Actuality Entailments, Negation, and Free Choice Inferences

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This talk is about Actuality Entailments (AEs) and their interaction with negation and Free Choice (FC). We present (i) a semantic account of the negative cases of AE within Homer's (2011) aspect-shift analysis, (ii) a critique of Hacquard's (2009) account of the negation data, and (iii) an illustration of how our proposal correctly predicts the absence of FC in AE constructions.

Background: AEs. AEs are inferences from perfective-marked modal premises to conclusions about *actual* states of affairs. Examples (1) and (2) illustrate AEs in Brazilian Portuguese (BP) — similar findings are reported for French, Hindi, Greek, among other languages (Hacquard 2014).

(1) a. Ele podia visitar seu amigo, mas ele não o visitou (IMP-$\Diamond p \not\models p$)
He **can-IMP** visit his friend, but he NEG him visit.PFV
'He was allowed to visit his friend, but he didn't'

b. Ele pôde visitar seu amigo, #mas ele não o visitou (PFV-$\Diamond p \models p$)
He **can-PFV** visit his friend, but he NEG him visit.PFV

In (1a) the (imperfective) modal claim is consistent with the lack of actuality, as one generally expects of an existential modal. By contrast, the PFV-analog in (1b) is inconsistent, indicating that the PFV-modal implies actuality. We find the same pattern for certain universal modals also:

(2) a. Ele tinha que ir no dentista, mas ele não foi (IMP-$\Box p \not\models p$)
He **have.to-IMP** go to-the dentist, but he NEG go.PFV
'He had to go to the dentist but he didn't'

b. Ele teve que ir no dentista, #mas ele não foi (PFV-$\Box p \models p$)
He **have.to-PFV** go to-the dentist, but he NEG go.PFV

Like (1a), the behavior in (2a) is expected: since deontic modality is non-realistic, necessity (obligation) need not imply actuality. Yet PFV-marking on the same modal (in (2b)) implies actuality.

Two theories. We focus on Hacquard's and Homer's accounts of AEs. Hacquard assumes that root modals appear below aspect heads. The PFV head introduces an event variable e in the evaluation world whose description is provided by the complement VP. In e.g. (1b), e is assigned a *modal* description, as an eventuality of *permissibly* visiting one's friend (or of obligatorily going to the dentist, in (2b)). To derive AEs, Hacquard adds the PED:

(3) Preservation of Event Descriptions (PED): For all worlds w_1, w_2, if e occurs in w_1 and in w_2, and e is a P-event in w_1, then *ceteris paribus*, e is a P-event in w_2 as well.

If the PED is assumed, the description of e in the relevant possible world(s) holds also in the actual world, and e (in 1b) becomes an event of *actually* visiting one's friend. The same applies to (2b).

To explain why IMP blocks AEs (1/2a), Hacquard utilizes the *genericity* of IMP: IMP introduces an event argument e in a non-actual/generic world. Since e does not exist in the actual world, its description as an eventuality of permissibly-visiting does not become actual (similarly for (2a)).

Homer argues that AEs result from aspect-shift: modals are stative, and stative predicates are atelic. PFV (unlike IMP) requires telic predicates. When PFV co-occurs with a (stative) modal, the combination triggers a 'shifted' reinterpretation, made possible by an operator ACT. ACT by default supplies a telic predicate which is coindexed with the embedded VP. The resulting semantics conjoins the modal description together with ACT's default argument, producing the AE:

(4) a. *[PFV [can/have-to VP]] b. ✓[PFV [ACT [can/have-to VP]]]

(5) $[\![\text{ACT-VP}_i\ [\Diamond\ \text{VP}_i]]\!]^{w,t} = [\lambda e_v . \underline{[\![\text{VP}_i]\!]^w(e)}\ \&\ \exists e'(\tau(e)\subseteq\tau(e')\ \&\ \underline{[\![\Diamond\ \text{VP}_i]\!]^w(e')})]$

Data 1: Negation. When sentences like (1/2b) are negated, as in (6/7b), both the modal *and* the AE are understood to be false, in contrast to the IMP cases. (Inference to $\neg\Diamond/\neg\Box$ not shown):

(6) a. Ele não podia visitar seu amigo, mas ele o visitou ($\neg$IMP-$\Diamond p \not\vDash \neg p$)
He **NEG can-IMP** visit his friend, but he him visited
'He wasn't allowed to visit his friend, but he did'

b. Ele não pôde visitar seu amigo, #mas ele o visitou ($\neg$PFV-$\Diamond p \vDash \neg p$)
He **NEG can-PFV** visit his friend, but he him visited

(7) a. Ele não tinha que ir no dentista, mas ele foi ($\neg$IMP-$\Box p \not\vDash \neg p$)
He **NEG have.to-IMP** go to-the dentist, but he go.PFV
'He didn't have to go to the dentist but he did'

b. Ele não teve que ir no dentista, #mas ele foi ($\neg$PFV-$\Box p \vDash \neg p$)
He **NEG have.to-PFV** go to-the dentist, but he go.PFV

Data 2: Free Choice. Another robust property of AE-constructions is that they block FC inferences. If an existential (root) modal takes a disjunctive prejacent, the sentence implies FC when the modal is IMP-marked, not when it is PFV-marked. PFV-marking forces ignorance readings.

