

# Hedging Your Ifs and Vice Versa

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# Ramsey's Test

“If two people are arguing ‘If  $p$  will  $q$ ?’ and are both in doubt as to  $p$ , they are adding  $p$  hypothetically to their stock of knowledge and arguing on that basis about  $q$ .”

# Our Starting Point

Simple conditionals are epistemic conditionals.

(1) If he didn't tell Harry, he told Tom.

Makes a claim about the state of the evidence available.

# Implementations

1. conditionals have epistemic semantics
2. conditionals have bare bones semantics + epistemic pragmatics
  - ▶ material conditional + assertibility conditions
  - ▶ NTV + ?

# One Challenge

Tug of war between subjectivity and objectivity (cf. Gibbard's Riverboat Puzzle)

Solution based on our "Might Made Right" being developed in our "The Subjectivity of Conditionals in a New Light"

# Edgington's Stress Test

“Any theory of conditionals has consequences for less-than-certain judgements. Something is proposed of the form: If A, B is true iff  $A*B$ . If a clear-headed person, free from confusions of a logical, linguistic or referential sort, can be nearly sure that  $A*B$  yet far from sure that if A, B, or vice versa, then this is strong evidence against the proposal.” (Edgington 1995/2007)

# A Plethora of Hedges

- ▶ It's  $X$ -probable that if  $p$ ,  $q$
- ▶ It's likely that if  $p$ ,  $q$
- ▶ I guess/suppose that if  $p$ ,  $q$
- ▶ It's plausible that if  $p$ ,  $q$
- ▶ It might be that if  $p$ ,  $q$
- ▶ I'm not sure that if  $p$ ,  $q$
- ▶ I doubt that if  $p$ ,  $q$

Do these hedged conditionals have the meanings predicted by the epistemic account?

# Expectation

Simple conditional: if  $p$ ,  $q$

Hedged conditional: HEDGE (if  $p$ ,  $q$ )

Meaning of simple conditional should be what it contributes to the meaning of the hedged conditional.



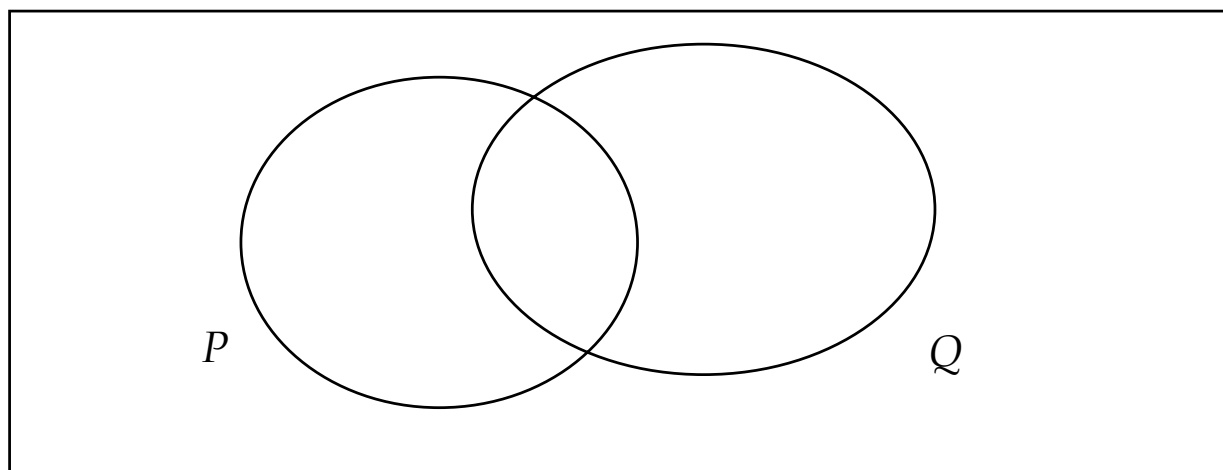
# The Compelling Intuition

Hedged conditionals express conditional hedges

- (2)    a.    HEDGE(if p, q) =  
      b.    HEDGE<sub>p</sub>(q)

Special Case: probability of a conditional = conditional probability.

