

# INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE & MANAGEMENT

I  
J  
R  
C  
M



A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

*Indexed & Listed at:*

Ulrich's Periodicals Directory ©, ProQuest, U.S.A., Cabell's Directories of Publishing Opportunities, U.S.A., Google Scholar,

Indian Citation Index (ICI), J-Gate, India [link of the same is duly available at Inflibnet of University Grants Commission (U.G.C.)],

Index Copernicus Publishers Panel, Poland with IC Value of 5.09 (2012) & number of libraries all around the world.

Circulated all over the world & Google has verified that scholars of more than 7144 Cities in 197 countries/territories are visiting our journal on regular basis.

Ground Floor, Building No. 1041-C-1, Devi Bhawan Bazar, JAGADHRI – 135 003, Yamunanagar, Haryana, INDIA

<http://ijrcm.org.in/>

# CONTENTS

Sr. No.	TITLE & NAME OF THE AUTHOR (S)	Page No.
1.	<p style="text-align: center;"><b>STUDY ON OCCUPATIONAL STRESS OF WOMEN EMPLOYEES IN SELECTED BANKS IN KOTTAYAM DISTRICT, KERALA</b></p> <p style="text-align: center;"><i>JISMY MARIA JOSEPH &amp; DR. K. RAMESH</i></p>	1
2.	<p style="text-align: center;"><b>ELECTRICITY DEMAND ANALYSIS AND FORECASTING IN TAIWAN</b></p> <p style="text-align: center;"><i>CHIH-SHINE HO</i></p>	7
	<b>REQUEST FOR FEEDBACK &amp; DISCLAIMER</b>	11

**FOUNDER PATRON**

**Late Sh. RAM BHAJAN AGGARWAL**

Former State Minister for Home & Tourism, Government of Haryana  
Former Vice-President, Dadri Education Society, Charkhi Dadri  
Former President, Chinar Syntex Ltd. (Textile Mills), Bhiwani

**CO-ORDINATOR**

**Dr. BHAVET**

Former Faculty, Shree Ram Institute of Engineering & Technology, Urjani

**ADVISOR**

**Prof. S. L. MAHANDRU**

Principal (Retd.), Maharaja Agrasen College, Jagadhri

**EDITOR**

**Dr. NAWAB ALI KHAN**

Professor & Dean, Faculty of Commerce, Aligarh Muslim University, Aligarh, U.P.

**CO-EDITOR**

**Dr. G. BRINDHA**

Professor & Head, Dr.M.G.R. Educational & Research Institute (Deemed to be University), Chennai

**EDITORIAL ADVISORY BOARD**

**Dr. SIKANDER KUMAR**

Vice Chancellor, Himachal Pradesh University, Shimla, Himachal Pradesh

**Dr. A SAJEEVAN RAO**

Professor & Director, Accurate Institute of Advanced Management, Greater Noida

**Dr. CHRISTIAN EHIOBUCHÉ**

Professor of Global Business/Management, Larry L Luing School of Business, Berkeley College, USA

**Dr. JOSÉ G. VARGAS-HERNÁNDEZ**

Research Professor, University Center for Economic & Managerial Sciences, University of Guadalajara, Guadalajara, Mexico

**Dr. TEGUH WIDODO**

Dean, Faculty of Applied Science, Telkom University, Bandung Technoplex, Jl. Telekomunikasi, Indonesia

**Dr. M. S. SENAM RAJU**

Professor, School of Management Studies, I.G.N.O.U., New Delhi

**Dr. KAUP MOHAMED**

Dean & Managing Director, London American City College/ICBEST, United Arab Emirates

**Dr. D. S. CHAUBEY**

Professor & Dean (Research & Studies), Uttaranchal University, Dehradun

**Dr. ARAMIDE OLUFEMI KUNLE**

Dean, Department of General Studies, The Polytechnic, Ibadan, Nigeria

**Dr. SYED TABASSUM SULTANA**

Principal, Matrusri Institute of Post Graduate Studies, Hyderabad

**Dr. MIKE AMUHAYA IRAVO**

Principal, Jomo Kenyatta University of Agriculture & Tech., Westlands Campus, Nairobi-Kenya

**Dr. NEPOMUCENO TIU**

Chief Librarian & Professor, Lyceum of the Philippines University, Laguna, Philippines

**Dr. BOYINA RUPINI**

Director, School of ITS, Indira Gandhi National Open University, New Delhi

**Dr. FERIT ÖLÇER**

Professor &amp; Head of Division of Management &amp; Organization, Department of Business Administration, Faculty of Economics &amp; Business Administration Sciences, Mustafa Kemal University, Turkey

**Dr. SANJIV MITTAL**

Professor &amp; Dean, University School of Management Studies, GGS Indraprastha University, Delhi

**Dr. SHIB SHANKAR ROY**

Professor, Department of Marketing, University of Rajshahi, Rajshahi, Bangladesh

**Dr. SRINIVAS MADISHETTI**

Professor, School of Business, Mzumbe University, Tanzania

**Dr. ABHAY BANSAL**

Head, Department of Information Technology, Amity School of Engg. &amp; Tech., Amity University, Noida

**Dr. KEVIN LOW LOCK TENG**

Associate Professor, Deputy Dean, Universiti Tunku Abdul Rahman, Kampar, Perak, Malaysia

**Dr. OKAN VELI ŞAFAKLI**

Professor &amp; Dean, European University of Lefke, Lefke, Cyprus

**Dr. V. SELVAM**

Associate Professor, SSL, VIT University, Vellore

**Dr. BORIS MILOVIC**

Associate Professor, Faculty of Sport, Union Nikola Tesla University, Belgrade, Serbia

**Dr. N. SUNDARAM**

Associate Professor, VIT University, Vellore

**Dr. IQBAL THONSE HAWALDAR**

Associate Professor, College of Business Administration, Kingdom University, Bahrain