(8) Ele podia comer bolo ou torta. Então ele podia comer bolo e podia comer torta
he **can.IMP** eat cake or pie. So he **can.IMP** eat cake and **can.IMP** eat pie
"he could eat cake or pie. Therefore he could eat cake, and he could eat pie"

(9) Ele pôde comer bolo ou torta. #Então ele podia comer bolo e podia comer torta
He **can.PFV** eat cake or pie. So he **can.IMP** eat cake and **can.IMP** eat pie

The puzzle in (9) is that it cannot imply FC while asserting that only one disjunct took place.

Discussion. (6/7b) present challenges to both Hacquard and Homer. If negation outscopes PFV in e.g. (7b), Hacquard's semantics will negate the existence of an event with the modal description ($\neg\exists e(\Box p(e))$). But this will (incorrectly) be compatible with the truth of the *obligation*; if we have a non-realistic (e.g. deontic) modal base, the predicted (negated) truth conditions $\neg\exists e(\Box(p(e)))$ will be compatible with $\Box(\exists e(p(e)))$, but the second condition makes the obligation *true*, contrary to intuition. Another problem is that the "anti-AE" inference, shown in (6/7b), is not predicted under Hacquard's view, for there can be an actual friend-visiting/dentist-going event ($\exists e(p(e))$) even if there are no events that are permissibly friend-visiting/necessarily dentist-going events. In other words, the desired anti-AE ($\neg\exists e(p(e))$) does not follow from the predicted truth conditions $\neg\exists e(\Diamond(p(e)))$—for (6b)—or $\neg\exists e(\Box(p(e)))$—for (7b)—when the modal base is deontic.

On Homer's account, the trouble comes from the conjunctive semantics of ACT: if PFV-marked modals are understood to *conjoin* the modal and the actuality, then negating a PFV-marked modal should hold whenever *one* of the modal/actuality is false, and in cases where modality is deontic, negating one will not guarantee the negation of the other, falling short of capturing the facts.

We therefore propose a(n admittedly stipulative) rewrite of Homer's ACT that generates the desired results. We show that this revision accounts for both the negation data and the FC facts, the latter following straightforwardly on analyses of FC within the Kratzer and Shimoyama (2002) tradition. We illustrate this using Fox's (2007) implementation. Our revision of ACT is in (10/11).

(10) $[\![\text{ACT-VP}_i\ [\Diamond\ \text{VP}_i]]\!]^{w,t} = [\lambda e_v : \underline{[\![\text{VP}_i]\!]^w(e) \leftrightarrow \exists e'(\tau(e)\subseteq\tau(e')\ \&\ [\![\Diamond\ \text{VP}_i]\!]^w(e'))} . [\![\text{VP}_i]\!]^w(e)]$

(11) $[\![\text{ACT}]\!]^{w,t} = [\lambda P_{\langle v,t\rangle} . \lambda Q_{\langle v,t\rangle} . \lambda e_v : \underline{P(e) \leftrightarrow \exists e'(\tau(e)\subseteq\tau(e')\ \&\ Q(e'))} . P(e)]$

(10) is defined for an eventuality e only if its membership in the embedded VP description guarantees, and is guaranteed by, the existence of an extended eventuality that satisfies the modal description. For example, $[\![$ACT-visit John $[\Diamond/\Box$ [visit John]]$]\!]$ is defined at t in w for an event e provided that: e is a John-visiting event iff e falls within a permission/obligation eventuality of

visiting John. If e is a John-visiting event then e must be surrounded by permission/obligation to visit John (without negation we derive the AE). If e is not a John-visiting event, then there is no permission/obligation surrounding e within the salient temporal window (in the presence of negation we derive the anti-AE). Abstracting over these details we now have the desired results:

(12) a. $\text{PFV-}\Diamond p \vDash p$ b. $\neg\text{PFV-}\Diamond p \vDash \neg p$.

Application to FC. On Fox's account of FC an exhaustivity operator O applies recursively to existential modal constructions of the form $\Diamond(p \vee q)$. The mechanism delivers the inferences $\Diamond p$, $\Diamond q$, $\neg\Diamond(p \wedge q)$, from a doubly-exhaustified parse of $\Diamond(p \vee q)$, i.e. from $O(O\Diamond(p \vee q))$. Details aside (see below), we note crucially that $\Diamond p, \Diamond q$ (which make up the FC inference) are jointly consistent with the exclusive inference $\neg\Diamond(p \wedge q)$. In Fox's system this consistency is necessary for deriving FC, and it contrasts with the case of unembedded disjunctions, where double-exhaustification correctly disallows the parallel FC-like derivation of p, q: in such cases the inferences p, q are jointly *in*consistent with the exclusive inference $\neg(p \wedge q)$, which is why no FC-like inference is available for $(p \vee q)$. On the proposed treatment of (anti-)AEs, we correctly predict that PFV-marked cases like (9) behave just like unembedded disjunctions, i.e. we predict that they fail to give rise to FC. This is because the alternatives $\text{PFV-}\Diamond p$ and $\text{PFV-}\Diamond q$—which are the only possible sources for FC—jointly entail $(p \wedge q)$, but in doing so they are inconsistent with the exclusive inference $\neg\text{PFV-}\Diamond(p \wedge q)$, since this inference entails $\neg(p \wedge q)$ according to (12b). As shown in detail below, the results in (12) render the key alternatives for FC non-excludable, thus obviating FC.

