

The Converse Consequence Condition and Hempelian Qualitative Confirmation*

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In this paper, I offer a proof that a disastrous conclusion (namely, that any observation report confirms any hypothesis) may be derived directly from two principles of qualitative confirmation which Carl Hempel called the "Converse Consequence Condition" and the "Entailment Condition." I then discuss three strategies which a defender of the Converse Consequence Condition may deploy to save this principle.

1. Introduction. Consider the following example of confirmational inference: observations of the orbit of Mars confirm Kepler's laws of planetary motion; Newton's laws of mechanics entail Kepler's laws of planetary motion; ergo, observations of the orbit of Mars confirm Newton's laws of mechanics. Carl Hempel called the confirmation principle exemplified above the "Converse Consequence Condition" (1965, 32). This principle may be stated as follows:

Converse Consequence Condition (CCC): If observation report *E* confirms hypothesis *H'* and if hypothesis *H* logically entails *H'*, then *E* confirms *H*.

By 'hypothesis' Hempel meant any sentence which can be expressed in the assumed language of science, no matter whether it is a generalized sentence containing only quantifiers, or a particular sentence referring only to a finite number of objects. By 'observation report' Hempel meant any finite class of observation sentences, and by 'observation

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sentence' any sentence which either asserts or denies that a given object has a certain observable property or that a given sequence of objects stand in a certain observable relation.

Though Hempel apparently found the Converse Consequence Condition intuitively attractive, he rejected it nonetheless. He did so on the ground that when this principle is conjoined with two other confirmation principles he accepted, a disastrous consequence logically follows, namely, that any observation report confirms any hypothesis. These two other confirmation principles are the

Entailment Condition (EC): If E entails H , then E confirms H , and the

Special Consequence Condition (SCC): If E confirms H , then E confirms every consequence of H .

We may derive the disastrous consequence as follows. On the assumption that every statement confirms, because it entails, itself, we may assume that any observation report E confirms E . Given that the conjunction $(H \ \& \ E)$ entails E (for any hypothesis H), by the Converse Consequence Condition it follows that E confirms $(H \ \& \ E)$. Since E confirms $(H \ \& \ E)$ and since $(H \ \& \ E)$ entails H , by the Special Consequence Condition it follows that E also confirms H where H is any hypothesis.

Seeking to avoid this disastrous consequence, and given that the Entailment Condition is too important to give up, Hempel chose to preserve the Special Consequence Condition and to give up the Converse Consequence Condition. Despite this disastrous consequence, according to Clark Glymour, the Converse Consequence Condition "has had an undying popularity, and attempts to make it work still continue" (1980, 30).

2. The Disastrous Consequence Derived Without the Special Consequence Condition. What Hempel and Glymour, along with such other distinguished confirmation theorists as Israel Scheffler (1963), John Earman (1992), and Wesley Salmon (1992) have not noticed, however, is that we can deduce the disastrous consequence *directly* from the Entailment Condition and the Converse Consequence Condition (i.e., independently of the Special Consequence Condition). We may prove this as follows.

1. Let H' be some logical truth e.g. $(x) [\text{Raven}(x) \supset \text{Raven}(x)]$.
(assumption)
2. Any E entails H' . (logical truth)
3. Any H entails $H' \supset$. (logical truth)

4. Any E confirms H' . (2, EC)
5. Any E confirms any H . (4, 3, CCC)

So even if we *reject* the Special Consequence Condition, this proof gives us another reason to reject the Converse Consequence Condition, a confirmation principle which strikes many as intuitively appealing and which is actually used in science.

3. Three Strategies to Save the Converse Consequence Condition. In response to this problem, at least three strategies are open to the defender of the Converse Consequence Condition.

One strategy would be to keep both the Converse Consequence Condition and the Special Consequence Condition and to reject the Entailment Condition. This rejection may be motivated on the independent ground that, given the Entailment Condition, certain consequences may be derived which may strike many as counterintuitive. For instance, since any statement entails itself, then, given the Entailment Condition, any statement confirms itself. Therefore, any false statement (e.g., 'All ravens are white') is confirmed by at least one statement, namely, itself.

