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PREPRINT

Ineffectual regulation

When an official of a regulatory agency seems to regulate effectually without actually doing so

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Abstract

Occasionally, officials of the world's regulatory agencies embark upon attempts at bringing previously unregulated physical systems under regulation by them. Each such attempt raises an epistemological issue. At issue is whether enough information about the outcomes of the events of the future, given the outcomes of the events of the

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present, will be in the hands of a would-be regulator for this regulator to regulate effectually. If present, this information is provided by runs of a model of the physical system that is slated for regulation. Ideally, this model makes an argument that draws its conclusion from the evidence presented to it. If so, this argument is of the form of a predictive inference. However, the process by which an argument draws its conclusion from the evidence may go awry. This happens, for example, when the axiom of probability theory called unit measure is falsified by a conclusion that is drawn from the evidence by this argument.

A method is derived from first principles for determination of whether unit measure is satisfied or falsified by an argument made by a model, given that this argument may attach unusual meanings to statistical terms. This method is used in a study of whether unit measure is satisfied or falsified by the arguments that are made by a pair of models. Both models are in active use by regulatory agencies around the world. Under neither argument do runs of the model provide an official of a regulatory agency with the information gain aka mutual information that he or she would need to regulate effectually. Under both arguments, attachment of unusual meanings to statistical terms creates the illusion that such an official can and does regulate effectually.

Introduction

A model plays a role in the process of regulation

To attempt to regulate a physical system, an official of a regulatory agency must base this attempt upon runs of a model of this system. Ideally, runs of his or her model provide this official with information gain. Absent information gain, this official cannot regulate effectually.

An argument made by a model makes an argument

Whether implicitly or explicitly, a model makes an argument, an example of which is:

> Cloudy now, therefore the value is 0.6 of the probability of the event of rain in the next 24 hours.
>
> Not cloudy now, therefore the value is 0.2 of the probability of the event of rain in the next 24 hours.

In the example, if the term "probability" takes on its usual meaning this argument is of the form of a predictive inference but if the term "probability" takes on an unusual meaning this argument is not a predictive inference. Simply by looking at this argument, one cannot determine whether this argument is or is not a predictive inference yet only if this argument is a predictive inference does a run of the model that makes this argument convey non-nil information gain aka mutual information to an official of a regulatory agency. Non-nil information gain is required for this official to regulate effectually. Going forward we'll derive from first principles a method by which this official or anyone else can determine whether the information gain is nil or non-nil. Then we'll apply this method to a pair of examples of arguments made by models in current use by regulatory agencies. The first of the tasks that lie before us is to define what we mean by the term "event."

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The idea of an "event" plays a role in the argument made by a model

An "event" is a subset of a sample space. Importantly, an event that is "actual" has a location in spacetime but an event that is not "actual" lacks such a location. For brevity we'll abbreviate the phrase "actual event" to the word "event" going forward. Thus, going forward, an "event" does not necessarily have a location in spacetime. Given that an event has a location in spacetime, this location is occupied by a really existing physical object called an "observational unit" but given that an event lacks a location in spacetime the corresponding observational unit does not exist, for if an event lacks a location in spacetime one does not know where to look if one is to observe it. Thus, if an observational unit exists then the value is 1 of the count of it but if this observational unit does not exist then the value is 0 of the count of it.

The event of

rain in the next 24 hours OR *no rain in the next 24 hours*

is an example of a "sure event" (SE). The outcome of an SE is generally of the form *O* OR (NOT *O*) where *O* designates the outcome of an event and NOT *O* designates the logical complement of *O*. Under an assumption of probability theory and mathematical statistics, 1 is the value of the measure of the SE of *O* OR (NOT *O*); under this assumption unit measure is satisfied by the argument made by the model. Under Aristotle's less restrictive Laws of Thought, 0, 1 or 2 is the value of the measure of the SE of *O* OR (NOT *O*). That 0 is the value falsifies the Law of the Excluded Middle (LEM) and unit measure. That 2 is the value falsifies the Law of Non-Contradiction

(LNC) and unit measure. The LEM and LNC are among Aristotle's three Laws of Thought.

