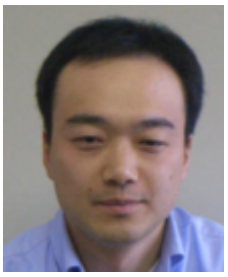
Computer Industry Laboratory

Incheon Paik
Professor

Shigeru Kanemoto
Professor



Kenta Ofuji
Associate Professor

Refereed academic journal

[o-fu-309-038-01:2016] Kenta Ofuji and Naoki Tatsumi. A Count Model Analysis of Traded Contracts in the JEPX Forward Market. *Electrical Engineering in Japan*, 194(4):10–18, 4 2016.

It is desirable that the number of forward contracts traded on the Japan Electric Power Exchange increase. However, few studies have clarified what factors have contributed to impacting the number of forward contracts traded. In this study, the authors analyzed the number of forward contracts using four count regression models. The negative binomial regression model and the zero-inflated models were better able to express the expected counts, by incorporating the overdispersion and excess zeros present in the observed data. Among others, the spot market can carry positive influences on the expected counts, by about 12 per cent for a 1 yen per kWh increase in price, and by about 27percent for a 0.1percentage-point increase in volumes. The zero-inflated models revealed that as many as three-fourth of the entire forward products have a high probability of zero counts, while the remaining one-fourth may see an increased number of counts as the spot market price and/or the spot volume becomes higher.

[o-fu-309-038-02:2016] Kenta Ofuji and Osamu Kimura. A Basic Literature Review on Energy Efficiency Obligation(EEO) in Europe and North America. *Journal of Public Utility Economics*, 68(2):33–44, 3 2017.

There is a growing interest in Japan on Energy Efficiency Obligation (EEO) Schemes implemented in many European countries and U.S. states. This paper is a brief literature survey as an introduction and review of this relatively new energy efficiency policy. Taking U.K., Italy, France and the state of Texas in U.S. as case studies, it aims to better understand the policy's mission, goals, and effectiveness. Based on a comparison of the four case studies, the paper finds that although all cases saw the energy saving targets met and deemed effective, the policy variables are fairly diverse, such as targeted fuel and denomination, targeted sectors, obligated parties, and specific energy saving measures introduced, because they reflect, among others, different policy goals and each country's energy efficiency service supply chain. Other policy domain such as climate change and retail liberalization can also interplay.

[o-fu-309-038-03:2016] Naomi Ogasawara and Kenta Ofuji. Linguistic Analysis of Water/landslide Disaster Warnings. *Disaster Information (Japan Society for Disaster Information Studies)*, TBD(TBD):TBD, TBD 2017.

This study collected water or landslide warnings from 56 autonomous bodies in Japan, categorized the warnings in preparation, advisory, and directive based on the urgency level, and linguistically analyzed them in terms of the number of sentences and phrases, requests, imperatives, single, compound, embedded clauses, relative clauses, passives, and types of information included in the warnings. After the analysis, the following results were found: 1 a warning is consisted of 5 sentences and 30 - 34 phrases in average; 2 there is a proportional relationship between the syntactic complexity of language and urgency level; 3 evacuation acts are expressed in request sentences instead of imperatives in many of the warnings; 4 warnings include information about sender, receivers, urgency level, shelter, risks, and evacuation acts.

[o-fu-309-038-04:2016] KenIhiro Nishio and Kenta Ofuji. Explaining Differences in Household Electricity Saving Rates: A Panel Data Analysis on Household Attributes and Electricity Consumption Tendencies. *IEEJ Transactions on Power and Energy*, 136(3):284–290, 3 2016.

In this paper, we studied differences in the electricity saving rates across households, observed in the summer months of July through September after the Great East Japan Earthquake. To explain what factors carry different influences on the electricity saving rates, we ran panel data regression models using the electricity consumption billing data in the summer months, July through September, over the five years of 2010-2014 for 910 households in the Tokyo and Kansai areas. Specifically, we concentrated on two main explanatory factors: household attributes that include household size and income, and electricity consumption tendencies characterized by average consumption level and its standard deviation. We found that, while some household attributes such as age and floor space have statistically significant linear relationships with the saving rates, households with higher average consumption can have higher saving rates, implying the electricity consumption data acquired by smart meters may be among the key determinants for tailored energy-saving recommendations.