**Dr. MOHENDER KUMAR GUPTA**

Associate Professor, Government College, Hodal

**Dr. ALEXANDER MOSESOV**

Associate Professor, Kazakh-British Technical University (KBTU), Almaty, Kazakhstan

**RODRECK CHIRAU**

Associate Professor, Botho University, Francistown, Botswana

**Dr. PARDEEP AHLAWAT**

Associate Professor, Institute of Management Studies &amp; Research, Maharshi Dayanand University, Rohtak

**Dr. DEEPANJANA VARSHNEY**

Associate Professor, Department of Business Administration, King Abdulaziz University, Saudi Arabia

**Dr. BIEMBA MALITI**

Associate Professor, School of Business, The Copperbelt University, Main Campus, Zambia

**Dr. SHIKHA GUPTA**

Associate Professor, Lingaya's Lalita Devi Institute of Management &amp; Sciences, New Delhi

**Dr. KIARASH JAHANPOUR**

Dean of Technology Management Faculty, Farabi Institute of Higher Education, Karaj, Alborz, I.R. Iran

**Dr. SAMBHAVNA**

Faculty, I.I.T.M., Delhi

**YU-BING WANG**

Faculty, department of Marketing, Feng Chia University, Taichung, Taiwan

**Dr. TITUS AMODU UMORU**

Professor, Kwara State University, Kwara State, Nigeria

**Dr. SHIVAKUMAR DEENE**

Faculty, Dept. of Commerce, School of Business Studies, Central University of Karnataka, Gulbarga

**Dr. THAMPOE MANAGALESWARAN**

Faculty, Vavuniya Campus, University of Jaffna, Sri Lanka

**Dr. JASVEEN KAUR**

Head of the Department/Chairperson, University Business School, Guru Nanak Dev University, Amritsar

**SURAJ GAUDEL**

BBA Program Coordinator, LA GRANDEE International College, Simalchaur - 8, Pokhara, Nepal

**Dr. RAJESH MODI**

Faculty, Yanbu Industrial College, Kingdom of Saudi Arabia

**Dr. BHAVET**

Former Faculty, Shree Ram Institute of Engineering & Technology, Urjani

**FORMER TECHNICAL ADVISOR**

**AMITA**

**FINANCIAL ADVISOR**

**NEENA**

Investment Consultant, Chambaghat, Solan, Himachal Pradesh

**LEGAL ADVISORS**

**JITENDER S. CHAHAL**

Advocate, Punjab & Haryana High Court, Chandigarh U.T.

**CHANDER BHUSHAN SHARMA**

Advocate & Consultant, District Courts, Yamunanagar at Jagadhri

**SUPERINTENDENT**

**SURENDER KUMAR POONIA**

## CALL FOR MANUSCRIPTS

We invite unpublished novel, original, empirical and high quality research work pertaining to the recent developments & practices in the areas of Computer Science & Applications; Commerce; Business; Finance; Marketing; Human Resource Management; General Management; Banking; Economics; Tourism Administration & Management; Education; Law; Library & Information Science; Defence & Strategic Studies; Electronic Science; Corporate Governance; Industrial Relations; and emerging paradigms in allied subjects like Accounting; Accounting Information Systems; Accounting Theory & Practice; Auditing; Behavioral Accounting; Behavioral Economics; Corporate Finance; Cost Accounting; Econometrics; Economic Development; Economic History; Financial Institutions & Markets; Financial Services; Fiscal Policy; Government & Non Profit Accounting; Industrial Organization; International Economics & Trade; International Finance; Macro Economics; Micro Economics; Rural Economics; Co-operation; Demography; Development Planning; Development Studies; Applied Economics; Development Economics; Business Economics; Monetary Policy; Public Policy Economics; Real Estate; Regional Economics; Political Science; Continuing Education; Labour Welfare; Philosophy; Psychology; Sociology; Tax Accounting; Advertising & Promotion Management; Management Information Systems (MIS); Business Law; Public Responsibility & Ethics; Communication; Direct Marketing; E-Commerce; Global Business; Health Care Administration; Labour Relations & Human Resource Management; Marketing Research; Marketing Theory & Applications; Non-Profit Organizations; Office Administration/Management; Operations Research/Statistics; Organizational Behavior & Theory; Organizational Development; Production/Operations; International Relations; Human Rights & Duties; Public Administration; Population Studies; Purchasing/Materials Management; Retailing; Sales/Selling; Services; Small Business Entrepreneurship; Strategic Management Policy; Technology/Innovation; Tourism & Hospitality; Transportation Distribution; Algorithms; Artificial Intelligence; Compilers & Translation; Computer Aided Design (CAD); Computer Aided Manufacturing; Computer Graphics; Computer Organization & Architecture; Database Structures & Systems; Discrete Structures; Internet; Management Information Systems; Modeling & Simulation; Neural Systems/Neural Networks; Numerical Analysis/Scientific Computing; Object Oriented Programming; Operating Systems; Programming Languages; Robotics; Symbolic & Formal Logic; Web Design and emerging paradigms in allied subjects.

Anybody can submit the **soft copy** of unpublished novel; original; empirical and high quality **research work/manuscript** **anytime** in **M.S. Word format** after preparing the same as per our **GUIDELINES FOR SUBMISSION**; at our email address i.e. [infoijrcm@gmail.com](mailto:infoijrcm@gmail.com) or online by clicking the link **online submission** as given on our website ([FOR ONLINE SUBMISSION, CLICK HERE](#)).

## GUIDELINES FOR SUBMISSION OF MANUSCRIPT

1. **COVERING LETTER FOR SUBMISSION:**

DATED: \_\_\_\_\_

**THE EDITOR**

IJRCM

**Subject: SUBMISSION OF MANUSCRIPT IN THE AREA OF**

**(e.g. Finance/Mkt./HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, please specify)**

**DEAR SIR/MADAM**

Please find my submission of manuscript titled ' \_\_\_\_\_ ' for likely publication in one of your journals.