That 1 is the value satisfies the LEM, LNC and unit measure. For consistency between the theoretical and empirical worldviews that is the mark of the scientific method of investigation, the value of the measure of an SE matches the value of the count of the observable units that occupy the location, if any, of this SE. Thus, the value is 0, 1 or 2 of this count. That the value is 0, 1 or 2 of this count and of the corresponding measure has been observed [1][2], providing empirical support for the Laws of Thought. It follows that the location of an observable unit matches the location of the corresponding SE.

The genesis of a method of research

Evidence about to be presented suggests the possibility that the value can be 0, 1 or 2 of the above referenced count perplexes people who believe the value is invariably 1 of this count. This evidence also suggests that a subset of these people react to their perplexity by attaching unusual meanings to statistical terms [2], the nature of which create the illusion that this value is 1 given that the value is 0 or 2. The result is for a statistical language to be born in which the term "unit of observation," (or a synonym of this term), means "0, 1 or 2 units of observation." In this respect, the new language is ambiguous in its use of statistical terms. This phenomenon has led to development of a method by which this language can be translated into the unambiguous language of mathematics. This method is described below, under the heading of Method.

This article

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This article is an account of the latest episode in a line of scientific research that is based upon the above referenced method. To give a name, this episode is called "our study" going forward. The method of our study is presented immediately below, under the heading of Method. The findings from our study are presented next, under the heading of Findings. In closing, the findings of our study are discussed, under the heading of Discussion.

Method

The role of logical semantics

The method of our study has both a logical and a semantic aspect. These two aspects are joined in the discipline called logical semantics. Under our application of logical semantics, the Laws of Thought impose a constraint on the semantics of statistical terms in the text of an argument made by a model. Imposition of this constraint results in the existence of a mathematical function that maps the type of an SE to the count of the observable units that occupy the location in spacetime of this SE. This function has a type signature i.e. a template that is descriptive of the types of this function's input and output but not of the link between the input and output. The type of this function's input is a string that is descriptive of the outcome of an SE of the given type e.g. the string "rain in the next 24 hours OR no rain in the next 24 hours." The type of this function's output is the value of the measure of an SE of the given type of input. Negation of the LEM by an argument made by a model yields the conclusion that the value is 0 of the measure of the SE. Negation of the LNC by this argument yields the conclusion that the value is 2 of the measure of this SE. Satisfaction of the LEM and LNC by this argument yields the conclusion that the value is 1 of the measure of this SE. Thus, the value of the measure of this SE is 0, 1 or 2.

The method of our study is based upon the finding from mathematical research that under the Laws of Thought, the value of the measure of an SE of a given type matches one of only three patterns that are available for being matched. The pattern that is matched by an SE of a given type is constrained by the relation from the location of the event of *O* to the location of the SE of *O* OR (NOT *O*). This relation is a proper subset relation in which the location of the event of *O* is a proper subset of the location of the SE of *O* OR (NOT *O*).

Neither the location of the event of *O* nor the location of the event of NOT *O* necessarily exists. Given that either location does not exist, this location is occupied by 0 observable units, it being impossible to find an observable unit whose location does not exist for the purpose of observing it. Given that this location exists, it is occupied by 1 observable unit.

Under precept of measure theory called “additivity,” the value of the count of the observable units occupying the location of the SE of *O* OR (NOT *O*) is the sum of the count of the observable units occupying the location of the event of *O* and the observable units occupying the location of the event of NOT *O*. Under the same precept, the value of the measure of the SE of *O* OR (NOT *O*) matches the value of the count of the observable units that occupy the location of this SE. Thus, the value of the measure of this SE is 0, 1 or 2.

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Q.E.D.

Adding up the information gains

The information gain to an official of a regulatory agency from runs of his or her model is a function of the types of the various SEs that are exhibited by the model. Under the precept of measure theory called "additivity," the information gains of the various SEs are additive. By adding these information gains we determined whether the overall information gain was nil or non-nil. Given that the overall information gain was nil, the regulation was judged to be completely ineffectual.