# Jackson on the Compelling Intuition



“I ask you the following question, If you throw a dart at the board, how likely is it to land in the area marked  $Q$  if it lands in the area marked  $P$ ? It is **compelling** that the answer to this question is nothing other than how likely the dart is to land in the intersection of  $P$  and  $Q$  given it lands in  $P$ , which equals the probability of its landing in the intersection of  $P$  and  $Q$  as a fraction of the probability of its landing in  $P$ .” (Jackson “Indicative Conditionals Revisited”, March 27, 2006)

# Compelling Across the Board

- (3)
  - a. Maybe if he didn't tell Harry, he told Tom. =
  - b. Maybe he told Tom (given he didn't tell Harry).
  
- (4)
  - a. Presumably if it's raining, it's cold. =
  - b. Presumably it's cold (given it's raining).

# The Trouble(s) with the Compelling Intuition

(Under plausible assumptions) it seems there is no (good) way to give truth-conditions to if p, q such that hedging of those truth-conditions being satisfied = hedging-within-p that q.

## For Instance: Probably

Lewis and successors:

- ▶ There is no (sane) way to give truth-conditions to if p, q such that the probability of those truth-conditions being satisfied = the conditional probability of q given p.

Jackson 2006:

- ▶ There are no such-and-such conditions associated with if p, q (not its assertibility conditions, not its acceptability conditions, nothing) such that the probability of those such-and-such conditions being satisfied = the conditional probability of q given p.

# Jackson's Despair

Jackson 2006: The Compelling Intuition is a mistake. The probability of a conditional is not the conditional probability.

“Our usage of the indicative conditional construction is governed by a mistaken intuition [...]. We [...] wrongly think and speak as if the indicative conditional in fact has truth conditions such that its probability is the conditional probability of its consequent given its antecedent.”

Simple conditionals have no meaning that could be embedded.

So, what happens when it looks as if they're embedded? . . .

# A Special Reading

Can a hedged conditional ever be interpreted in the predicted complex-nested fashion?

- (5) It is almost certainly false that if the die comes up even, it will be a six – since it almost certainly is a fair die.



# The Lewis-Kratzer Way Out

When we ask

- (6) What is the probability that  $q$ , if  $p$ ?
- (7) How likely is it that  $q$ , if  $p$ ?

we are not asking what the probability of an indicative / epistemic conditional is.

Instead, the if-clause restricts the probability operator.

What does a restricted probability operator express? Conditional probability.

# Lewis

“The if of our restrictive if-clauses should not be regarded as a sentential connective. It has no meaning apart from the adverb it restricts. The if in *always if* . . . , . . . , *sometimes if* . . . , . . . , and the rest is on a par with the non-connective and in *between . . . and* . . . , with the non-connective or in *whether . . . or* . . . , or **with the non-connective if in *the probability that . . . if* . . . .** It serves merely to mark an argument-place in a polyadic construction.”

# Lewis on Adverbs of Quantification

- (8) This dog almost always/usually/sometimes/never bites if he is approached.

# Kratzer's Thesis

Lewis wasn't just right about adverbial quantification. His analysis is right about other occurrences of if.

“The history of the conditional is the story of a syntactic mistake. There is no two-place if ... then connective in the logical forms of natural languages. If-clauses are devices for restricting the domains of various operators.” (Kratzer “Conditionals”, 1986)

In other words: there are no conditionals, just constructions involving an if-clause and an operator that the if-clause restricts.

