How would SBVR support the kind of inference needed for decisions or determinations (e.g., by rules as expressed in decision tables)? This discussion explains the logical underpinning of the appropriate approach. It is based on implications, which are treated differently under claims of necessity for facts vs. claims of obligation for facts. The requisite 'magic' happens under the former.

SBVR Support for Inference
Logical Effects of Claims of Necessity and Obligation on Implications

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A claim of necessity for an implication[1] turns the implication into a logical implication. A claim of obligation, in contrast, does not. The effects of such claims are summarized below. This summary is given in terms of facts. For A → B let A and B be facts where A is the premise and B is the conclusion.

Rule 1: It is necessary that A → B.
This rule can also be expressed as: "It is necessary that B if A".

Rule 2: It is obligatory that A → B.
This rule can also be expressed as: "It is obligatory that B if A".

Logic for Rule 1:

If "A" is a fact, then "B" is also a fact.

If "NOT B" is a fact, then "NOT A" is also a fact.

Logic for Rule 2:

If "A" is a fact and …

- "B" is a fact, then it is also a fact that Rule 2 is not violated.
- "NOT B" is a fact, then it is a fact that Rule 2 is violated.

If "NOT A" is a fact, then it is also a fact that Rule 2 is not violated.

Rule 2 is a behavioral rule. Behavioral rules guide correct behavior. They thereby provide the basis for identifying incorrect behavior, specifically violations.[2]

Identifying violations is not typically the focus of business rules aimed at making business determinations or decisions. Instead, their focus usually centers on assessing what is known about

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[1] In SBVR "implication" and "material implication" are synonyms.

[2] It should be remembered that a violation of a rule is actually a state of affairs. A fact that a violation happens corresponds to an actual violation in the same way that the propositions A and B correspond to respective states of affairs.

some case (situation, set of circumstances, or matter of concern) and whether or not the conclusion can be inferred for the case[3]. This is one reason why decision tables are generally specified on the basis of determination rules, not behavioral rules.

Rule 1 is a special kind of definitional rule called a *determination rule.* Unlike behavioral rules, no definitional rule can be violated. Literally, things *will* be correct according to the meaning of such rules *by definition*.

The specific effects of a claim of necessity vs. obligation for an implication are outlined in the table below, which specifies what happens when it becomes known that A is true and knowledge of B is as indicated.

	B is known to be true	**B is known to be false**	**B is unknown**
necessity	Rule is satisfied.	Contradiction. It is impossible for B to be false when A is true.	B is now known to be true. *(B is inferred.)*
obligation	Rule is satisfied.	Violation is detected.	B remains unknown. (*B is not inferred.)* Unknown whether a violation occurs.

The most significant practical effect of a claim of necessity versus obligation for an implication arises when B is *unknown*. The distinct effects of the respective claims are as follows:

- Determination Rule: When A becomes true, then B also becomes true (by definition) if not already true – i.e., B is inferred. To an external observer, it would appear as if a 'hidden hand' were acting so as to make B true.
- Behavioral Rule: When A becomes true, no 'hidden hand' acts so as to make B true. Unlike for the determination rule, A becoming true does not make B become true. (Whether a violation has occurred is unknown. An example is given later.)

This difference in effect is quite significant for business problems requiring determinations or decisions. In such situations, B is quite likely to be unknown for a particular case because either the case is new or the case is being changed to some new state. Consistency or correctness of the result (conclusion) is the paramount concern.

[3] resulting in a form of inference

Additional effects of a claim of necessity vs. obligation for an implication are outlined in the table below, which specifies what happens when it becomes known that B is *false* and knowledge of A is as indicated.

	A is known to be true	**A is known to be false**	**A is unknown**
necessity	Contradiction. It is impossible for A to be true when B is false.	Rule is satisfied.	A is now known to be false. *(Not A is inferred.*[4]*)*
obligation	Violation is detected.	Rule is satisfied.	A remains unknown. *(Not A is not inferred.)* Unknown whether a violation occurs.

As the table indicates, a difference in effect occurs if A is unknown, and B becomes *false*. For a determination rule in that circumstance, A will become *false* – i.e., not A is inferred. To an external observer, it would appear as if a 'hidden hand' were acting so as to make A false.

Notes

1. SBVR supports an open-world assumption, which allows A and B to be unknown.

2. A claim of necessity or obligation for a bidirectional implication can be treated as two implications.

3. Under a claim of obligation it is unknown whether a violation occurs in the circumstances that A is true and B is unknown. The following example illustrates.

   It is obligatory that a branch office is closed between the hours of 1AM and 5AM.

   This rule is based on the implication:

   A (time is between 1AM and 5AM) → B (branch office is closed)

   Suppose that:

   - The current time is 3AM.
   - It is unknown whether branch office 1234 is closed.

   In these circumstances, whether a violation has occurred for branch office 1234 is *unknown*.

4. Under a claim of obligation, no inferring of B (or of not A) ever occurs even if the rule's enforcement level is 'strictly enforced'. A behavioral rule is always about behavior, never about

[4] resulting in a form of inference

knowledge. For example, any behavior resulting in A being known to be true, and B being known to be false, would simply be prevented. No ‘correction’ of the behavior’s result occurs.

5. The two tables above cover these combinations:
   - A known, B known (in both tables)
   - A known, B unknown
   - A unknown, B known

   The tables do not cover the combination A unknown, B unknown. Nothing can be said about that combination because literally nothing is known.