integrated of order zero denoted by $y_t \sim I(0)$
- Let , x_t , yand be three time series then
- If $X_t \sim I(0)$ and$Y_t \sim I(1)$ then$Z_t = (X_t + Y_t) = I(1)$ ie, a linear combination or sum of stationary and non stationary time series is non stationary.

What is unit root in time series?

Let y_t follows

$$y_t = \rho y_{t-1} + u_t \qquad -1 \leq \rho \leq 1$$

If $\rho = 1$ than y_t follows a RWP; hence y_t is non-stationary

Therefore, why not simply regress Y_t on its lagged value Y_{t-1} and find out if the estimated is statistically equal to 1

Suppose

$y_t - y_{t-1} = \rho y_{t-1} - y_{t-1} + u_t$

$= (\rho - 1) y_{t-1} + u_t$

$\Delta y_t = \delta y_{t-1} + u_t$

where $\delta = (\rho - 1)$

In practice we estimate this equation and test the null hypothesis that $\delta = 0$.

If $\delta = 0$ *then* $\rho = 1$, *means we have a unit root and the time series is non stationary*

$\Delta y_t = \delta_{y_{t-1}} + u_t$

Take the first difference of y_t *and and regress them on* y_{t-1} *and see if the estimated slope coefficien ts in this regression is zero or not. If it is zero* y_t *is non stationary .If it is negative* y_t *is stationary .*

$\delta = (\rho - 1)$

Testing for Unit root

The DF test

$$y_t = \rho y_{t-1} + u_t$$

Testing for unit root in y_t involves testing the null

$H_0 : \rho = 1$ against an alternative

$H_1 : \rho \neq 1$ However, the best way to handle this problem is to manipulate the equation

$$\Delta y_t = \delta y_{t-1} + u_t$$

$H_0 : \delta = 0 \quad (\delta = \rho - 1)$

Hence, the null is

y_t has a unit root

In conducting the DF test we assume that the error terms, u_t *are correlated in case* u_t *are correlated Dicky and Fuller have developed a test, known as the ADF test .This test is conducted by adding the lagged values of the dependent variable* Δy_t

$$\Delta y_t = \delta y_{t-1} + \sum_{i=1}^{m} \gamma_i \Delta y_{t-i} + u_t$$

The ADF test

Other Unit Root tests

Phillips Perron

Kwiatkowski-Phillips-Schmidt-Shin

Ng-Perron

Technical Session –XII & XII

(18/09/2015- 12-3.30pm)

Analysis of Panel Data &
Analysis of Cross Sectional Data
Dr. Sunil Paul, Madras School of Economics

The technical session of Dr. Sunil Paul was started with making the participants familiar with cross sectional data series and its analysis by using E-Views. The session begins with the introduction of Regression Analysis by examines the nature and form of the relationship among two or more variables, Simple regression (two variables) and Multiple regression (More than two variables).

How Econometrics models became very relevant in the data analysis was explained with the help of data, variables and economic theories. What are the important points to be there in the mind while selecting the econometrics models were also explained in the session. Important diagnostic testing for the selection of models was also discussed.

The practical session for the estimation of Regression with E-Views was more effective in the workshop. Different variables and data series were analyzed and the results were explained with Wald test. Basic theory for the effective interpretation of regression results and assumptions of the model and effectiveness of the model in the real research were put in to vary serious discussion.

Unit Roots and Spurious Regression

Consider:

The assumptions of classical regression models are:

- $\{Y_t\}$ and $\{Z_t\}$ sequences be stationary
- e_t has zero mean and finite variance.

Instead, if $\{Y_t\}$ and $\{Z_t\}$~I(1)-- spurious regression.

- R^2 and t-values
- e_t may not be white noise.

R^2 > D-W statistic

Granger and Newbold (1974) generated $\{Y_t\}$ and $\{Z_t\}$ sequences as pure random walk process:

Hence, Y_t and Z_t are independent of each other. If so, equation (1) is meaningless. See the properties of e_t:

If we set the initial value of $\{Y_t\}$ and $\{Z_t\}$ sequences as zero, then equation (4) can be written as:

Hence, the variance of error term becomes infinite as t increases.

There could be four cases with respect to equation (1)

Case
If both Y_t and Z_t are stationary, classical regression model is appropriate

Case
If Yt and Z_t are integrated of different order, regression is meaningless. Assume that

$$Z_t = \rho Z_{t-1} + \varepsilon_{zt} \qquad \text{where } |\rho| < 1$$

$$e_t = \sum_{i=1}^{t} \varepsilon_{yi} - a_1 \sum_{i=0}^{t} \rho^i \varepsilon_{zt-i}$$

Although the second component of the right hand side is convergent, e_t will have a trend component.