I hereby affirm that the contents of this manuscript are original. Furthermore, it has neither been published anywhere in any language fully or partly, nor it is under review for publication elsewhere.

I affirm that all the co-authors of this manuscript have seen the submitted version of the manuscript and have agreed to inclusion of their names as co-authors.

Also, if my/our manuscript is accepted, I agree to comply with the formalities as given on the website of the journal. The Journal has discretion to publish our contribution in any of its journals.

**NAME OF CORRESPONDING AUTHOR** :  
 Designation/Post\* :  
 Institution/College/University with full address & Pin Code :  
 Residential address with Pin Code :  
 Mobile Number (s) with country ISD code :  
 Is WhatsApp or Viber active on your above noted Mobile Number (Yes/No) :  
 Landline Number (s) with country ISD code :  
 E-mail Address :  
 Alternate E-mail Address :  
 Nationality :

\* i.e. Alumnus (Male Alumni), Alumna (Female Alumni), Student, Research Scholar (M. Phil), Research Scholar (Ph. D.), JRF, Research Assistant, Assistant Lecturer, Lecturer, Senior Lecturer, Junior Assistant Professor, Assistant Professor, Senior Assistant Professor, Co-ordinator, Reader, Associate Professor, Professor, Head, Vice-Principal, Dy. Director, Principal, Director, Dean, President, Vice Chancellor, Industry Designation etc. **The qualification of author is not acceptable for the purpose.**

**NOTES:**

- a) The whole manuscript has to be in **ONE MS WORD FILE** only, which will start from the covering letter, inside the manuscript. **pdf. version is liable to be rejected without any consideration.**
  - b) The sender is required to mention the following in the **SUBJECT COLUMN of the mail:**  
**New Manuscript for Review in the area of** (e.g. Finance/Marketing/HRM/General Mgt./Engineering/Economics/Computer/IT/ Education/Psychology/Law/Math/other, please specify)
  - c) There is no need to give any text in the body of the mail, except the cases where the author wishes to give any **specific message** w.r.t. to the manuscript.
  - d) The total size of the file containing the manuscript is expected to be below **1000 KB**.
  - e) Only the **Abstract will not be considered for review** and the author is required to submit the **complete manuscript** in the first instance.
  - f) **The journal gives acknowledgement w.r.t. the receipt of every email within twenty-four hours** and in case of non-receipt of acknowledgment from the journal, w.r.t. the submission of the manuscript, within two days of its submission, the corresponding author is required to demand for the same by sending a separate mail to the journal.
  - g) The author (s) name or details should not appear anywhere on the body of the manuscript, except on the covering letter and the cover page of the manuscript, in the manner as mentioned in the guidelines.
2. **MANUSCRIPT TITLE:** The title of the paper should be typed in **bold letters, centered and fully capitalised.**
  3. **AUTHOR NAME (S) & AFFILIATIONS:** Author (s) **name, designation, affiliation (s), address, mobile/landline number (s), and email/alternate email address** should be given underneath the title.
  4. **ACKNOWLEDGMENTS:** Acknowledgements can be given to reviewers, guides, funding institutions, etc., if any.
  5. **ABSTRACT:** Abstract should be in **fully Italic printing**, ranging between **150 to 300 words**. The abstract must be informative and elucidating the background, aims, methods, results & conclusion in a **SINGLE PARA**. **Abbreviations must be mentioned in full.**
  6. **KEYWORDS:** Abstract must be followed by a list of keywords, subject to the maximum of **five**. These should be arranged in alphabetic order separated by commas and full stop at the end. All words of the keywords, including the first one should be in small letters, except special words e.g. name of the Countries, abbreviations etc.
  7. **JEL CODE:** Provide the appropriate Journal of Economic Literature Classification System code (s). JEL codes are available at [www.aea-web.org/econlit/jelCodes.php](http://www.aea-web.org/econlit/jelCodes.php). However, mentioning of JEL Code is not mandatory.
  8. **MANUSCRIPT:** Manuscript must be in **BRITISH ENGLISH** prepared on a standard A4 size **PORTRAIT SETTING PAPER**. **It should be free from any errors i.e. grammatical, spelling or punctuation. It must be thoroughly edited at your end.**
  9. **HEADINGS:** All the headings must be bold-faced, aligned left and fully capitalised. Leave a blank line before each heading.
  10. **SUB-HEADINGS:** All the sub-headings must be bold-faced, aligned left and fully capitalised.
  11. **MAIN TEXT:**

**THE MAIN TEXT SHOULD FOLLOW THE FOLLOWING SEQUENCE:****INTRODUCTION****REVIEW OF LITERATURE****NEED/IMPORTANCE OF THE STUDY****STATEMENT OF THE PROBLEM****OBJECTIVES****HYPOTHESIS (ES)****RESEARCH METHODOLOGY****RESULTS & DISCUSSION****FINDINGS****RECOMMENDATIONS/SUGGESTIONS****CONCLUSIONS****LIMITATIONS****SCOPE FOR FURTHER RESEARCH****REFERENCES****APPENDIX/ANNEXURE****The manuscript should preferably be in 2000 to 5000 WORDS, But the limits can vary depending on the nature of the manuscript.**