But a serious problem lurks for this strategy. For even if we *reject* the Entailment Condition, another disastrous consequence may be derived from conjoining the Converse Consequence Condition and the Special Consequence Condition; to wit, that if observation report E confirms some hypothesis H , then E confirms any hypothesis.¹ We may prove this as follows:

1. Suppose that E confirms H .
2. Let H^* be any hypothesis.
3. $(H \& H^*)$ entails H . (logical truth)
4. E confirms $(H \& H^*)$. (1, 2, 3, CCC)
5. $(H \& H^*)$ entails H^* . (logical truth)
6. E confirms H^* . (4, 5, SCC)

In light of this problem, a defender of the Converse Consequence Condition may opt for a second strategy which consists in rejecting both the Entailment Condition and the Special Consequence Condition and in keeping the Converse Consequence Condition. But to save the latter condition at the cost of both of the former may strike many as too high a price to pay.

A third strategy to save the Converse Consequence Condition would be to impose the restriction that sentences that are confirmed or dis-

1. I owe this point and this proof to an anonymous referee of this journal.

confirmed must be synthetic; accordingly, if E entails H , then E confirms H only if H is neither analytically true or analytically false.² Given this "Syntheticity Restriction," all analytic truths (including tautologies) would not be subject to confirmation (or disconfirmation) and all analytic falsehoods (including contradictions) would not be subject to disconfirmation (or confirmation). The imposition of this restriction would block step 4 in my putative proof by not allowing it to be derived from step 2 and the Entailment Condition.

The idea that only (hypotheses expressed by) synthetic sentences are subject to confirmation is supported by some plausible considerations. The Editor of this journal adduces two.³

One is that logical truths (and analytic truths more generally), having no empirical content, rule nothing out and are never at risk. On this view, an observation of a black raven does not confirm a putative hypothesis such as "All ravens are ravens" because, no matter how the observation turned out, the observation report would still be compatible with this putative hypothesis. A putative hypothesis is subject to confirmation only if it was at prior risk of disconfirmation. Since logical truths (and analytic truths generally) are never at such risk, they are never subject to confirmation.

The Editor also suggests that Bayesians explicitly offer a criterion that was probably implicit in earlier views of confirmation, namely, that a putative hypothesis is confirmed only if its posterior probability is greater than its prior probability. Since the prior probability of any logical truth (or analytic truth generally) is 1, its posterior probability can never be higher than its prior probability, and hence it is not subject to being confirmed.⁴

However plausible may be the grounds for the Syntheticity Restriction, imposing it comes at the cost of repudiating some key aspects of the Hempelian conception of qualitative confirmation. Let me explain.

Hempel conceived of qualitative confirmation as a *logical* relation between two sentences, one describing the given evidence, and the other expressing the hypothesis. He proposed what he called "the Satisfaction Criterion of Confirmation" whose basic idea consists in construing a hypothesis-sentence H as confirmed by a given evidence-sentence E if H is satisfied in the finite class of those objects mentioned in E . He proposed, omitting minor details, that E *directly confirms* H if E

2. This strategy was suggested to me in a letter by the Editor of this journal.

3. In a letter.

4. The Editor adds: "If someone set the credibility of an analytic truth below 1, then that person would already have made a cognitive error. An observation might serve as the occasion for the correction of the error but it wouldn't confirm the analytic truth."

entails the development of H for the class of those objects mentioned in E , and that E confirms H if H is entailed by a class of sentences each of which is directly confirmed by E (1965, 37). The concept of *development* of a hypothesis-sentence may be put informally as follows: the development of hypothesis-sentence H for class C states what H would assert if there existed only those objects belonging to C (1965, 36). Thus, for the class $\{a, b\}$, the development of the disjunctive hypothesis-sentence ' $(x)[P(x) \vee Q(x)]$ ' is ' $[[P(a) \vee Q(a)] \& [P(b) \vee Q(b)]]$ ' and the development of the existential hypothesis-sentence ' $(\exists x)[P(x)]$ ' is ' $[P(a) \vee P(b)]$ '.⁵

Consider now the following two hypothesis-sentences:

$$H_1 (x) [Raven(x) \supset Black(x)]$$

$$H_2 (x) [Raven(x) \supset Raven(x)]$$

The evidence-sentence ' a is a raven and is black' or ' $[Raven(a) \& Black(a)]$ ' directly confirms (and therefore confirms) H_1 because it entails the development of H_1 for the class $\{a\}$. By parity of reasoning, this evidence-sentence also confirms H_2 , because, as with H_1 , it entails the development of H_2 for the class $\{a\}$. More generally, we can regard a logical truth such as H_2 as directly confirmed (and hence confirmed) by any evidence-sentence. H_1 and H_2 differ not in terms of *whether* they are confirmable, but rather in terms of *what* confirms them: H_1 is presumably confirmed by some, but not all, evidence-sentences, whereas H_2 is presumably confirmed by all evidence-sentences.