Case 3

If $\{Y_t\}$ and $\{Z_t\}$ sequences are *I (1)* and the residual sequence has a stochastic trend, then the regression is spurious. In such cases, regression equation must be estimated in first differences.

Where Δe_t has no stochastic trend.

Case

If $\{Y_t\}$ and $\{Z_t\}$ sequences are *I (1)* and the residual sequence is a stationary process, then both variables are said to be cointegrated.

Cointegration

Y_t is I (1); and Z_t is I (1)

Still the linear combination:

is I (0). If so, both Y_t and Z_t are said to be cointegrated and a is the cointegrating parameter.

An illustration

The quantity theory of money is define as:

$MV = PY$

In reality, M, P and Y are I (1) variables; hence the time series on these variables are not mean reverting. However, theory asserts that there exists a linear combination of these non-stationary variables that is stationary.

Let the lower case letters indicate the log of the variables. The above equation can be written as: where β_0 is velocity and assumed to be a constant. $\{\beta_0\ \beta_1\ \beta_2\ \beta_3\}$ is the cointegrating vector. In regression format:

where e_t measures the short-run deviation from the identity. There exists cointegration provided e_t is I (0); hence, the deviation is temporary. Also, the theory indicates that the $\beta_1 = 1$; $\beta_2 = -1$; and $\beta_3 = -1$.

There are few points to note about the definition of cointegration:

1) The cointegrating vector $\{\beta_0\ \beta_1\ \beta_2\ \beta_3\}$ is not unique. For any non-zero λ, $\{\lambda\beta_0\ \lambda\beta_1\ \lambda\beta_2\ \lambda\beta_3\}$ is also cointegrating vector.. Hence, the cointegrating vector can be normalized with respect to any one of the variablesI f you want to normalize with respect to m then define $\lambda = 1/\beta_3$. The normalized cointegrating relationship can be written as:

where $a_0 = \beta_0/\beta_1$; $a_1 = \beta_2/\beta_1$; and $a_2 = \beta_3/\beta_1$.

In this case,

Note that b_1 must be non-zero and e_t must be stationary. If so,

$m_t - b_1 p_t$ is I (1) and cointegrated with other I (1) variables: Δp_t and y_t.

3) It is possible that when there are n variables there could be $n-1$ cointegrating vectors. Suppose the monetary authority follows a feed-back rule that whenever there is rise in price level the central bank reduces money supply and vice versa. If so, we may have another cointegrating relationship: $\gamma_1\ \gamma_2\ 0$; hence, we will have

$$\beta = \begin{Bmatrix} \beta_1 & \beta_2 & \beta_3 \\ \gamma_1 & \gamma_2 & 0 \end{Bmatrix}$$ i.e. there are two cointegrating vectors.

Error Correction Models

When there is disequilibrium, some of the variables must respond to restore equilibrium. The error correction representation of a cointegrated system is:

$$\Delta m_t = \lambda_m (m_{t-1} - a_0 - a_1 p_{t-1} - a_2 y_{t-1}) + \varepsilon_{mt}$$
$$\Delta p_t = \lambda_p (m_{t-1} - a_0 - a_1 p_{t-1} - a_2 y_{t-1}) + \varepsilon_{pt}$$
$$\Delta y_t = \lambda_y (m_{t-1} - a_0 - a_1 p_{t-1} - a_2 y_{t-1}) + \varepsilon_{yt}$$

$\lambda_m < 0$; $\lambda_p > 0$; $\lambda_y > 0$ Why? where the elements of ε are white noise errors and λ_s are speed of adjustment parameters (**Why?**). At least, one of the λ_s must be statistically significant. (**Why?**).

Note that the dependent variables are stationary. Hence, the equations are meaningful only if right hand side variables are stationary. If there is cointegration, the term within the parenthesis (e_{t-1}) is stationary.