12. **FIGURES & TABLES:** These should be simple, crystal **CLEAR, centered, separately numbered** & self-explained, and the **titles must be above the table/figure. Sources of data should be mentioned below the table/figure. It should be ensured that the tables/figures are referred to from the main text.**
13. **EQUATIONS/FORMULAE:** These should be consecutively numbered in parenthesis, left aligned with equation/formulae number placed at the right. The equation editor provided with standard versions of Microsoft Word may be utilised. If any other equation editor is utilised, author must confirm that these equations may be viewed and edited in versions of Microsoft Office that does not have the editor.
14. **ACRONYMS:** These should not be used in the abstract. The use of acronyms is elsewhere is acceptable. Acronyms should be defined on its first use in each section e.g. Reserve Bank of India (RBI). Acronyms should be redefined on first use in subsequent sections.
15. **REFERENCES:** The list of all references should be alphabetically arranged. **The author (s) should mention only the actually utilised references in the preparation of manuscript** and they may follow Harvard Style of Referencing. **Also check to ensure that everything that you are including in the reference section is duly cited in the paper.** The author (s) are supposed to follow the references as per the following:
- All works cited in the text (including sources for tables and figures) should be listed alphabetically.
  - Use **(ed.)** for one editor, and **(ed.s)** for multiple editors.
  - When listing two or more works by one author, use --- (20xx), such as after Kohl (1997), use --- (2001), etc., in chronologically ascending order.
  - Indicate (opening and closing) page numbers for articles in journals and for chapters in books.
  - The title of books and journals should be in italic printing. Double quotation marks are used for titles of journal articles, book chapters, dissertations, reports, working papers, unpublished material, etc.
  - For titles in a language other than English, provide an English translation in parenthesis.
  - **Headers, footers, endnotes and footnotes should not be used in the document.** However, **you can mention short notes to elucidate some specific point**, which may be placed in number orders before the references.

**PLEASE USE THE FOLLOWING FOR STYLE AND PUNCTUATION IN REFERENCES:**

**BOOKS**

- Bowersox, Donald J., Closs, David J., (1996), "Logistical Management." Tata McGraw, Hill, New Delhi.
- Hunker, H.L. and A.J. Wright (1963), "Factors of Industrial Location in Ohio" Ohio State University, Nigeria.

**CONTRIBUTIONS TO BOOKS**

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

**JOURNAL AND OTHER ARTICLES**

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

**CONFERENCE PAPERS**

- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–23

**UNPUBLISHED DISSERTATIONS**

- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

**ONLINE RESOURCES**

- Always indicate the date that the source was accessed, as online resources are frequently updated or removed.

**WEBSITES**

- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 <http://epw.in/user/viewabstract.jsp>



## ELECTRICITY DEMAND ANALYSIS AND FORECASTING IN TAIWAN

**CHIH-SHINE HO**  
**DOCTORAL CANDIDATE**  
**DEPARTMENT OF ECONOMICS**  
**SOOCHOW UNIVERSITY**  
**CHUNGCHENG DISTRICT, TAIPEI CITY 100, TAIWAN**

**ABSTRACT**

*In 2013, Taiwan authorises increase in oil and electricity prices to reduce the energy demand of the masses. However, this measure not only failed to achieve the expected policy goal, but also caused prices to rise. Hence, this study tries to discuss the electricity consumption and the different prices of the sectors. The econometric model of Kalman filter is the estimation of the demand elasticity of electricity in Taiwan. Due to electric demand is foreign trade oriented in Taiwan, we suggest to set a combination of stimulus packages to alleviate it.*

**KEYWORDS**

electricity price. Kalman filter. electric demand.

**JEL CODES**

Q40, Q41, Q47.

**1. INTRODUCTION**

In the past, Taiwan's power technology was mainly based on fossil fuel power generation. From 1960 to 2014, not only did policy makers try to increase the rapidly growing economy of the GDP, but also the layout subsidized to export-oriented economies such as the price of electricity. On the one hand, the industrial competitiveness approach relied on preferential cost of production factors. On the other hand, the industry emphasised less on energy efficiency. Taiwan's per capita carbon emissions always be a big carbon emitter that the relevant authority monitors goods price volatility to remain the stable electricity tariff. Taiwan's electricity tariff rates have been adjusted twice a year in 2015. The adjustment of electricity prices timely helps in allocating resources efficiently. The issues of carbon emissions and greenhouse gases have gradually attracted international attention. Hence, Taiwan's power generation is devoted to elevate green energy, increase natural gas, decrease coal-fired, reach nuclear-free, and guarantee a stable power supply to reduce air pollution and carbon emissions. The share of green energy in the power generation ratio will increase from % 5 in 2016 to 20% in 2025. Furthermore, the generation capacity of natural gas will increase from its current 32,4% to 50% by 2025. The industrial sector particularly concerns about the increase in the ratio of renewable energy to natural gas power generation, which will lead to a substantial increase in the production cost of the product. Rising electricity price is chiefly concerned with all.

Numerous articles discussed the variables and categories of electricity consumption, such as consumer behaviours, the temperature, industry characteristics, electricity efficiency, electricity price, consumer price index, incomes, GDP, etc. The study of domestic energy demand estimated the connection of temperature and electric consumption (Pardoa et al., 2002; Chang et al., 2016). Using annual data would analyse the patterns of electricity consumption between electricity prices and economic growth (Shiu and Lam, 2004). Applying a co-integration and error-correction model established short-and long-run elasticities of the electricity's demand price and income with respect to price and income in the Korean service sector (Kyoung-Min et al., 2014). Applying Harvey's Structural Time Series Model estimated equations of gasoline demand and residential electricity demand in Saudi Arabia (Mohammad et al., 2021). The global electricity demand pays close attention to the electricity prices and income levels of user. This article is the estimation of price elasticities of electricity demand in Taiwan from 1991 to 2021 by applying the Kalman filter.

**1.1. OBJECTIVES OF THE STUDY**

1. To study the factors effecting the electricity demand in Taiwan.
2. To study the price and income elasticities of the electricity demand in Taiwan.