[o-fu-309-038-05:2016] Kenta Ofuji and Naoki Tatsumi. Wholesale and retail electricity markets in Japan: Results of market revitalization measures and prospects for the current reform. *Economics of Energy and Environmental Policy*, 5(1):31–49, 7 2016.

This study provides an overview of the current status of the wholesale and retail electricity markets in Japan, with a focus on the results of market revitalization policies, such as the thermal power bidding system, regular backup, and partial supply system. This study also offers a perspective on the future of the Electricity

System Reform policy currently under way. Throughout the history of Japan's electricity market reform, the implementation of full-scale retail deregulation and the unbundling of electricity generation from the transmission and distribution sectors have been significant issues. The outcomes and issues generated by market revitalization efforts indicate that reforms have entered the crucial stage that determines whether consumers will actually benefit from them.

Unrefereed academic journal

[paikic-309-038-01:2016] Incheon Paik Wuhui Chen and Neil Y. Yen. Discovering internal social relationship for influence-aware service recommendation. *Multimedia Tools and Applications, Springer*, 76(18):18193–18220, September 2017.

Existing approaches, such as semantic content-based or Collaborative Filtering-based recommendations, fail to exploit social aspects of services because services lack social relationships and do not consider social influence. In this paper, we propose a methodology for connecting distributed services in a global social service network (GSSN) to facilitate discovering internal social relationship for social influence-aware service recommendation. First, we propose a novel platform for constructing a GSSN by linking distributed services with social links based on quality of social link. We then propose a flexible model of the effective awareness of social influence, which provides a quantitative measure of the strength of influence between services. Next, a novel social influence-aware service recommendation approach is proposed based on GSSN using internal social relationship among services. The experimental results demonstrated that our new approach can solve the service recommendation problem with a low usage threshold and high accuracy, where the user preferences are exploited by a recommend-as-you-go method.

[paikic-309-038-02:2016] Zhenni Li Neil Yen Wuhui Chen, Incheon Paik. A Cost Minimization Data Allocation Algorithm for Dynamic Datacenter Resizing. *Journal of Parallel and Distributed Computing*, pages –, 2017.

Modern datacenters dynamically adjust the number of active servers in different geographic regions to adapt to the dynamic workloads from user requests and electricity price heterogeneity. One of the main challenges for datacenter resizing is that the heavy network traffic among datacenters causes significant deterioration of the overall performance and considerably increases the operational expenditure of datacenters. In this paper, we propose an efficient data

allocation technique that considers both the static and dynamic characteristics of datacenters to enable more efficient datacenter resizing. We first formulate the optimal data allocation problem, propose a generic model for minimizing the communicating cost in datacenter resizing, and show that the data allocation problem is NP-hard. To produce feasible solution in polynomial time, we propose a heuristic algorithm considering the traffic flow in the network topology of datacenters by first transforming the data allocation problem into a chunk distribution tree (CDT) construction problem, and then reducing the CDT construction to a graph partitioning problem. The experimental results show that our efficient data allocation approach can improve the performance of MapReduce operations effectively with lower communicating and computing costs for datacenter resizing.

Refereed proceedings of an academic conference

[o-fu-309-038-06:2016] Kenta Ofuji Naomi Ogasawara and Akari Harada. Appropriateness of Acoustic Characteristics on Perception of Disaster Warnings. In the Acoustical Society of America and Acoustical Society of Japan, editors, *Poster 5aSC43 at the 5th Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan, Honolulu Hawaii, 28 November - 2 December 2016*, page 5aSC43, Honolulu, Hawaii, USA, November 2016. the Acoustical Society of America and Acoustical Society of Japan, the Acoustical Society of America and Acoustical Society of Japan.