Nothing gets altered, if we specify ECM in more general form:

$$\Delta m_t = \lambda_m (m_{t-1} - a_0 - a_1 p_{t-1} - a_2 y_{t-1}) + \sum \phi_{11}(i)\Delta m_{t-i} + \sum \phi_{12}(i)\Delta p_{t-i} + \sum \phi_{13}(i)\Delta y_{t-i} + \varepsilon_{mt}$$
$$\Delta p_t = \lambda_p (m_{t-1} - a_0 - a_1 p_{t-1} - a_2 y_{t-1}) + \sum \phi_{21}(i)\Delta m_{t-i} + \sum \phi_{22}(i)\Delta p_{t-i} + \sum \phi_{23}(i)\Delta y_{t-i} + \varepsilon_{pt}$$
$$\Delta y_t = \lambda_y (m_{t-1} - a_0 - a_1 p_{t-1} - a_2 y_{t-1}) + \sum \phi_{31}(i)\Delta m_{t-i} + \sum \phi_{32}(i)\Delta p_{t-i} + \sum \phi_{33}(i)\Delta y_{t-i} + \varepsilon_{yt}$$

The above system is a three variables VAR model augmented by

e_{t-1}. If λ_s are zero, then it is a simple VAR model and there is no cointegration. Hence, cointegration and error correction are equivalent representation (**Granger representation theorem**).

When variables in level are cointegrated, VAR in first differences is a misspecification (**Why?**).

If $\lambda_m = 0$; $\lambda_p = 0$; and λ_y is statistically significant, only output responds to restore equilibrium and m and p are weakly exogenous in the system.

The λ_s are additional source for inferring causality. For instance, m does not cause p $\phi_{21}(i)_s$ in the second equation are zero and $\lambda_p = 0$ **(Why?)**.

JOHANSEN'S METHODOLGY

The maximum likelihood approach to test for cointegration is based on the following system of equations

$$\Delta x_t = \pi x_{t-k} + \sum_{i=1}^{p-1} \pi_i \Delta x_{t-i} + \varepsilon_t \qquad (6)$$

The number of independent cointegrating vector is equal to the rank of matrix π

If rank of $\pi = 0$; then π is a null matrix and equation (6) turns out to be a VAR model

If rank of $\pi = 1$, there is one cointegrating vector and πx_{t-1} is an error correction term.

How to test the number of distinct cointegrating vector?

Johansen suggests that it can be done by testing the significance of characteric roots of π

Suppose that π is a matrix and the ordered characteristic roots are $\lambda_1 > \lambda_2 > \lambda_3$

If rank of $\pi = 0$ then $\lambda_i = 0$; hence, $\ln(1 - \lambda_i) = 0$

If rank of $\pi =$ unity then $0 < \lambda_1 < 1$ and $\ln(1 - \lambda_1)$ will be negative and the rest $\ln(1 - \lambda_2) = \ln(1 - \lambda_3) = 0$

what we obtain is the estimates of π and Johansen suggests two test statistics to test the null hypothesis that number of characteristics roots are insignificantly different from unity.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \qquad (7)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \qquad (8)$$

λ_i = estimated characteristic roots or eigen values

T = the number of usable observations

λ_{trace} test the null hypothesis

$r = 0$ against the alternative of $r \geq 1$

λ_{max} test the null hypothesis

$r = 0$ against the alternative of $r = 1$

Understanding Trace statistics

Let

$k = 3, \quad T = 100, \quad \hat{\lambda}_1 = 0.9 \; and \; \hat{\lambda}_2 = \hat{\lambda}_3 = 0$

$H_0 : r = 0; \quad H_1 : r \geq 1$

$$trace(0|3) = -T[\ln(1-0.09) + \ln(1-0.0) + \ln(1-0.0)]$$
$$= -100(-2.302 + 0 + 0)$$
$$= 230.2 > 34.91$$

$H_0 : r \leq 1; \quad H_1 : r \geq 2$

$$trace(1|3) = -T[\ln(1-0.0) + \ln(1-0.0)]$$
$$= -100(0 + 0)$$
$$= 0 < 19.96$$

$H_0 : r \leq 2; \quad H_1 : r = 3$

$$trace(2|3) = -T[\ln(1-0.0)]$$
$$= -100(0)$$
$$= 0 < 9.24$$

Understanding statistics

$H_0 : r = 0; \quad H_1 : r = 1$

$$\lambda_{max}(0|3) = -T[\ln(1-0.09)]$$
$$= -100(-2.302)$$
$$= 230.2 > 22.00$$

$H_0 : r \leq 1; \quad H_1 : r = 2$

$$\lambda_{max}(1|3) = -T[\ln(1-0.0)]$$
$$= -100(0)$$
$$= 0 < 15.67$$

$H_0 : r \leq 2; \quad H_1 : r = 3$

$$\lambda_{max}(2|3) = -T[\ln(1-0.0)]$$
$$= -100(0)$$
$$= 0 < 9.24$$

Testing number of distinct Cointegration vectors

Null Hypothesis	Alternative Hypothesis		5% Critical Value
λ_{trace} test		λ_{trace} value	
	$r > 0$	49.14	53.12
	$r > 1$	19.05	34.91
	$r > 2$	8.69	19.96
	$r > 3$	2.35	9.24