**2. THE LITERATURE OF METHODOLOGY****2.1. GENERAL TOPICS**

Numerous studies are based on electricity demand as the topic of discussion. The more common analysis methods include co-integration analysis and Granger's technique. The tool analysis of cointegration has an important contribution to the development of econometrics (Engle and Granger, 1987; Johansen, 1991). By seeking the method of cointegration to establish long-term relationships that affect the economic variables in Malaysia. There is a positive correlation between carbon dioxide and economic growth. The policy implications of this article initiated the recommendation for continuing the decoupling of economic growth from CO<sub>2</sub> emissions. Therefore, the advantage of using natural gas to generate electricity with less carbon emissions is used as a suggestion to lay the foundation for sustained economic growth and protection of the environment (Etokakpan et al., 2020).

Most countries choose fossil fuel power generation technology based on cost factors and power supply stability. Therefore, coal-fired power generation technology has become an indispensable basic option. This study's main objective is to apply Granger's technique to investigate the relationship between gross domestic product and energy price or consumption. The price of oil rises and may cause recessions in the U.S economy (Hamilton, 1983; Mork, 1989). To investigate the relationship between GDP and energy consumption, he used Taiwanese data from 1954 to 1997. By examining the energy usage of the four power generation technologies before and after this period, including natural gas, crude oil, electricity and coal, he found that they have a causal relationship with each other for economic growth (Yang, 2000).

Before setting energy prices, policymakers often use price trends in previous periods as a reference. However, the problem with co-integration analysis is that the relationship between variables must indicate to assume a long-term stable relationship. Hence, most studies are similar in assumptions that the price elasticity of electricity is constant through the periods inspected (Inglesi-Lotz, 2011). According to this assumption, we understand that various variables will change over time. This means that the trend of electricity demand over time cannot be captured and it cannot be a reference standard for policy planners. While the international community is gradually advocating vigorously for reducing emissions, the renewable energy generation technology has relatively lenient control on policy compared with other energy sources. It means that the power infrastructure has been completely readjusted, from high-carbon petrochemical power generation to low-carbon natural gas and renewable energy power generation technology. The characteristics of renewable energy generation equipment are mainly natural resources, such as the sun and tides.

Therefore, new energy generation equipment is an intermittent equipment of the power, comparing to traditional petrochemical power generation technology. Many studies focused on electricity demand of the sectors, such as the industrial sector, the residential sector, the agricultural sector, and the power generation sector. Before responding to power demand, it is necessary to make many unpredictable changes in the time trend under the current limited information. The electricity demand will never be a stable state. Therefore, it is necessary for power plant operators that gain the information for reference of electricity demand and various variables.

As far as the electricity sector is concerned, price and income flexibility may have become the most critical factors influencing electricity consumption decisions. The more increase in natural gas and renewable energy power generation, the more it will make the price of electricity that raises the cost of industrial development. It's absolutely vital that the social planners obviously required a set of trustworthy and referenced modules to respond to fluctuations in energy prices. The Kalman filter can capture the characteristics of variables modified over time in the model. When the variables change over time, it can be used to capture the change of the variable under the inclusion of new information and effects, thereby predicting new trends and traces. This algorithm not only expands the OLS model, but the electricity demand is a better policy and business assessment tool (Morrison and Pike, 1977).

**2.2. KALMAN FILTER APPLICATION**

It's absolutely vital that understanding the customer's needs is to be the growing business. Electricity companies try to foresee future trends in electricity demand. This shows that most studies create a model to capture the effect of economic variables on energy demand. We can discover many estimated tools and assume that the time series data is stable states. It limited to assist the decision-making and evaluation of relevant unit's company managers.

The structural time series model is an invaluable instrument for conducting research of electricity demand. The algorithm of the model is written by Kalman filter, which can be used to analyse the trend (horizontal plus slope), seasonality and irregular components in the time series. In this paper, we tried structural models with real independent variable time series in Taiwan. We decomposed the electricity consumption of sector time series with a smooth trend and we focused on the trend and the cyclical component. The issues affecting the consumption of electricity are nothing more than income, electricity prices and economic growth. The scope of this research is the power demand of each department in a period of time. In the specific presentation of electricity demand of various sectors, the most obvious way of electricity consumption is the seasonal difference.

In this study, we tried to hold energy price reform to measure the consumption of electricity in Taiwan. Aggregate electricity demand is modelled as a function of the real electricity price, real income, sector's electricity consumption and so on. We considered the following equation:

$$E_t = a_1Gdp_t + a_2Trans_t + a_3Sv_t + a_4Eng_t + a_5Ind_t + a_6Inc_t + a_7Res_t + a_8Agr_t + a_9Ind_{t-p} + a_{10} Res_{t-p} + \epsilon_t \dots (1)$$

where  
 In period t,  $E_t$  is the dependent variable, is the total electricity consumption,  $Gdp_t$  is the electricity consumption of gross domestic product,  $Trans_t$  is the electricity consumption of transport sector,  $Sv_t$  is the electricity consumption of service sector,  $Eng_t$  is the electricity consumption of energy sector,  $Ind_t$  is the electricity consumption of industry,  $Inc_t$  is the national income,  $Res_t$  is the electricity consumption of residential sector,  $Agr_t$  is the electricity consumption of agricultural sector,  $Ind_{t-p}$  is the price of industrial electricity and  $Res_{t-p}$  is the price of residential electricity.