Consider now the following two hypothesis-sentences:

$$H_3 (\exists x) [Raven(x)]$$

$$H_4 (\exists x) [Raven(x)] \vee \sim(\exists x) [Raven(x)]$$

H_3 and H_4 are both directly confirmed (and hence confirmed) by the evidence-sentence ' a is a raven and is black' because it entails the development of both of them. We may even say that they are *conclusively* confirmed by this evidence-sentence, because they are entailed by it, and entailment, as Hempel pointed out, may be regarded as a special case of confirmation, viz., as *conclusive* confirmation (1965, 30, 34). Just as with H_1 and H_2 , H_3 and H_4 differ not in terms of *whether* they are confirmable, but rather in terms of *what* confirms them: H_3 is confirmed presumably by some, but not all, evidence-sentences, whereas H_4 is confirmed presumably by all evidence-sentences.

Returning now to the Syntheticity Restriction, we can now see that to impose it, whether it be to save the Converse Consequence Condition

5. The development of a hypothesis-sentence containing no quantifiers is the hypothesis-sentence itself, regardless of what the reference class of objects is.

or for some other reason, requires repudiating key aspects of the Hempelian conception of qualitative confirmation. For instance, instead of treating the conditionals H_1 and H_2 as confirmed by 'a is a raven and is black' for the same reason (namely, that it entails the development of both of them for the class $\{a\}$), the Syntheticity Restriction requires us to treat the first, but not the second, as confirmed. Or to give another example, despite the fact that H_3 and H_4 are both entailed by 'a is a raven and is black', the Syntheticity Restriction requires us to treat both entailments asymmetrically: the first entailment results in confirmation, but not the second.

Notice, moreover, that this restriction seems to require abandoning, or at least modifying, a standard of adequacy which Hempel put forth for any proposed definition of qualitative confirmation, viz., that a "proposed definition of confirmation is to be rejected as logically inadequate if it is not constructed in such a way that (8.1) [i.e., the Entailment Condition] is unconditionally satisfied" (1965, 31). For to stipulate that only synthetic sentences can satisfy the Entailment Condition is to lay down a condition for which sentences (namely, synthetic sentences only) can satisfy the Entailment Condition.

In sum, then, the Converse Consequence Condition can be saved from my earlier objection by imposing the Syntheticity Restriction, a restriction which can be motivated on independent grounds. But the imposition of this restriction requires repudiating some key aspects of the Hempelian conception of qualitative confirmation.

4. Conclusion. Though I cannot offer here a full-dress defense of the (Syntheticity Restriction-free) Hempelian conception of qualitative confirmation, let me end by mentioning a couple of its interesting features.

The first is that it offers a way of delineating an analytic/synthetic distinction in terms of qualitative confirmation; we can say, for instance, that an analytic truth is conclusively confirmed, because entailed, by all evidence-sentences, whereas a synthetic truth is confirmed by some, but not all, evidence-sentences. Instead of thinking of analytic truths as not being subject to confirmation because any evidence-sentence or observation report is compatible with them, we can think of them as being the most conclusively confirmed of all truths precisely because any evidence-sentence or observation report is compatible with (in fact, entails) them. Instead of thinking of analytic truths as not being subject to confirmation because their posterior probability cannot be higher than their prior probability, we can think of them as being the most confirmed of all truths precisely because their prior probability = their posterior probability = 1. By contrast, since syn-

thetic hypotheses presumably have a prior probability of less than 1, they are confirmed only when their posterior probability is greater than their prior probability.

A second interesting feature of the (Syntheticity Restriction-free) Hempelian conception of qualitative confirmation is the way it elegantly exploits the analogy between confirmation and logical consequence. For instance, whether sentence S_2 is a logical consequence of S_1 does not depend on whether S_1 is true (or known to be true); analogously, whether the hypothesis-sentence H_1 is confirmed by the evidence-sentence ' a is a raven and is black' does not depend on whether the latter is true (or based on actual experience). Or to give another example, though logical consequence can be conceived of as a semantical relation between sentences, it is also possible, for certain languages, to establish criteria of logical consequence in purely syntactical terms; analogously, though confirmation can be conceived of as a semantical relation between an evidence-sentence and a hypothesis-sentence, it is also possible, for certain languages, to conceive of criteria of confirmation in purely syntactical terms. Carrying the analogy between confirmation and logical consequence one step further, we might naturally expect the following: just as there may be entailment relations between analytic and synthetic sentences, so too there may be confirmation relations between analytic and synthetic sentences (*pace* adherents of the Syntheticity Restriction).

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