λ_{max} test		λ_{max} value	
$r=0$	$r=1$	30.09	28.14
$r=1$	$r=2$	10.36	22.00
$r=2$	$r=3$	6.34	15.67
$r=3$	$r=4$	2.35	9.24

λ_1=0.4332 λ_2= 0.1776 λ_3=0.1128 λ_4=0.0434 T=53

Hypothesis Testing

It is possible to test some of the theoretical restriction imposed on the elements of π matrix. For instance, the Danish money demand function takes the form

$$x_t = (m_{2t}^d, p_t, i_t^b, i_t^d)$$
$$m_t^d = \beta_1 p_t + \beta_2 i_t^b + \beta_3 i_t^d + \beta_0 + \varepsilon_t$$
$$\beta_1 = 1; \quad \beta_2 < 0; \quad \beta_3 > 0$$

We can re-estimate the model by imposing these restrictions. If restrictions are not binding then the number of cointegrating vectors has not diminished.

Johansen (1991) suggested the following test statistics that follows χ^2 distribution

$$-T\sum_{i=r+1}^{n}\left[\ln(1-\hat{\lambda}_i^*)-\ln(1-\hat{\lambda}_i)\right]$$

$$\hat{\lambda}_1, \hat{\lambda}_2, \ldots, \hat{\lambda}_n$$

are the characteristic roots of unrestricted model

$$\hat{\lambda}_1^*, \hat{\lambda}_2^*, \ldots, \hat{\lambda}_n^*$$

are the characteristic roots of restricted model

The estimated money demand function is

$$m_t = 1.03y_t - 5.21i_t^b + 4.22i_t^d + 6.06$$

Restricting β_1=1 we get the following characteristics roots

$i=1$	0.433	-30.04
$i=2$	0.172	-10.01

i=3	0.044	-2.36
i=4	0.006	-0.32

Since $r = 1$

$$T \ln(1 - \hat{\lambda}_1^*)$$

$$- T \ln(1 - \hat{\lambda}_1)$$

χ^2 is insignificant. Hence, conclude that restriction is not binding

In similar fashion, we can impose restriction on speed of adjustment parameters in ECM specifications.

Let

$$\pi = \alpha\beta'$$

where α is the weighting matrix. In our example, there are α_1, α_2, α_3, α_4

Assume that only money demand responds to deviation from the equilibrium in the last period. This involves the following restriction.

$\alpha_2 = \alpha_3 = \alpha_4 = 0$

The largest characteristic root from the restricted model is such that

$$T \ln(1 - \hat{\lambda}_1^*) = - 23.42$$

The unrestricted model is such that

$$T \ln(1 - \hat{\lambda}_i) \quad \chi^2 = 30.09 - 23.42 = 7.67$$

The estimated χ^2 statistic with three degrees of freedom is 7.67 while the critical value is 7.81. Hence, there is a mild support for the hypothesis that the restriction is not binding

Multiple cointegrating vectors

Assume that $x_t = (x_{1t}, x_{2t}, x_{3t}, x_{4t})$

Further assume that there are two cointegrating vectors. If so, there is a cointegrating vector for each bilateral pairs of the variables ($2 = n - r + 1$)

$$\begin{bmatrix} 1 & -\beta_{12} & -\beta_{13} & -\beta_{14} \\ 1 & -\beta_{22} & -\beta_{23} & -\beta_{24} \end{bmatrix} \begin{bmatrix} x_{1t} \\ x_{2t} \\ x_{3t} \\ x_{4t} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

Subtract row 1 from row 2

$$\begin{bmatrix} 1 & -\beta_{12} & -\beta_{13} & -\beta_{14} \\ 0 & (\beta_{12}-\beta_{22}) & (\beta_{13}-\beta_{23}) & (\beta_{14}-\beta_{24}) \end{bmatrix}$$

Normalize row 2 with respect to x_{2t}

$$\begin{bmatrix} 1 & -\beta_{12} & -\beta_{13} & -\beta_{14} \\ 0 & 1 & -\beta^*_{23} & -\beta^*_{24} \end{bmatrix}$$

$$-\beta^*_{23} = (\beta_{13}-\beta_{23}/\beta_{12}-\beta_{22})$$

$$-\beta^*_{24} = (\beta_{14}-\beta_{24}/\beta_{12}-\beta_{22})$$

Hence, there are two cointegrating relationship

$$x_{1t} = \beta_{12}x_{2t} + \beta_{13}x_{3t} + \beta_{14}x_{4t}$$
$$x_{2t} = \beta^*_{23}x_{3t} + \beta^*_{24}x_{4t}$$

Why to choose an ARCH model?