Technical details: O is assumed to have similar semantics to *only*. It asserts its complement and negates the alternatives to that complement (we show O's set of alternatives in a subscript, e.g. O_A). The alternatives for a given sentence S result from replacing S's scalar items with their own alternatives. For disjunction the alternatives include the individual disjuncts and their conjunction. This gives us the alternatives in (13) for $\Diamond(p \vee q)$, (14) for $(p \vee q)$, and (15) for $\text{PFV-}\Diamond(p \vee q)$.

(13) $\text{ALT}(\Diamond(p \vee q)) = \{\Diamond p, \Diamond q, \Diamond(p \wedge q)\} \underline{= A_1}$ (14) $\text{ALT}(p \vee q) = \{p, q, (p \wedge q)\} \underline{= B_1}$

(15) $\text{ALT}(\text{PFV-}\Diamond(p \vee q)) = \{\text{PFV-}\Diamond p, \text{PFV-}\Diamond q, \text{PFV-}\Diamond(p \wedge q)\} \underline{= C_1}$

If S includes an occurrence of O, e.g. $O_{A_1}\Diamond(p \vee q)$ or $O_{B_1}(p \vee q)$, we get the sets in (16/17/18).

(16) $\text{ALT}(O_{A_1}\Diamond(p \vee q)) = \{O_{A_1}\Diamond p,\ O_{A_1}\Diamond q,\ O_{A_1}\Diamond(p \wedge q)\} \underline{= A_2}$

(17) $\text{ALT}(O_{B_1}(p \vee q)) = \{O_{B_1}p,\ O_{B_1}q,\ O_{B_1}(p \wedge q)\} \underline{= B_2}$

(18) $\text{ALT}(O_{C_1}\text{PFV-}\Diamond(p \vee q)) = \{O_{C_1}\text{PFV-}\Diamond p,\ O_{C_1}\text{PFV-}\Diamond q,\ O_{C_1}\text{PFV-}\Diamond(p \wedge q)\} \underline{= C_2}$

With the definition of O in (19)—from Fox—the FC is derived only for the non-PFV modal:

(19) $\underline{O_A(S)} = S \ \&\ \neg\bigvee \text{IE}(A)(S)$;
$\underline{\text{IE}(A)(S)} = \bigcap\{C : C \subseteq A \ \&\ \neg\bigvee C \nvDash \neg S \ \&\ \neg\exists C'(C' \subseteq A \ \&\ C \subset C' \ \&\ \neg\bigvee C' \nvDash \neg S)\}$

(20) $\underline{\text{IE}(A_1)(\Diamond(p \vee q))} = \{\Diamond(p \wedge q)\}$; $\underline{\text{IE}(A_2)(O_{A_1}\Diamond(p \vee q))} = A_2$ (Details not shown)
$\underline{\text{IE}(B_1)(p \vee q)} = \{(p \wedge q)\}$; $\underline{\text{IE}(B_2)(O_{B_1}(p \vee q))} = \emptyset$ (Details not shown)
$\underline{\text{IE}(C_1)(\text{PFV-}\Diamond(p \vee q))} = \{\text{PFV-}\Diamond(p \wedge q)\}$; $\underline{\text{IE}(C_2)(O_{C_1}\text{PFV-}\Diamond(p \vee q))} = \emptyset$ (Details not shown)

(21) $O_{A_2}O_{A_1}\Diamond(p \vee q) = O_{A_1}\Diamond(p \vee q) \& \neg\bigvee A_2 = \Diamond(p \vee q)\ \&\ \neg\Diamond(p \wedge q)\ \&\ (\Diamond p \leftrightarrow \Diamond q)$ (✓FC)
$O_{B_2}O_{B_1}(p \vee q) = O_{B_1}(p \vee q) \& \neg\bigvee\emptyset = (p \vee q)\ \&\ \neg(p \wedge q)$ (*FC)
$O_{C_2}O_{C_1}\text{PFV-}\Diamond(p \vee q) = O_{C_1}\text{PFV-}\Diamond(p \vee q) \& \neg\bigvee\emptyset = \text{PFV-}\Diamond(p \vee q)\ \&\ \neg\text{PFV-}\Diamond(p \wedge q)$ (*FC)

The lack of IE-alternatives in the last two cases correctly blocks FC. This result is novel for PFV-marked modals, and in this work it depended on the proposed (semantic) treatment of anti-AEs.

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