Inadvertent collection of data

In the course of our study we inadvertently collected data on the contrasting receptivity to the finding that a regulation was completely ineffectual on the part of an official of a regulatory agency who had made this mistake and a referee for a peer-review journal article that had warned this mistake was being made. These data are reported below, under the heading of Findings. Then, under the heading of Discussion, a generalization is drawn from this evidence. This generalization then supports a recommendation for reform in the manner in which an official of a regulatory agency is compensated under which the amount of the compensation is sensitive to whether the regulation by this official is effectual or ineffectual.

Examples

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Two examples of uses of the method of our study were made in the course of this study. Each example focused on a different model and argument made by this model.

To give them names, the two arguments are called the Damage Tolerance argument and the Climate Sensitivity argument. The Damage Tolerance argument is made by the Damage Tolerance model. The Climate Sensitivity argument is made by the Climate Sensitivity model.

Under the Damage Tolerance argument, a study is of the “cross sectional” variety, implying that spacetime reduces to the “space” portion of spacetime; a point in the “space” portion of spacetime will be called “space-point.” Under the Climate Sensitivity argument, a study is of the “longitudinal” variety implying that spacetime reduces to the “time” portion of spacetime; a point in the “time” portion of spacetime will be called a “time-point.” Under the Damage Tolerance argument, the location of an event is a set of spacepoints. Under the Climate Sensitivity argument, the location of an event is a set of time-points.

Findings

Focusing on Damage Tolerance

As previously noted, the Damage tolerance argument is made by the Damage tolerance model. For this argument, the location of a unit of observation, if any, is a set of space-points. This location is also the location of the corresponding SE. Given that a unit of observation does not exist, the value is 0 of the measure of the corresponding SE.

For the Damage tolerance model, the physical system being modelled is a defective, safety-critical structural system that functions under mechanical stress (acronym DSCSS). Under the Damage Tolerance argument, when a DSCSS is periodically tested by a reliable non-destructive test in which actual defects large enough to cause collapse of this DSCSS before the next scheduled test are not detected, this system is safe to operate. A defect that is an “actual” defect is an event that has a location in space with the consequence that corresponding to this actual defect is 1 unit of observation. A defect that is not an “actual” defect lacks a location in space with the consequence that corresponding to this defect are 0 units of observation.

The Damage Tolerance argument is made by models of a variety of DSCSSs; they include the flawed, stress-bearing aluminum skin of an aging passenger aircraft while this aircraft is in flight [3] and the stress-bearing components of an aging nuclear reactor while this reactor is in operation. The DSCSS that is featured in our study is composed of the flawed tubes of a pressurized water reactor steam generator. A pressurized water reactor is a type of nuclear reactor.

A pressurized water reactor steam generator is a type of boiler. The exteriors of the tubes are prone to corrosion with resulting formation of actual defects through the combined action of the corrosion and the stress. Among the types of the actual defects are pits and cracks. Each actual defect extends inward from the exterior of the tube, where corrosive chemicals are present, and into the wall of this tube. The wall bears stress making it susceptible to collapse while the reactor is in operation. The existence of its actual defects, if any, weakens the ability of a tube to withstand collapse [4].

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In the regulatory system of the U.S., the U.S. Nuclear Regulatory Commission (NRC) holds the responsibility for ensuring the public safety against the collapse of one or more tubes while a pressurized water reactor is in operation. Under unfavorable circumstances, collapse would result in release of harmful radioactive products of nuclear fission from confinement and into places inhabited by people.

In 1978, the NRC declared the possibility of collapse of tubes of a pressurized water reactor steam generator while a pressurized water reactor was in operation to be an "unresolved safety issue" [7]. In response to this issue, NRC officials ordered the conduct of a study, Task 13 of which was to be devoted to cross validation of the model by which these officials attempted to regulate the public safety against the collapse of one or more tubes. Circa 1985, while serving as an advisor to NRC officials on the design of and conduct of their study, this writer warned NRC officials that NRC researchers could not act on their plan as the statistical population underlying their model did not exist. For this statistical population to exist was, however, required for the model to be cross validated. Ignoring this warning, NRC officials proceeded onward with their plan to cross validate their model, absent the underlying statistical population that was required for this to happen.