The Problem of Heteroscedasticity

Define a linear regression model:

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$$

One of the basic assumptions of OLS method is:

$$E(\varepsilon_i^2) = \sigma^2$$

Implies that the conditional variance of Y_i is a constant or the errors (ε_i) are homocedastic. On the contrary, if

$$E(\varepsilon_i^2) = \sigma_i^2$$

then the variance is not a constant or the errors are Heteroscedastic. This is a common problem with cross section data.

If so, estimates (β_0 and β_1) are unbiased, but conventional estimates of standard errors and confidence intervals are very narrow, giving false sense of precision. For instance, the usual variance formula is:

$$\text{var}(\hat{\beta}_1) = \sigma^2 / \sum x_i^2$$

whereas the true variance with heteroskedastic errors is:

$$\text{var}(\hat{\beta}^*_1) = \sum x_i^2 \sigma_i^2 / (\sum x_i^2)^2$$

Obviously,

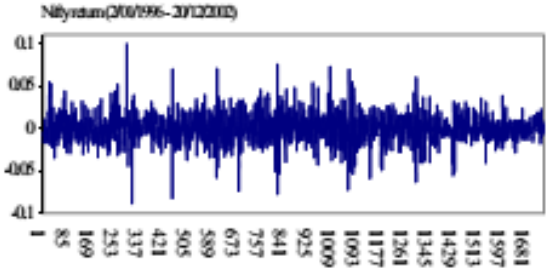
$$\text{var}(\tilde{\beta}_1) \neq \text{var}(\tilde{\beta}_1^*)$$

Thus, application of OLS method provides biased variance estimate; hence, inference based on OLS estimates will be misleading.

The Persistence of volatility

High frequency financial time series data exhibit volatility clustering, which shows that some periods are highly volatile with some degree of autocorrelation.

Forecasting Mean and Variance



It is easy to imagine a situation in which prediction of volatility is highly useful. For instance, asset holders want to forecast both mean and variance of the return. In this context, ARCH models are highly useful.

Conditional Forecast Variance

Estimate a stationary AR (1) model:

$$Y_t = a_0 + a_1 Y_{t-1} + \varepsilon_t$$

The conditional forecast of Y_{t+1} is:

$$E_t Y_{t+1} = a_0 + a_1 Y_t$$

The forecast error variance is:

$$E_t[(Y_{t+1} - a_0 - a_1 Y_t)]^2 = E_t \varepsilon_{t+1}^2 = \sigma^2$$

Conditional Forecast Variance

Estimate a stationary AR (1) model:

The unconditional forecast error variance is:

$$E\{[Y_{t+1} - a_0/(1-a_1)]^2\} = E[(\varepsilon_{t+1} + a_1\varepsilon_t + a_1^2\varepsilon_{t-1} + \ldots)^2]$$
$$= \sigma^2/(1-a_1^2)$$

$1/(1-\alpha_1^2) > 1$

The unconditional forecast variance is greater than conditional forecast variance.

ARCH Process

Thus far, we have assumed that the variance is a constant. However, time series data with volatility clustering indicate that the variance is not a constant; hence, it is essential to model the variance as an AR process. Suppose we estimate the model:

$$Y_t = \beta X_t + \varepsilon_t$$

$$\varepsilon_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 + v_t$$

where υt is a white noise process. The conditional variance for t is:

$$E\varepsilon_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2$$

The above equation is called an ARCH (2) process.

The most convenient way is to model both mean and variance simultaneously using maximum likelihood techniques. Engle (1982) provides a multiplicative conditionally heteroscedastic model:

$$\varepsilon_t = v_t \sqrt{\alpha_0 + \alpha_1 \varepsilon_{t-1}^2}$$

where υt is a white noise process with unit variance; $\alpha_0 > 0$ and $0 < \alpha_1 < 1$.