The electricity consumption of each department varies under the time trend, which fully reflects the difference in energy demand of each department. Taiwan's economic momentum is mainly export trade. According to export data, Taiwan's peak export season is in the third and fourth quarters. Therefore, depending on the products was produced by each department, it must be completed in advance. Because the industrial sector has the largest proportion of total electricity consumption, lots of evidence has a great influence on the total electricity consumption and the electricity demand of GDP. The three variables of total electricity consumption, economic growth and industrial sector have been processed for the time lag trend. Finally, based on the aforementioned factors, this article uses the sspace (state space) in the EViews 7.2 software to provide a simple and easy-to-use interface, using a powerful recursive Kalman filter algorithm for analysis (Hamilton 1994a, 1994b; Harvey, 1989), equation (1) becomes

$$signal E_t = c(1)*total(-1) + c(2)*gdp(-1) + c(3)*ind(-1) + c(4)*res_t + c(5)*sv_t + c(6)*trans_t + c(7)*eng_t + c(8)*agr_t + sv1*ind_{t-p} + sv2*res_{t-p} + sv3*inc_t + [var = exp(c(9))]$$

$$(2)$$

$$state sv1 = sv1(-1) (3)$$

$$state sv2 = sv2(-1) (4)$$

$$state sv3 = sv3(-1) (5)$$

**3. DATA**

Applying the Kalman filter algorithm traced the electricity demand of various sectors. At first, this study tries to use the AREMOS database of Taiwan Economic Data Center to estimate the electricity consumption in Taiwan. The aggregate electricity consumption is measured in kilowatt-hour. Secondly, the electricity fare is obtained by the Bureau of Energy, Ministry of Economic Affairs; whilst the data series on national income and consumer price index was obtained from the Directorate General of Budget, Accounting and Statistics, Executive Yuan.

This paper explores the substantial change of real variables. We must convert nominal variables into real variables, in which the income and the electricity price is divided by CPI (constant prices 2016). The database is from 1991Q1 to 2020Q1. Finally, we obtained the real variable rate of change to apply to the Kalman filter calculation model.

**4. RESULTS AND DISCUSSION**

**4.1. ADF&PP TEST**

The article used to capture the relationship between electricity price and electricity consumption which was the Kalman filter. Before using the econometric model evaluation, the statistical test will be provided assistance by verifying if the estimated parameters changed over time. For this study, we selected the statistical verification methods of ADF and PP. Because the p-value is smaller than the 5% significance level, regardless of how the ADF and PP tests rejected the null hypothesis that the parameters were stable. The results are displayed in Table 1. According to these results, we applied the Kalman filter model further.

TABLE 1

Variables	ADF	PP
eng <sub>t</sub>	-8.528***	-20.916***
gdp <sub>t</sub>	-8.322***	-49.275***
Income <sub>t</sub>	-7.515***	-30.857***
ind <sub>t</sub>	-9.243***	-22.865***
ind <sub>t-p</sub>	-9.383***	-26.537***
total <sub>t</sub>	-8.922***	-16.377***
trans <sub>t</sub>	-5.642***	-25.054***
sv <sub>t</sub>	-8.719***	-17.040***
Agr <sub>t</sub>	-19.540***	-20.593***
Res <sub>t</sub>	-6.927***	-24.740***
Res <sub>t-p</sub>	-9.129***	-49.487***

Note: \*Statistically significant at 10%; \*\*statistically significant at 5%; \*\*\*statistically significant at 1%.

4.2. KALMAN FILTER

In the model, the Kaman filter was used to explore the trend of the electricity price, electricity consumption, and the variables in various sectors in the same period. Table 2 reports that the algorithm of structural time series model is the Kalman filter estimation results.

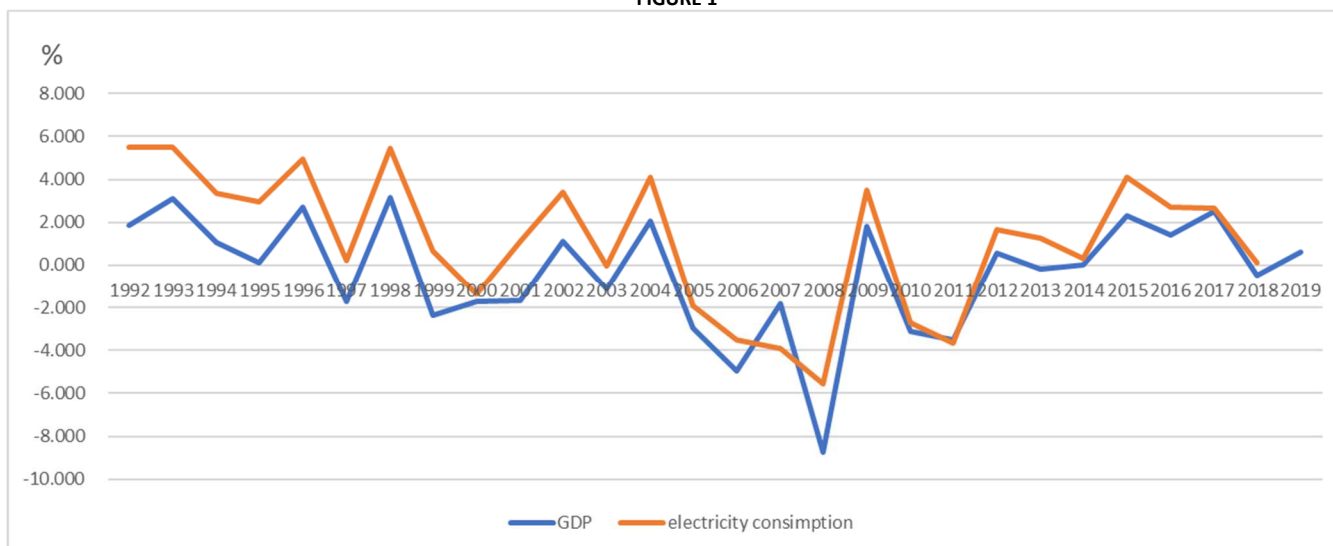
TABLE 2

Space Model		
Sample:1991Q2~2020Q1		
Included observations:116		
Variables	Estimated coefficients	p-vale
C(1)	-0.0912	0.0061
C(2)	0.0003	0.5276
C(3)	0.0228	0.2581
C(4)	0.0930	0.0009
C(5)	0.4927	0
C(6)	0.0506	0.0316
C(7)	0.0820	0.1285
C(8)	-0.0117	0.7615
C(9)	-8.5112	0
Variables	Final State	p-vale
SV1	-0.0027	0.8575
SV2	-0.0158	0.3593
SV3	0.0903	0.0067
Log likelihood	294.9693	
Akaike info criterion	-4.9734	
Schwarz criterion	-4.7556	
Hannan-Quinn criter	-4.8862	