Below are our main findings: Generally, for each rating criterion (Intelligibility, Reliability, Urgency), the average rating was the highest when the calls were spoken with a female voice, with normal speed and normal pitch. However, for Urgency only, increased speed and raised pitch resulted in an improved average rating. For all of Intelligibility, Reliability, and Urgency, the main effect of speaking speed was the most dominant. In particular, Urgency can be influenced by the speed factor alone by up to 43 per cent. By setting speed to fast, the perceived Urgency can be raised to the highest level, even at the expense of Intelligibility and Reliability to some degrees. Based on these results, we argue that the speech rate may effectively be varied depending on the purpose of an evacuation call, whether it prioritizes Urgency, or Intelligibility and Reliability. Future work: 1 we wish to use similar experiments to test other respondents who reflect actual demo-

graphic traits (age in particular) of residents in the disaster-prone areas, such as coastal areas threatened by tsunami, and riverside basins threatened by floods; 2 the auditory condition may have to incorporate actual environmental limitations experienced by such dwellers, where, for example, evacuation call voice can be difficult to hear in torrential rain and high winds; 3 the content, in addition to the acoustic properties examined this time, of the evacuation calls deserves to be studied as it will also significantly affect respondents' perception.

[paikic-309-038-03:2016] Jeremy Perkins Incheon Paik, Younghyon Heo. Classification of Machine-Translated Text Using Deep Learning. In ICEIC Comittee, editor, *Proceedings of International Conference on Electronics, Information, and Communication*, Honolulu, Hawaii, January 2018.

[paikic-309-038-04:2016] Chungho Lee and Incheon Paik. Stock Market Analysis from Twitter and News Based on Streaming Big Data Infrastructure. In IEEE, editor, *Proceedings of IEEE International Conference on Awareness Science and Technology (iCAST 2017)*, Taichung, Taiwan, November 2017. IEIE, IEEE.

[paikic-309-038-05:2016] Incheon Paik Sheng Zhang. An Efficient Algorithm For Web Service Selection Based On Local Selection In Large Scale. In IEEE, editor, *Proceedings of IEEE International Conference on Awareness Science and Technology (iCAST 2017)*, Taichung, Taiwan, November 2017. IEIE, IEEE.

[paikic-309-038-06:2016] Thenuwara Hannadige Akila Sanjaya Siriweera Incheon Paik, Yutaka Koshiba. Efficient Service Discovery Using Social Service Network Based on Big Data Infrastructure. In IEEE, editor, *Proceedings of IEEE 11th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSOC 2017)*, Seoul, Korea, September 2017. IEEE, IEEE CPS.

[paikic-309-038-07:2016] Shuxue Ding Incheon Paik Atsunori Kanemura Yujie Li, Benying Tan. Key Frame Extraction from Video Based On Determinant-Type of Spare Measure And DC Programming. In IEEE, editor, *Proceedings of IEEE 11th International Symposium on Embedded Multicore/Many-core Systems-on-Chip (MCSOC 2017)*, Seoul, Korea, September 2017. IEEE, IEEE CPS.

[paikic-309-038-08:2016] Incheon Paik Kazuki Sasaki. Analysis of Data Distribution to Classify Documents on Taxonomy Hierarchy. In IEIE, editor, *Proceedings of The 32nd International Technical Conference on Circuits/Systems, Computers and Communications*, Busan, Korea, July 2017. IEIE, IEIE.

[paikic-309-038-09:2016] Incheon Paik Kento Hayasaka. Improving Taxonomical Document Classification Using Explicit Semantic Analysis and Convolutional Neural Network. In IEIE, editor, *Proceedings of The 32nd International Technical Conference on Circuits/Systems, Computers and Communications*, Busan, Korea, July 2017. IEIE, IEIE.