In 1988, NRC officials published the final report to them by the NRC researchers [4]. The text of this report presents the argument made by the model of the NRC officials and in doing so provides this writer with the opportunity to demonstrate an application of the method of research that was presented earlier, under the heading of Method.

 doi:10.20944/preprints202009.0223.v1

From data presented in the final report of the NRC researchers, the types of the SEs can be extracted [5]. The types are:

0) “a *true negative* OR a *false positive*,”

1) “a *true positive* OR a *false negative* given that the actual defect is undetected” and,

2) “a *true positive* OR a *false negative* given that the actual defect is detected.’

The pattern that is matched when the SE is of type 2) is of a partition of the “space” portion of spacetime, each element of which is the location of the SE of a *true positive* OR a *false negative* given that the actual defect is detected. The location of each such SE is occupied by 2 units of observation. The first of these units of observation occupies the location of the event of a *true positive* while the second of these units of observation occupies the location of the event of a *false negative*.

The pattern that is matched when the SE is of type 1) is of a partition of the “space” portion of spacetime, each element of which is the location of the SE of a *true positive* OR a *false negative* given that the actual defect is undetected. The location of each such SE is occupied by 1 unit of observation.

The pattern that is matched when the SE is of type 0) is of a class of empty sets of space-points, each element of which is the non-existent location of the SE of a *true negative* OR a *false positive*. The non-existent location of each such SE is occupied by 0 units of observation.

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To summarize, the value is respectively 0, 1 or 2 of the count of the units of observation that occupy the locations of the SEs of the 0), 1) and 2) types. The value is respectively 0, 1 and 2 of the measure of an SE of each type. Given that the value is 0 or 2 of this measure, this measure is not a probability; consequently, assignment of a value to this measure in a run of the NRC's model conveys nil information gain to an NRC official. Given that the value is 1 of this measure, this measure is the probability that is called the "probability of detection" in the report of the NRC researchers [6]. As the actual defect is undetected, the value is 0 of the probability of detection. That the value is 0 implies that the probability of detection is an unconditional probability. Consequently, the information gain is nil to an NRC official from runs of his or her model.

Taking into account SEs of each of the three types and summing the information gain of an SE of each type, the value is nil of the information gain from an SE of each of the three types, precluding effectual regulation. Though effectual regulation is impossible, assignment by the argument made by the NRC's model of unusual meanings to statistical terms including "unit" [5] and "probability" [6] could lead a reader of the final report by the NRC researchers to the NRC officials to the mistaken conclusion that effectual regulation is taking place.

Q.E.D.

Epilogue

In the year 1995, seven years after publication of the final report of the NRC researchers to the NRC officials, this writer and a co-author submitted the manuscript for a critical review of this report to a peer-review journal of the American Society of Mechanical Engineers. The proposed title for this work was “Erratic measure,” reflecting this work’s finding that under the argument made by the model of the NRC officials, the value of the measure of an SE varied, dependent upon the type of this SE. The co-author was R. A. Christensen, a one-time contractor to NRC officials who specialized in the construction of models that delivered the maximum possible information gain to a user of one of these models [12]. Under the “erratic measure,” the value was nil of the information gain, precluding effectual regulation by the NRC officials. Though they could not regulate effectually these officials could seem to regulate effectually as the by now published final report by the NRC researchers to the NRC officials repeatedly referred to a “probability of detection” under the condition that this “probability” was a non-probability as it falsified unit measure.

After receiving notice of acceptance of the above referenced manuscript from the editor of the journal in which it was scheduled to be published, this writer wrote to an NRC official, forwarding a preprint of the article and calling for action on the part of NRC officials on the findings of the article. NRC officials responded to this call for action by petitioning the editor of the journal in which the article was scheduled to be published to quash publication. As the editor told the story to this writer of his disposition of this petition he responded by augmenting his panel of anonymous referees by addition to this panel of an academic statistician. Upon reading the article, the statistician found the article to be “excellent” with the result that the editor rejected the petition of the NRC officials and published the article on schedule [2]. In telling his story, the editor

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described the argument made by NRC officials in their petition as “non-technical.” Details on the argument made by the NRC officials remain publicly unavailable as these officials have never published this argument. This unpublished argument, though having been rejected by anonymous referees of the American Society of Mechanical Engineers, became and remains the basis for the public policy of the U.S. on the collapse of tubes of a pressurized water reactor steam generator while a pressurized water reactor is in operation.