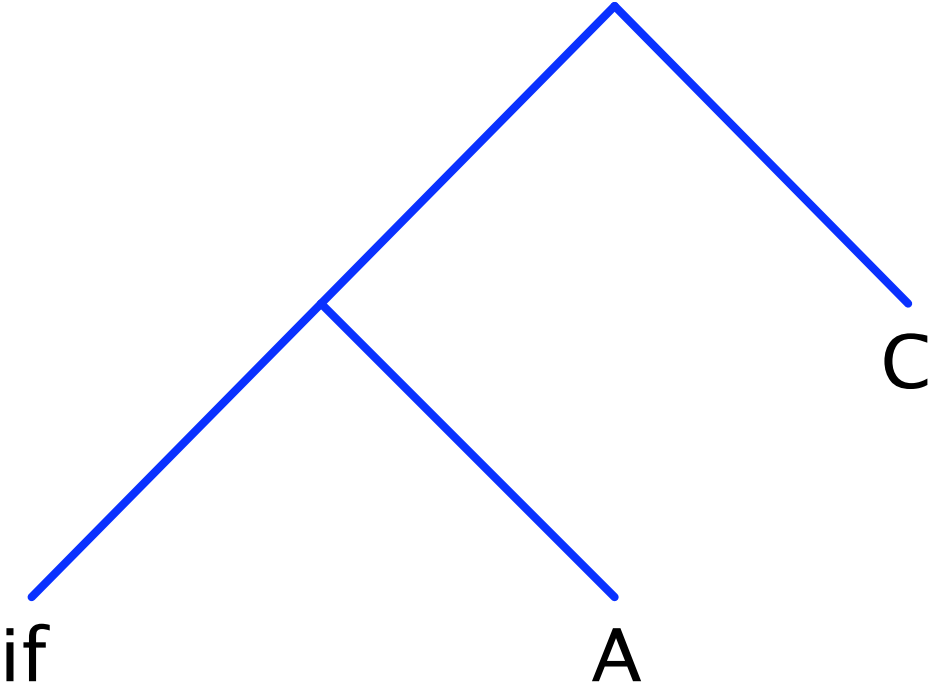
# Tripartite Structures

Heim's dissertation:

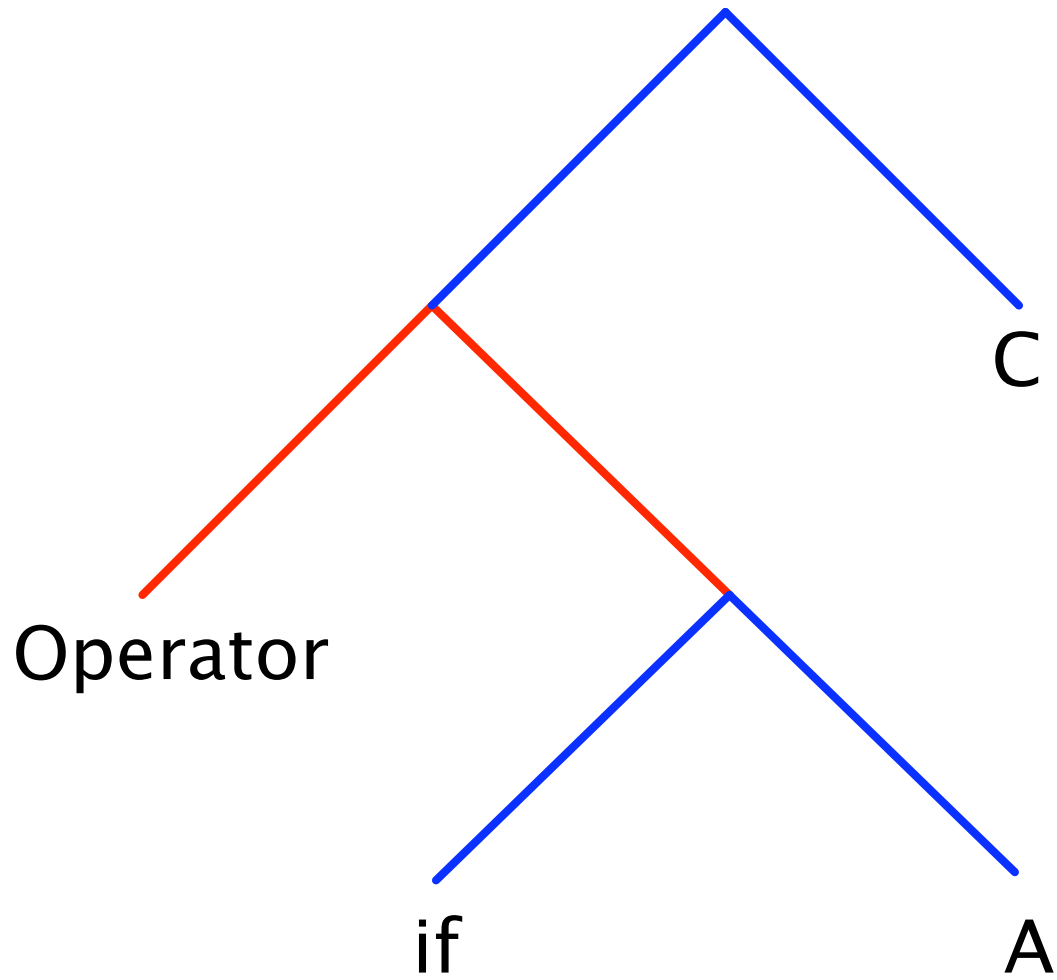
## **Quantifier/Operator [Restriction] [(Nuclear) Scope]**

Heim achieved a solution to the problem of donkey anaphora, which ensured that the Lewis/Kratzer/Heim view of the partition of “conditionals” into Operator + if-clause + consequent became the received view in linguistic semantics.