The GARCH Model

Bollerslev (1986) defines conditional variance as an ARMA process, which is called gerneralised ARCH model or GARCH model. The GARCH (1,1) model is:

$$r_t = \mu + v_t \sqrt{\sigma_t^2}$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2$$

where ε_{t-1} and σ_{t-1} are ARCH and GARCH terms respectively.

Eviews uses the following maximum likelihood method to estimate these parameters simultaneously:

$$l_t = -\frac{1}{2}\log(2\pi) - \frac{1}{2}\log(\sigma_t^2) - \frac{1}{2}(y_t - x_t'\gamma)^2 / \sigma_t^2$$

The ARCH-M Model

In some of the applications, the dependent variable in the mean equation may be determined by its conditional variance. For instance, the expected return on an asset is related to expected asset risk. If so, the mean equation can be defined as:

$$r_t = \mu + \gamma\sigma_t^2 + v_t\sqrt{\sigma_t^2}$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2$$

Such models are called ARCH-in-Mean or ARCH-M Models due to (Engle, Lillien, Robins, 1987).

The Asymmetric ARCH Models

Often, we notice that the downward movements in the market are highly volatile than upward movement of the same magnitude. In such case, symmetric ARCH model undermines the true variance process. Engle and Ng (1993) provide a news impact curve with asymmetric response to good and bad news.

Eviews supports estimating two types of asymmetric ARCH models – TARCH and EGARCH.

The TARCH Model

The T ARCH or Threshold ARCH due to Zakoian (1990) can be defined as:

$$r_t = \mu + \nu_t \sqrt{\sigma_t^2}$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \sigma_{t-1}^2 + \lambda \varepsilon_{t-1}^2 d_{t-1}$$

where $d_{t-1} = 1$ if $\varepsilon_t < 0$ and 0 otherwise

$\varepsilon_t > 0 \Rightarrow$ good news, $\varepsilon_t < 0 \Rightarrow$ bad news

good news has an impact of $\alpha_1 \varepsilon_{t-1}^2$ while bad news has an impact of $(\alpha_1 + \lambda)\varepsilon_{t-1}^2$

If $\lambda > 0$, there is leverage effect.

if $\lambda \neq 0$, the news impact is asymmetric .

The EGARCH Model

The EGARCH or exponential GARCH model proposed by Nelson (1991) takes the form:

$$\log \sigma_t^2 = \alpha_0 + \alpha_1 \log \sigma_{t-1}^2 + \alpha_3 \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \lambda \frac{\varepsilon_{t-1}}{\sigma_{t-1}}$$

This implies that the leverage effect is exponential than quadratic

If $\varepsilon_{t-1} / \sigma_{t-1}^2 > 0$ *the impact is* $(\alpha_3 + \lambda)$

if $\varepsilon_{t-1} / \sigma_{t-1}^2 < 0$ *the impact is* $(-\alpha_3 + \lambda)$

If $\lambda > 0$, *there is leverage effect.*

if $\lambda \neq 0$, *the impact is asymmetric*

Assessing the Fit of the Model

We can use the AIC and SBC criteria to examine the fit of the model. However, we need to be careful with the statistical properties of such criteria in ARCH context. For instance, define

$AIC = T\ ln\ (RSS) + 2n$

Note that RSS = $\Sigma\varepsilon^2$; hence, the AIC assesses the fit of the mean model. Instead, define

$$RSS^1 = \sum_{t=1}^{T} (\varepsilon_t^2 - \sigma_t^2)^2$$

and select the model that provides minimum RSS!.

Diagnostic Checks for Model Adequacy

An estimated GARCH model must capture all the dynamics of mean and variance model. The estimated errors (v_t) are serially uncorrelated and do not display any remaining conditional volatility.

Standardize the residuals:

$$S_t = \hat{\varepsilon}_t \Big/ \sqrt{\sigma^2}$$

Construct the Ljung and Box Q statistics:

$$Q = T(T+2)\sum_{k=1}^{s} r_k^2 / (T-k)$$

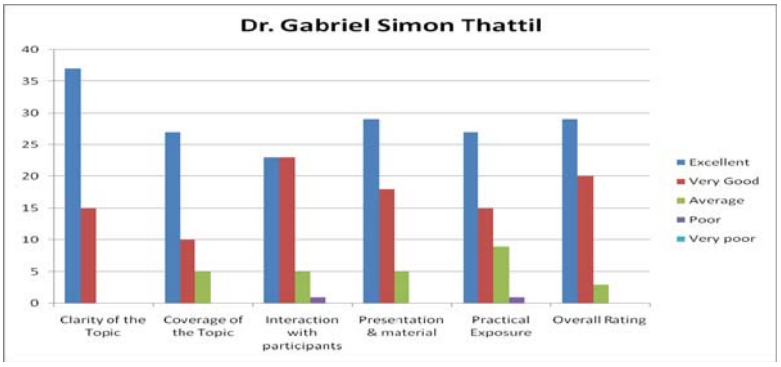
T is number of observations; r is autocorrelation coefficient. If estimated Q exceeds critical value of χ^2 with degrees of freedom s then at least one of the autocorrelation coefficients is statistically significant; implying that mean of the model is not properly specified.