Following the publication of “Erratic measure,” this writer delivered an oral presentation of the article to a conference of the American Society of Mechanical Engineers. In the audience for this presentation was not a single representative of the NRC officials. Not a single member of the audience of approximately 30 specialists in non-destructive evaluation of a DSCSS voiced an objection to anything that was said by this writer in the course of his presentation or in the written version of the article. During the post-presentation period for discussion, a specialist from one of the U.S. government’s National Laboratories shared his views. He stated, in effect, that he had observed the “Erratic measure” in his own laboratory. He went on to express fear of flying home from the conference on a passenger aircraft for, as he correctly pointed out, the DSCSSs of this aircraft would have been given their periodic, non-destructive evaluations by methods that were similar in design to those used in the periodic, non-destructive evaluations of the tubes of a pressurized water reactor steam generator.

At the break following this writer’s presentation, a member of the audience approached this writer and identified himself as a recently retired member of the Section XI

Committee of the American Society of Mechanical Engineers, a different branch of the same organization that had published “Erratic measure” over the objection of NRC officials. The Section XI Committee was a non-governmental regulatory agency that wrote and published the rules under which the various DSCSSs of a nuclear power reactor were given their periodic non-destructive evaluations; among these DSCSSs were the tubes of a pressurized water reactor steam generator. The retired member of the Section XI Committee suggested to this writer that he get together with the members of the Section XI Committee for discussions on the topic of “Erratic measure.”

When he returned home, this writer wrote to the Section XI Committee to offer to get together with the members for discussions, free of charge. This offer produced no response over a period of about 6 months. Finally, the Secretary of the Section XI Committee responded on behalf of the Committee by declining to meet. Representatives of other organizations proved willing to meet [13][14] but the ensuing meetings proved unresponsive to the reason for meeting.

Among the groups approached by this writer on holding a meeting after “Erratic measure” was published was a group composed of NRC officials. After a prolonged delay, these officials called a meeting to be held at NRC headquarters in Rockville MD. To this meeting these officials invited the authors of “Erratic Measure”: this writer and R. Christensen. An official of the NRC told this writer that the meeting was being held under rules that allowed NRC officials to bar public participation. Attending this meeting were this writer and Christensen plus a number of NRC officials but no representatives of the general public. In the course of this meeting, the lead NRC official asked

Christensen, in effect, of whether the value of the count of the observable units occupying the location of the SE of a *true positive* OR *false negative* given that the actual defect was detected was not 1 rather than being 2. The article co-authored by Christensen said the value was 2. Now, reversing what he had said as a co-author, Christensen agreed with the lead NRC official that the value was 1. Before Christensen died in 2016, this writer showed him a proof that the value was 2 and he accepted this proof. Christensen had not known of the decisive fact that the location of the event of a *true positive* is a proper subset of the location of the SE of a *true positive* OR a *false negative* given that the actual defect was detected.

In another highlight of the post-publication era, the Inspector General of the NRC conducted an investigation into the matter of whether the value was 1 or 2. His investigatory style had the remarkable feature of failing to interview this writer though this writer was the lead author of “Erratic measure,” “Erratic measure” was published in a peer-review journal, “Erratic measure” said the value was 2 and no counter-argument had been published by the NRC or anyone else. Based upon the evidence that was produced under this style of investigation, the Inspector General decided that the value was 1. The fiction that the value is 1 continues to be the basis for NRC policy on the periodic non-destructive evaluation of the tubes of a pressurized water reactor steam generator. By their adherence to this policy, NRC officials fabricate 1 bit per event of information gain on the part of an NRC official from runs of his or her model, the apparent information gain being 1 bit per event and the actual information gain being 0 bits per event.

