Refutation of inclusion logic

Abstract: We evaluate a seminal equation from a proof sketch, which is *not* tautologous. By extension, this means dependence logic, inclusion logic, and independence logic are also *no*t tautologous. Therefore dependence logic, inclusion logic, and independence logic are *non* tautologous fragments of the universal logic VŁ4.

We assume the method and apparatus of Meth8/VŁ4 with `T`autology as the designated proof value, **`F`** as contradiction, `N` as truthity (non-contingency), and `C` as falsity (contingency). The 16-valued truth table is row-major and horizontal, or repeating fragments of 128-tables, sometimes with table counts, for more variables. (See ersatz-systems.com.)

LET ~ Not, ¬ ; + Or, ∨, ∪, ⊔ ; - Not Or; & And, ∧, ∩, ⊓ ,·; \ Not And;
> Imply, greater than, →, ⇒ , ↦, ≻, ⊃, ↠ ;
< Not Imply, less than, ∈, ≺, ⊂, ⊬, ⊭, ↞, ≲ ;
= Equivalent, ≡, :=, ⟺, ↔, ≜, ≈, ≃ ; @ Not Equivalent, ≠;
% possibility, for one or some, ∃, ◊, M; # necessity, for every or all, ∀, □, L;
(z=z) `T` as tautology, ⊤, ordinal 3; (z@z) **`F`** as contradiction, Ø, Null, ⊥ , zero;
(%z>#z) `N` as non-contingency, Δ, ordinal 1;
(%z<#z) `C` as contingency, ∇, ordinal 2;
~(y < x) (x ≤ y), (x ⊆ y); (A=B) (A~B); (B>A) (A⊢B); (B>A) (A⊨B).
Note for clarity, we usually distribute quantifiers onto each designated variable.

From: Yang, F. (2019). Axiomatizing first-order consequences in inclusion logic. arxiv.org/pdf/1904.06227.pdf fan.yang.c@gmail.com

[Edited] In this paper, we axiomatize first-order consequences of inclusion logic. *Inclusion logic* is a variant of *dependence logic*. Another important variant of dependence logic is *independence logic*. Dependence logic and its variants adopt the framework of *team semantics* to characterize dependency notions. Inclusion logic aims to characterize inclusion dependencies by extending first-order logic with *inclusion atoms*, as strings of sequences of variables of the same length. With team semantics inclusion atoms and other formulas are evaluated in a model with respect to *sets* of assignments (called *teams*), in contrast to single assignments as in the usual first-order logic. [I]nclusion logic is expressively equivalent to positive greatest fixed-point logic.

3 Normal form, Theorem 3.1

$\exists x\varphi \lor \psi \equiv \exists x(\varphi \lor \psi)$; (3.1.4.1)

LET p, q, r: φ, ψ, *x*.
((%r&p)+q)=(%r&(p+q)) ; `TTCC TTTT TTCC TTTT` (3.1.4.2)

Eq. 3.1.4.2 is *not* tautologous. By extension, this means dependence logic, inclusion logic, and independence logic are also *no*t tautologous.