# Before Lewis, Kratzer, Heim



# After Lewis, Kratzer, Heim



# Bare Conditionals

(9) If this dog is approached, he bites.

(10) If John was here on time, he left Cambridge at noon.

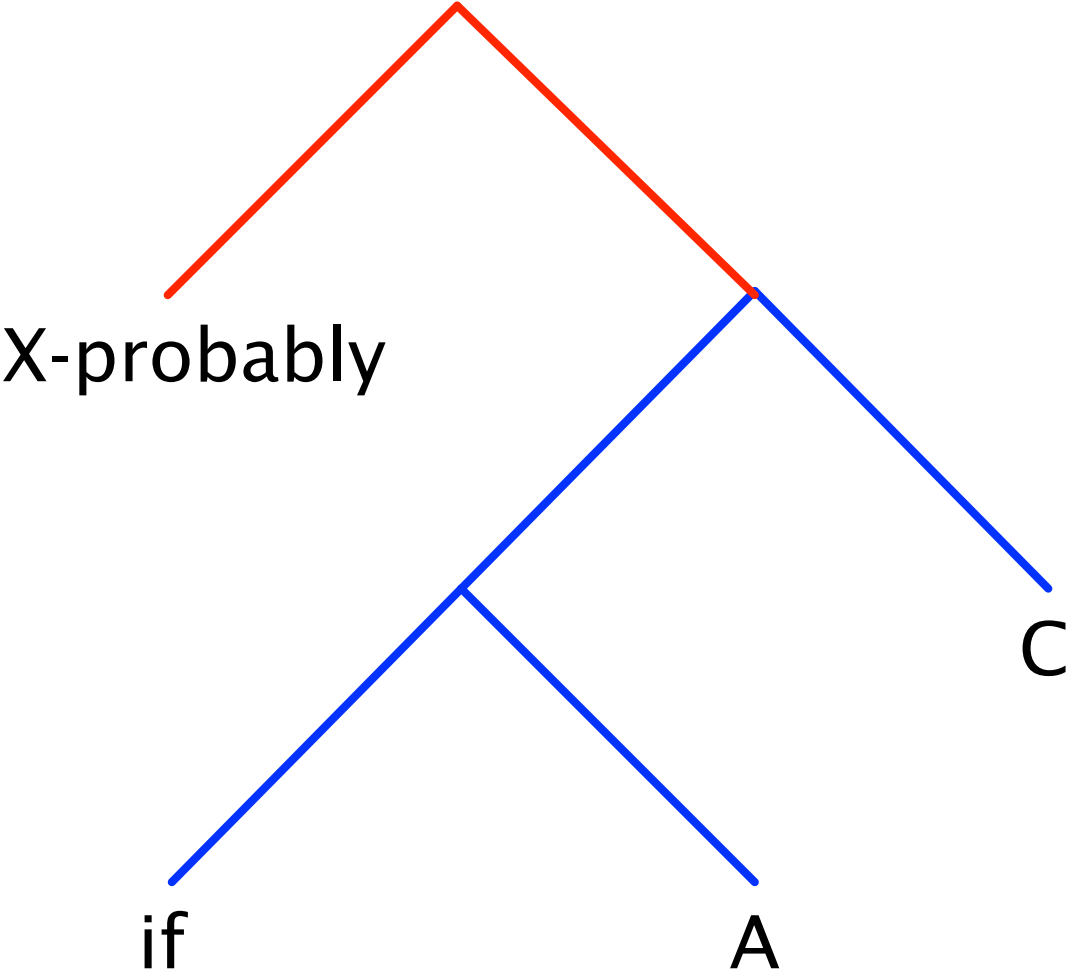
Kratzer:

- ▶ covert operator restricted by if-clause
- ▶ covert frequency adverb in (9) ( $\approx$  “always”)
- ▶ covert epistemic necessity modal in (10) ( $\approx$  “must”)

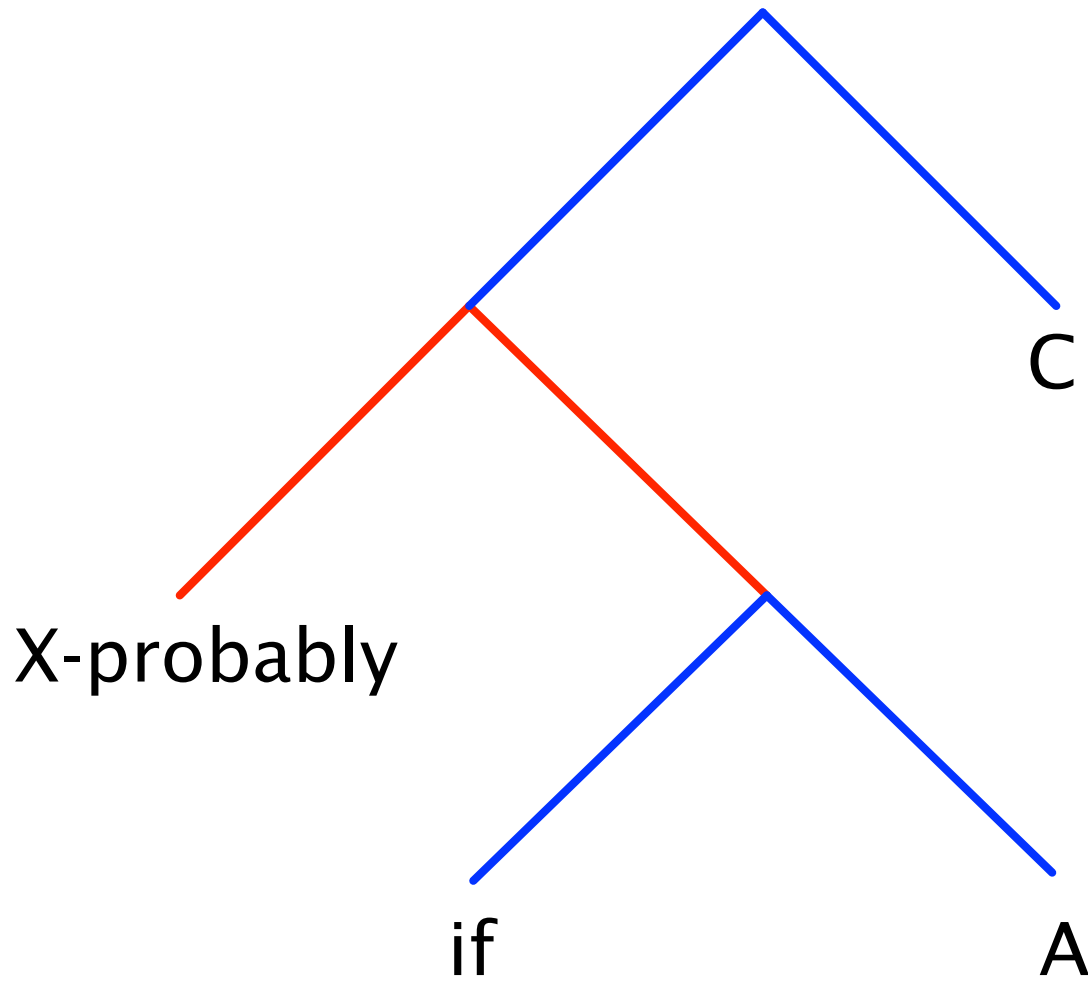


# Back to our Problem(s)

Instead of



we are actually dealing with



# The restrictor view of the embedding problem

Simple conditional:  $\Box$ -if p, q

Hedged conditional: HEDGE-if p, q

Shared surface string "if p q", but no shared logical constituent!