c(1)represents the total electricity consumption in period t-1; c(2) represents the gross domestic production period t-1; c(3) represents the electricity consumption of the industry in period t-1; c(4) represents the electricity consumption of the residential sector in period t; c(5) represents the electricity consumption of the service sector in period t; c(6) represents the electricity consumption of transport sector in period t; c(7) represents the electricity consumption of the energy sector in period t; c(8) represents the electricity consumption of the agriculture sector in period t; c(9) represents the constant parameters of the estimation in period t; sv1 and sv2 represent the final estimates for the electricity price elasticity of industry and household and sv3 represents he final estimates for the income elasticity.

The main driving force of Taiwan's economic development is exports. The economic growth will inevitably affect the growth of electricity consumption. The relationship between the gross domestic product and electricity consumption almost shows to change in the same direction for the time period in in Figs. 1. Thus, it's vitally important to discuss electricity prices and electricity consumption in detail.

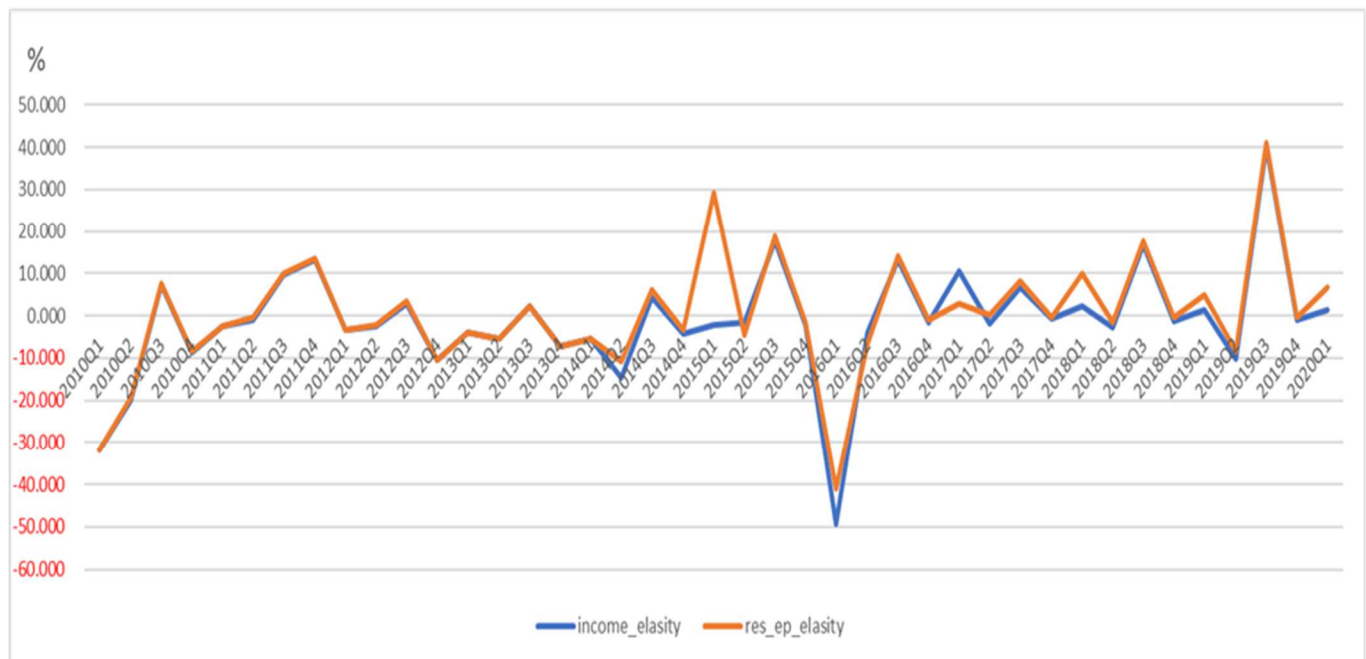
FIGURE 1



We try to describe the elasticity trajectory of income and industry/residential sector electricity price in Figs. 2 and 3. Most of the income elasticity changes in the same range as the price elasticity. This fact reveals that the electricity price alone cannot reduce the electricity consumption of the department.

Therefore, in order to reduce electricity consumption, the social planner has to form a complete set of policy incentive-supporting mechanisms, such as demand response and carbon tax, which have been common in recent years.

FIGURE 2



## 5. CONCLUSION

Electric demand rests with both electric balance and the inflation. In the previous decade, electric fees and consumption always are the major issue of energy policy in Taiwan. The main reason is that energy (electricity) prices will affect the consumer price index and industrial factor cost. The industrial sector occupies the highest electricity consumption of all sectors, accounting for 52% on average. In 2012, a substantial adjustment of energy prices did not change the behaviour of electricity consumption, but it caused the commodity price to fluctuate sharply. It has aroused people's expectations and may have led to rising prices. This is a far cry from the original policy goal of reducing electricity consumption.

Behaviour Shaping lies in the accumulation of daily life. The response of various sectors to the difference in electricity prices lies in the direction of electricity consumption. If it assumed that the electricity demand variable sequence was in a long-term stable state sequence once people faced the changes in prices, the current electricity consumption behaviour would be changed. The advantage of the Kalman filter algorithm model captured short-term data trends, wherein it was particularly suitable for the discussion of electricity demand.

The mode makes both ends of the supply and demand which process the goal of suppressing power consumption/generation. It can be regarded as a positive advantage of suppressing electricity demand. In recent years, many policies have proposed a comprehensive energy transition to decouple energy use from economic growth. For less developed countries or developing countries, it is a win-win trajectory for economic development and energy demand and it is a worthwhile approach.