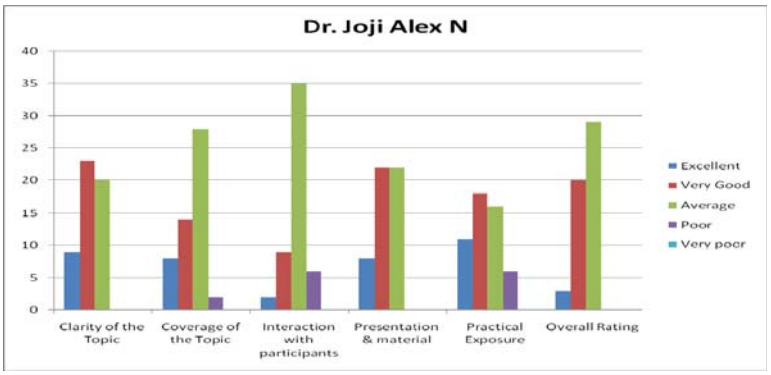
Construct Q statistics for s^2 and if the calculated statistics exceeds critical value then it implies that the GARCH effect is not completely captured by the model.

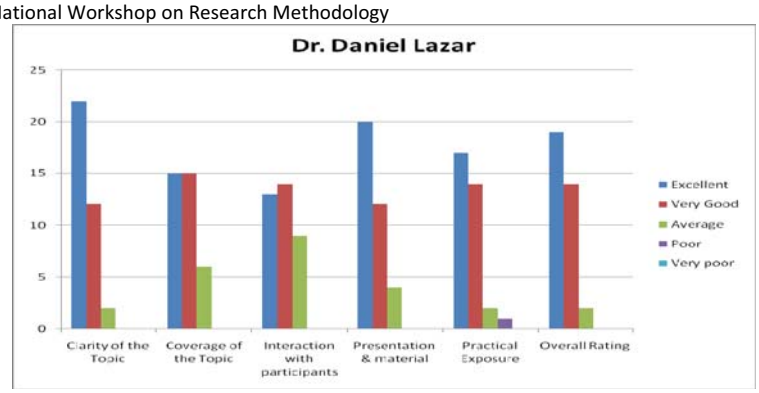
Session Evaluation

Each Resource person was evaluated by the participants of that session and the summary of the evaluation is given below. The evaluation is made on the following criteria.

1. Clarity of the topic
2. Coverage of the topic
3. Interaction with participants
4. Presentation and Material
5. Practical Exposure
6. Overall Rating






Dr. Daniel Lazar
25
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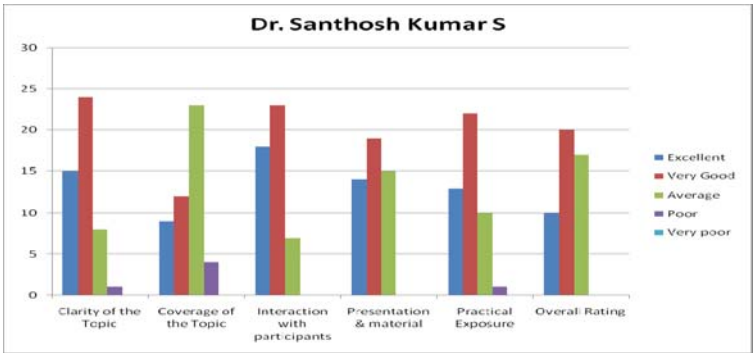
Clarity of the Topic
Coverage of the Topic
Interaction with participants
Presentation & material
Practical Exposure
Overall Rating
Excellent
Very Good
Average
Poor
Very poor