## Similar Cases

A surface string can receive one parse when occurring on its own and a very different one when occurring embedded:

- (11)
  - a. A randomly tossed coin comes up heads.
  - b. The probability that a randomly tossed coin comes up heads is fifty-fifty.
- (12)
  - a. ?On a given day, the Red Sox win.
  - b. The probability that on a given day the Red Sox win is about 60%.
- (13)
  - a. This dog bites if he is approached.
  - b. This dog quite often bites if he is approached.
  - c. It almost never happens that this dog bites if he is approached.

# Why This Interpretation?

There are three reasons why structures where a conditional apparently occurs under a probability expression are (almost) always parsed not as involving an embedded conditional with a covert operator but as having the if-clause restrict the probability operator:

- ▶ positing covert operator is a last resort strategy
- ▶ the probability operator would like to be restricted
- ▶ epistemic modals resist embedding under probability operators

# Resisting Embedding

- (14)
- a. If she threw an even number, it must have been a six.
  - b. ?The probability that if she threw an even number it must have been a six is . . . .

# Objection

If the following two structures do not share a constituent corresponding to the “conditional”, then how come they are felt to be talking about the same thing?

- (15)
- a. If she is not in her office, she must be at home.
  - b. Actually, it is not very likely that she is at home if she is not in her office.

# Reply

Because they both talk about possible scenarios in which she is not in her office. Compare:

- (16)
- a. All students smokes.
  - b. Actually, MOST students smoke.
- 
- ▶ shared surface string ("students smoke")
  - ▶ no shared logical constituent
  - ▶ but shared subject matter (proportion of students who smoke)



# The Cross-Speaker Problem

- (17) A: If he didn't tell Harry, he told Tom.  
B: Probably so.  
B': That's very unlikely.

We don't just have an intuition that there is a shared logical constituent (if p, q), but we actually use anaphors like so and that to pick it up.

# What now?

- ▶ Despair

# What now?

- ▶ Copy & reparse

Copy the **string** "if p,q" into the slot held by the anaphor  
then reparse the second sentence

# What now?

- ▶ Divide & conquer
- ▶ Belnap
- ▶ Higher type

# Divide & Conquer

- (18) A: Every student smokes.  
B: Most (of them) (do).
- (19) A: If he didn't tell Harry, he told Tom.  
B: Probably so.  
B': That's very unlikely.

## Something to worry about

- (20) A: If he didn't tell Harry, he told Tom.  
B: I'm not sure that's true.  
A: No, really. I know he told one of them.
- (21) A: If he didn't tell Harry, he told Tom.  
B: I'm not sure (it's true that) he told Tom.  
A: Me either./??No, really. I know he told one of them.

## Something to worry about

- (22) A: If he didn't tell Harry, he told Tom.  
B: That may be true./That's plausible./I guess that's true.  
A: No, really. I know he told one of them.
- (23) A: If he didn't tell Harry, he told Tom.  
B: Maybe (it's true that) he told Tom./It's plausible that he told Tom./I guess it's true he told Tom.  
A: ??No, really. I know he told one of them.
- (24) A: If he didn't tell Harry, he told Tom.  
B<sub>1</sub>: I doubt that's true.  
B<sub>2</sub>: I doubt (it's true that) he told Tom.

# Belnap's Alternative

Belnap's meaning for conditionals: if p, q is true if p and q are true, false if p is true but q is false, and has no truth-value if p is false.

Embedding operators are restricted to quantify over worlds where the embedded proposition has a truth-value.



# Escape?

If he didn't tell Harry, he told Tom.

must (if he didn't tell Harry, he told Tom)

Probably so.

probably (if he didn't tell Harry, he told Tom)

# The Belnapian's To Do List

- ▶ Can Belnap's conditional stand on its own, or does it always require an operator to embed it? (If yes, then we would mimic the restrictor analysis very closely.)
- ▶ Partial propositions of the kind that the Belnap-conditional expresses are usually used to model presuppositions. But here, we absolutely do not want to say that if  $p$ ,  $q$  presupposes that  $p$  is true. So, we need a new technical system that distinguishes presuppositions from Belnap-partiality.

## Going to high types

Re-Schönfinkel (or re-Curry) the meaning of if

if:  $\lambda p.\lambda q.\lambda O. O_p q$

# All together now

- ▶ Despair
- ▶ Copy + Reparse
- ▶ Divide & Conquer
- ▶ Belnap
- ▶ Retyping if

What now?