[paikic-309-038-10:2016] B. T. G. S. Kumara Rupasingha A. H. M. Rupasingha, Incheon Paik. Improving Web Service Clustering through a Novel Ontology Generation. In IEEE, editor, *Proceedings on IEEE International Conference on Web Service 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

[paikic-309-038-11:2016] Incheon Paik T. H. Akila S. Siriweera. QoS and Customizable Transaction?aware Selection for Big Data Analytics. In IEEE, editor, *Proceedings on IEEE International Conference on Service Computing 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

[paikic-309-038-12:2016] T. H. Akila S. Siriweera Koswatte R. C. Koswatte Banage T.G.S. Kumara, Incheon Paik. QoS Aware Service Clustering to Bootstrap the Web Service Selection. In IEEE, editor, *Proceedings on IEEE International Conference on Service Computing 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

[paikic-309-038-13:2016] Incheon Paik T. H. Akila S. Siriweera. Constraint?Driven Dynamic Workflow for Automation of Big Data Analytics based on GraphPlan. In IEEE, editor, *Proceedings on IEEE International Conference on Web Service 2017*, Hawaii, U.S.A, September 2017. IEEE, IEEE CPS.

Unrefeered proceedings of an academic conference

[o-fu-309-038-07:2016] Naomi Ogasawara and Kenta Ofuji. How should evacuation calls be announced to be effective? - Influence from acoustic properties of

annoucements -. In *Proceedings of the 18th Conference on Japan Society of Disaster Information Studies*, pages 226–227. Japan Society of Disaster Information Studies, Japan Society of Disaster Information Studies, October 2016.

[o-fu-309-038-08:2016] Osamu Kimura and Kenta Ofuji. A Basic Literature Review on Energy Efficiency Obligation(EEO) in Europe and North America. In *Proceedings of the 2016 annual meeting of Japan Society of Public Utility Economics*. Japan Society of Public Utility Economics, June 2016.

There is a growing interest in Japan on Energy Efficiency Obligation (EEO) Schemes implemented in many European countries and U.S. states. This paper is a brief literature survey as an introduction and review of this relatively new energy efficiency policy. Taking U.K., Italy, France and the state of Texas in U.S. as case studies, it aims to better understand the policy's mission, goals, and effectiveness. Based on a comparison of the four case studies, the paper finds that although all cases saw the energy saving targets met and deemed effective, the policy variables are fairly diverse, such as targeted fuel and denomination, targeted sectors, obligated parties, and specific energy saving measures introduced, because they reflect, among others, different policy goals and each country's energy efficiency service supply chain. Other policy domain such as climate change and retail liberalization can also interplay.

Advisor for undergraduate research and graduate research

[o-fu-309-038-09:2016] Akihito Endo. Graduation Thesis: A statistical analysis of JEPX Forward contracts - Survival Analysis -, University of Aizu, 3 2017.

Thesis Advisor: K. Ofuji

[o-fu-309-038-10:2016] Yuki Yanagisawa. Graduation Thesis: A Conjoint analysis of disaster inforation call contents by questionnaire survey, University of Aizu, 3 2017.

Thesis Advisor: K. Ofuji

[o-fu-309-038-11:2016] Narumu Yokokawa. Graduation Thesis: Are continuous improvement activities effective in promoting power saving in offices and factories? - effects from data and organizational contents -, University of Aizu, 3 2017.

Thesis Advisor: K. Ofuji

[o-fu-309-038-12:2016] Yusuke Sakai. Graduation Thesis: Panel data analysis of power saving rates in Japanese offices in 2011-2014, University of Aizu, 3 2017.

Thesis Advisor: K. Ofuji

[o-fu-309-038-13:2016] Akari Harada. Graduation Thesis: Appropriateness of Acoustic Characteristics on Perception of Disaster Warnings, University of Aizu, 3 2017.

Thesis Advisor: K. Ofuji

Contributions related to syllabus preparation

[o-fu-309-038-14:2016] Syllabus: Graduate School, Univ. of Aizu: PMC01 Managerial Economics