## REFERENCES

1. Alice Shiu & Pun-Lee Lam, 'Electricity consumption and economic growth in China', *Energy Policy*, Volume No. 32 (2004), Issue No.1 (January), ISSN0301-4215, pp. 47–54.
2. Andrew C. Harvey, 'Forecasting, Structural Time Series Models and the Kalman Filter. Cambridge': Cambridge University Press (1989), pp.100-167.
3. Angel Pardo, Vicente Menu & Enric Valor, 'Temperature and seasonality influences on Spanish electricity load', *Energy Economics*, Volume No. 24 (2002), Issue No.1 (January), ISSN 0140-9883, pp. 55-70.
4. Etokakpan, M.U., Solarin, S.A., Yorucu, V., Bekun, F.V & Sarkodie, S.A, 'Modeling natural gas consumption, capital formation, globalization, CO2 emissions and economic growth nexus in Malaysia: Fresh evidence from combined cointegration and causality analysis', *Energy Strategy Reviews*, Volume No.31 (2020), (September), ISSN 2211-467X, pp.100526.
5. G. W. Morrison & D. H. Pike, 'Kalman Filtering Applied to Statistical Forecasting', *Management Science*, Volume No. 23 (1977), Issue No.7 (March), ISSN0025-1909, pp. 768–774.
6. Hao-Yen Yang, 'A note on the causal relationship between energy and GDP in Taiwan', *Energy Economics*, Volume No. 22 (2000), Issue No.3 (June), ISSN0140-9883, pp. 309–317.
7. James D. Hamilton, 'Oil and the Macroeconomy since World War II', *The Journal of Political Economy*, Volume No. 91 (1983), Issue No.2 (April), ISSN0022-3808, pp.228-248.
8. James D. Hamilton, 'State-space models. In: Engle RF & McFadden DL (ed.), *Handbook of Economics*', (1994a), Edition 1, Chapter 50, pp.3039-3080, Elsevier.
9. James D. Hamilton, 'Time Series Analysis. Princeton' Princeton University Press (1994b), pp.372-379.
10. Knut Anton Mork, 'Oil and the Macroeconomy When Prices Go Up and Down: An Extension of Hamilton's Results', *Journal of Political Economy*, Volume No. 97 (1989), Issue No.3(June), ISSN0022-3808, pp. 740-744.
11. Mohammad Aldubyan & Anwar Gasim, 'Energy price reform in Saudi Arabia: Modeling the economic and environmental impacts and understanding the demand response', *Energy Policy*, Volume No.148 (2021), Issue Part B(January), ISSN 0301-4215, pp.111941.
12. R. Inglesi-Lotz, 'The evolution of price elasticity of electricity demand in South Africa: A Kalman filter application', *Energy Policy*, Volume No.39(2011), Issue No.6(June), ISSN0301-4215, pp. 3690-3696.
13. Robert F. Engle & C. W. J. Granger, 'Co-Integration and Error Correction: Representation, Estimation, and Testing', *Econometrica*, Volume No.55(1987), Issue No.2(March), ISSN1468-0262, pp.251-276.
14. Soren Johansen, 'Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models', *Econometrica*, Volume No.59(1991), Issue No.6(November), ISSN1468-0262, pp. 1551-1580.
15. Yoosoon Chang, Chang Sik Kim, J. Isaac Miller, Joon Y. Park & Sungkeun Park, 'A new approach to modeling the effects of temperature fluctuations on monthly electricity demand', *Energy Economics*, Volume No.60(2016), (November), ISSN 0140-9883, pp.206–216.

## **REQUEST FOR FEEDBACK**

**Dear Readers**

At the very outset, International Journal of Research in Commerce & Management (IJRCM) acknowledges & appreciates your efforts in showing interest in our present issue under your kind perusal.

I would like to request you to supply your critical comments and suggestions about the material published in this issue, as well as on the journal as a whole, on our e-mail [infoijrcm@gmail.com](mailto:infoijrcm@gmail.com) for further improvements in the interest of research.

If you have any queries, please feel free to contact us on our e-mail [infoijrcm@gmail.com](mailto:infoijrcm@gmail.com).

I am sure that your feedback and deliberations would make future issues better – a result of our joint effort.

Looking forward to an appropriate consideration.

With sincere regards

Thanking you profoundly

**Academically yours**

Sd/-

**Co-ordinator**

## **DISCLAIMER**

The information and opinions presented in the Journal reflect the views of the authors and not of the Journal or its Editorial Board or the Publishers/Editors. Publication does not constitute endorsement by the journal. Neither the Journal nor its publishers/Editors/Editorial Board nor anyone else involved in creating, producing or delivering the journal or the materials contained therein, assumes any liability or responsibility for the accuracy, completeness, or usefulness of any information provided in the journal, nor shall they be liable for any direct, indirect, incidental, special, consequential or punitive damages arising out of the use of information/material contained in the journal. The journal, neither its publishers/Editors/ Editorial Board, nor any other party involved in the preparation of material contained in the journal represents or warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such material. Readers are encouraged to confirm the information contained herein with other sources. The responsibility of the contents and the opinions expressed in this journal are exclusively of the author (s) concerned.



## ABOUT THE JOURNAL

In this age of Commerce, Economics, Computer, I.T. & Management and cut throat competition, a group of intellectuals felt the need to have some platform, where young and budding managers and academicians could express their views and discuss the problems among their peers. This journal was conceived with this noble intention in view. This journal has been introduced to give an opportunity for expressing refined and innovative ideas in this field. It is our humble endeavour to provide a springboard to the upcoming specialists and give a chance to know about the latest in the sphere of research and knowledge. We have taken a small step and we hope that with the active co-operation of like-minded scholars, we shall be able to serve the society with our humble efforts.

### *Our Other Journals*