Dr. Santhosh Kumar S
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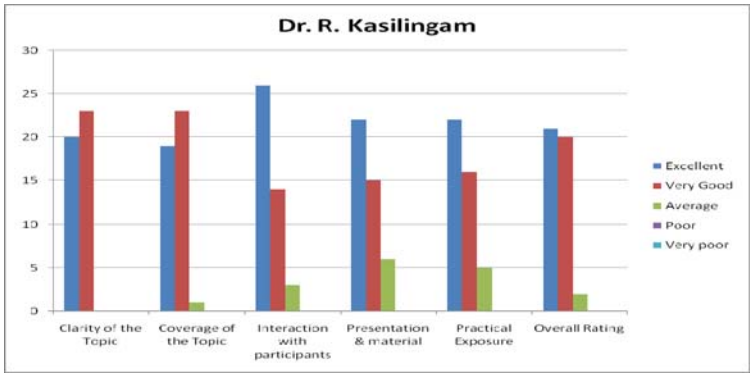
Clarity of the Topic
Coverage of the Topic
Interaction with participants
Presentation & material
Practical Exposure
Overal Rating
Excellent
Very Good
Average
Poor
Very poor


Dr. R. Kasilingam
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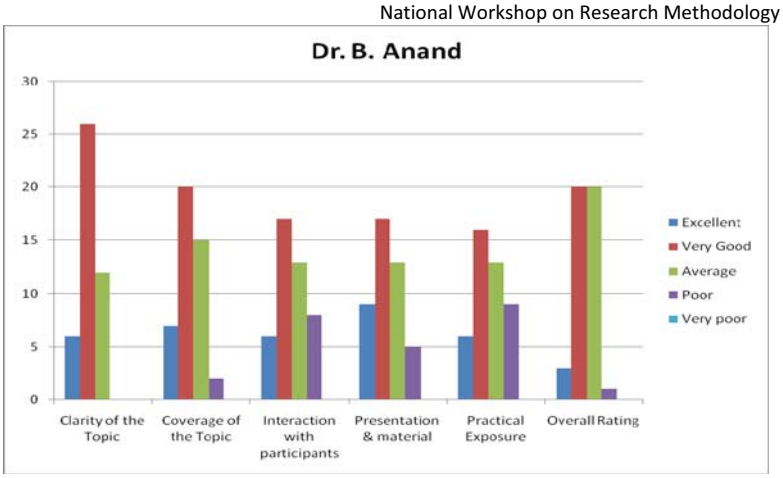
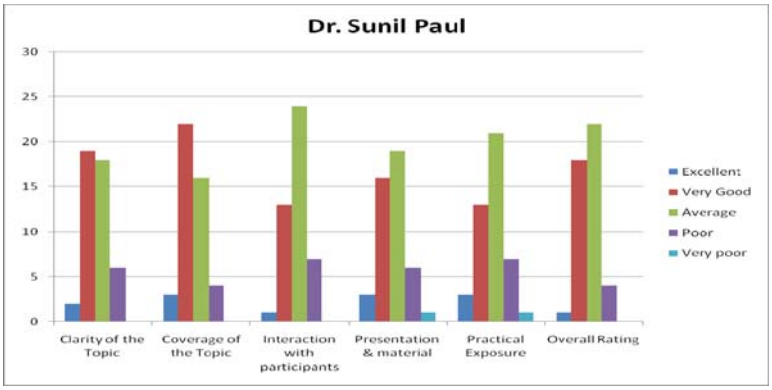
Clarity of the Topic
Coverage of the Topic
Interaction with participants
Presentation & material
Practical Exposure
Overall Rating
Excellent
Very Good
Average
Poor
Very poor





Overall Rating

Overall Rating: 4.129

Appendix

Participation Certificate

UGC SPONSORED THREE DAY NATIONAL WORKSHOP ON RESEARCH METHODOLOGY
(FOR COMMERCE, MANAGEMENT & ECONOMICS)

16-18 SEPTEMBER- 2015

POSTGRADUATE & RESEARCH DEPARTMENT OF COMMERCE
ST. THOMAS COLLEGE, PALAI, KOTTAYAM DT. KERALA 686574
(RE-ACCREDITED WITH "A" GRADE BY NAAC)

Certificate

This is to certify that Ms./Mr/ Prof / Dr .....

.....participated in the UGC Sponsored National Workshop on Research Methodology for Commerce, Management and Economics held on September 16-18, 2015 at St. Thomas College, Palai, organized in collaboration with Mahatma Gandhi University, Kottayam, Kerala.

Dr. Babu Jose
Convenor

Prof. K.V. John
Head of the Department

Dr. Sunny Joseph
Principal

Dr. R.Vijayakumar
Director, College Development Council
Mahatma Gandhi University