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Focusing on Climate Sensitivity

The Australian Government, Department of the Environment, explains that:

> Climate sensitivity describes the amount of warming in the atmosphere associated with increases in atmospheric carbon dioxide (CO2) [8].

The Climate Sensitivity argument is made by the Climate Sensitivity model; this model is of Earth's climate system. The logical foundation for this model is the hypothesis that Earth's climate system exhibits an "Equilibrium Climate Sensitivity" (ECS). Under this hypothesis, ECS is the rise in the global average surface air temperature at thermal equilibrium from a rise in the logarithm of the atmospheric concentration of carbon dioxide. The model assumes that ECS is a constant whose numerical value is, however, uncertain. In the course of our study we tested the hypothesis that Earth's climate system exhibits a climate sensitivity.

On the assumption that Earth's climate system does exhibit a climate sensitivity, a reasonably accurate estimate of the magnitude of ECS is a necessity, for if the magnitude is low enough there is no reason for an official of a regulatory agency to regulate but if the magnitude is high enough there is ample reason for this official to so. Climatologists have responded to the need for an estimate by hypothesizing the mathematical existence of a probability density function over ECS [9] but without entertaining the possibility that the "probability" of this "probability density function" falsifies unit measure. In our test of the hypothesis we entertained this possibility. We did so by applying the integral calculus. Under the Climate Sensitivity argument, the

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event of *O* is the integral of the "probability" density from the numerical value of minus infinity for ECS to the numerical value of *x* for ECS; here, the word "probability is rendered in quotes as whether this "probability" satisfies unit measure is at issue. Similarly, the event of NOT *O* is the integral of the "probability" density from the numerical value of *x* for ECS to the numerical value of plus infinity for ECS. Under the Laws of Thought, the value is 0, 1 or 2 of the value of the measure of the SE of *O* OR NOT *O*. Only under the condition that the value is 1 is the "probability" of this "probability" density function a genuine probability. Otherwise, this "probability" is a non-probability. In a run of the climate sensitivity model by an official of a regulatory agency, if this model assigns a numerical value to an unconditional probability or non-probability this act provides this official with nil information gain. With nil information gain, effectual regulation on the part of an official of a regulatory agency is impossible. However, an appearance of effectual regulation is possible through attachment of unusual meanings to statistical terms, including "probability. Whether unusual meanings are being attached to these terms is determinable through the use of the previously described pattern matching algorithm (see Method, above, for derivation).

Given that the value is 1 of the measure of the SE of *O* OR (NOT *O*), the pattern is of a partition of time, each element of which is the location of the SE of *O* OR (NOT *O*). This is the pattern that is matched by probability theory and mathematical statistics. If this were the pattern then cross validation of the climate sensitivity model would be possible.

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In the earliest of the periodically issued Climate Assessment Reports of the United Nations Intergovernmental Panel on Climate Change, the authors of these reports claimed the Climate Sensitivity model to have been cross validated. Acting from his position as an “expert reviewer” i.e. referee for these reports, V. Gray, advised the authors of one of these reports that cross validation had not taken place whereupon the authors changed the term “validate” to the term “evaluate” and did so thereafter [10].

In effect, Gray had discovered a mistake that had been made in the design of his study by S. Arrhenius, a pioneer in studies of the effects of increases in Earth’s atmospheric concentration of carbon dioxide upon Earth’s climate system. Though he could have done so, Arrhenius neglected the step of describing a partition of time, each element of which was the location of the SE of *O* OR (NOT *O*) and held an observable unit that was the planet Earth plus its atmosphere. For example, Arrhenius could have described a partition of time, each element of which was a calendar year. Thus, though global warming climatologists had the Earth and its atmosphere in mind, they had no such partition. Followers of Arrhenius compounded his error by assuming the existence of a probability density function over ECS, imposing constraints on this non-existent probability density function and publishing the results for the use of officials of regulatory agencies in regulating Earth’s climate system.

The “probability” of this “probability density function” does not match the pattern of a partition of time each element of which is occupied by an observable unit. The pattern that this “probability density function” matches is of a class of empty sets of points in time each element of which is occupied by 0 units of observation. Though Earth and its atmosphere exist, units of observation do not exist as a researcher does not know of the locations in time at which to observe them. Had Arrhenius provided a partition of time, each element of which was occupied by 1 observable unit, the Earth and its atmosphere would have acquired a set of “features” i.e. independent variables for use in the construction of a model. One of these features could have been the atmosphere concentration of carbon dioxide but there could have been others, making construction of a model an exercise in multivariate statistical modeling. Arrhenius’s mistake reduced this multivariate problem to a collection of univariate problems each with its own “forcing.” A rise in the logarithm of the atmospheric concentration of carbon dioxide was one of these forcings. Supposedly, this rise “forced” the global average surface air temperature at thermal equilibrium to rise proportionately, the proportionality constant being ECS.

Reduction of a multivariate problem to a collection of univariate problems linearized this problem, easing the computational load for construction of a model but at a prohibitive expense. The expense was for the model that was constructed in this manner to convey nil information gain to an official of a regulatory agency who made runs of this model in his or her attempts at regulation, precluding effectual regulation. Nil was the information gain as the “probability” of the probability density function over ECS was a non-probability, the pattern that is matched by probability theory and mathematical statistics not being matched by the Climate Sensitivity argument.

Thus, effectual regulation of Earth’s climate system on the basis of runs of the Climate Sensitivity model is impossible. Effectual regulation is made to seem possible by the

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practice of calling the non-probability density function over ECS a “probability density function.” An example of this practice is published here: [9].

Q.E.D.

Postscript

Circa 2007, this writer read the previously referenced memoir of V. Gray and drew the conclusion from this memoir that the “probability” of the “probability density function” over over ECS was a non-probability. It followed that the statistical population underlying the Climate Sensitivity model did not exist, contrary to the assumption of officials of regulatory agencies around the globe who were attempting to regulate the degree of warming by regulating the emissions of carbon dioxide. The job then fell to this writer of breaking the bad news to these officials that their assumption was wrong. The job of breaking this news proved to be an uphill battle.

In one attempt at breaking the bad news, this writer wrote to R. Pachauri, then the Chairman of the United Nations Intergovernmental Panel on Climate Change, to advise him that the pattern matched by the argument made by the Climate Sensitivity model was inconsistent with regulation of the Climate System on the basis of runs of the Climate Sensitivity model. Pachauri’s organization had published a series of Climate Assessment Reports that attached unusual meanings to statistical terms, creating the illusion that the “probability” of the “probability density function” over ECS was a genuine probability. Pachauri did not respond to this letter.

In a second attempt at breaking the bad news this writer provided written comments to the U.S. Environmental Protection Agency (EPA) on its proposed “Endangerment Finding” in regard to carbon dioxide emissions. In finding that that carbon dioxide emissions were an “endangerment,” EPC officials ignored all of this writer’s comments without asking for clarification or presenting counterarguments and while falsely claiming it had taken all such comments into account [11].

In a third attempt, this writer wrote to L. Jackson, then the chief administrator of the EPA, to advise her that, reaching its endangerment finding, the EPA had ignored his comments while claiming to have ignored no comments. Jackson did not respond to his letter.

In a fourth attempt, this writer spoke to a hearing of the EPA that was held in San Francisco on proposed EPA regulation of carbon dioxide emissions from electricity generating stations. He left EPA officials with a written transcript of his comments. In opting for regulation, EPA officials ignored this writer’s comments without asking for clarification or presenting counter arguments.

Discussion

As noted previously, in the course of our study we inadvertently collected data on the contrasting receptivity to the finding that a regulation was completely ineffectual on the part of two groups of people. One group was composed of officials who had made this mistake. The other group was composed of referees for a peer-review journal articles

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that had warned this mistake was being made. These data have been presented, under the heading of Findings.

These data exhibit a pattern of behavior under which a referee for a peer-review journal article is receptive to the news that an official of regulatory agency is regulating ineffectually but not this official. The existence of this pattern suggests the need for reform in the way in which an official of a regulatory agency is compensated. Under this reform, an official of a regulatory agency would be paid for regulating effectually but not for regulating ineffectually.

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