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Defaulting on Reasons

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In this paper I contrast two analyses of reasons: John Horty's (2012) account of reasons as defaults, which takes reasons as basic and defines categorical and conditional *oughts* in terms of them, and a theory I shall call ABM, based on work done by Asher, Bonevac, and Morreau on defeasible deontic logic (Asher and Morreau 1991, 1995, Asher and Bonevac 1996, 1997, Morreau 1997a, 1997b, and Bonevac 1998), which starts with *ought* and develops an account of reasons. Horty's account rests on what David Makinson (2005) calls a pivotal-rule approach, obtaining additional, defeasible conclusions by exploiting rules; ABM, on a pivotal-valuation approach, obtaining additional, defeasible conclusions by restricting valuations. I argue that ABM solves several problems that plague Horty's account. Some advantages of ABM stem from its *oughts*-first character; more stem from its semantic approach to defeasibility. But that approach also has disadvantages. I close by presenting criteria for an adequate logic of reasons and reasons to think that no single theory might be able to satisfy all of them. As Makinson (2005, 14) argues with respect to defeasibility in general, it may be a mistake to expect to discover *the* theory of reasons.

1. Practical Defeasibility

Both the Horty and ABM accounts exemplify a *kind* of account has been implicit in the literature on the application of nonmonotonic logic to practical reasoning for some time. (See, for example, the papers collected in Nute 1997.) A reason is "a consideration that counts in favor" of something (Scanlon 1998, following Raz 1990); a *pro tanto* reason is one that can be defeated (Kagan 1989, 47; Alvarez 2016, 12). If we interpret counting in favor as functioning as a premise in practical reasoning, and treat that reasoning as defeasible or nonmonotonic, we get a picture of reasons as practical defaults. There are thus two theses underlying such theories:

- As Kieran Setiya puts the first, "A reason for action is a premise of practical reasoning" (2014, 221) or, setting questions about the metaphysical nature of reasons aside (see, e.g., Alvarez 2010, 2016, Hyman 2015), is at least *specified* by a premise of practical reasoning. Reasons (or reason-statements) function as practical premises.
- Practical reasoning is typically defeasible or nonmonotonic, an instance of commonsense reasoning in which the addition of a premise can lead us to retract a conclusion.

Reasons, on this kind of view, are (specified by) premises in defeasible practical arguments.

The direction of explanation within this general kind of account can vary. Should we begin with the concept of a reason as a practical premise, and then understand practical reasoning as reasoning using such premises? Or should we begin with a conception of practical reasoning, and then understand reasons as premises that give such reasoning its practical character?

This paper gives reasons for preferring the latter strategy. Horty's reasons-first analysis encounters a number of problems, most of which stem from his particular choice of logic for defeasible reasoning but some of which stem from starting from the idea of a reason itself.

The theories I examine here start with the thought that practical reasoning is typically defeasible. Classical logic is *monotonic* in the sense that adding premises never turns a deductively valid argument into an invalid one; if $X \models B$ then $X \cup Y \models B$. But there is reason to think that much practical reasoning is nonmonotonic. Adding premises sometimes leads us to withdraw conclusions that we would have drawn from more limited information.

(1) a. Jim promised to attend the conference.
    b. If Jim promised to attend, he should (other things being equal).
    c. So, Jim should attend the conference.

That's a reasonable inference. But additional information could undermine its conclusion, leading Jim to conclude, reasonably, that he should not attend the conference, his promise notwithstanding.

We can refer to inferences of the form above as *Defeasible Modus Ponens* inferences. Instances of modus ponens, whether deontic or non-deontic, should be viewed as defeasibly but not deductively valid. The addition of a premise can lead us to retract a conclusion. The classic AI case, (2), has (1) as an obvious deontic analogue.

(2) a. Tweety is a bird.
    b. If Tweety is a bird, (generally) Tweety can fly.
    c. $\therefore$ Tweety can fly.

These arguments are defeasibly but not deductively valid. Tweety might be a penguin; a storm might make it inadvisable for Jim to go.

2. Horty's Analysis

Horty builds his analysis of reasons on Ray Reiter's (1980) default logic, the best known consistency-based theory of nonmonotonic reasoning. It formalizes defaults as having the form of a rule:

$$\frac{A : B_1, \ldots, B_n}{C}$$

We can read this as: From A, if it is consistent to assume $B_1, \ldots, B_n$, then infer C. A is the default's *prerequisite* or *premise*; each B_i is a *consistency condition*; and C is the default's *consequent* or *conclusion*. The default says that if A is provable in the relevant context and each B_i is consistent (that is, its negation is not provable in that context), then infer C.[1] For example, for our Tweety inference, we might have the default

$$\frac{Bt : Ft}{Ft}$$

which tells us to infer, from the information that Tweety is a bird, that Tweety can fly, unless we possess information to the contrary.

Note that, in this example, the consistency condition and consequent are the same. That defines a *normal* default rule. Horty restricts himself to normal default rules, and writes them more efficiently with an arrow, as, e.g., $Bt \rightarrow Ft$. Hereafter I assume all defaults to be normal.

If δ is the default $A \rightarrow B$, then $Premise(\delta) = A$ and $Conclusion(\delta) = B$. If S is a set of defaults, then $Premise(S) = \{Premise(\delta) : \delta \in S\}$ is the set of premises of defaults in S, and $Conclusion(S) = \{Conclusion(\delta) : \delta \in S\}$ is the set of conclusions of those defaults.

Horty assigns priorities to defaults; some take precedence over others. If δ and δ', etc., are defaults, we can write $\delta < \delta'$ to indicate that δ' has higher priority than δ. In such a case, call δ' *stronger than* δ. This ordering is a strict partial ordering, irreflexive and transitive.

A *fixed priority default theory* is a triple $< W, D, < >$ consisting of a set W of facts and a set D of defaults, strictly partially ordered by $<$. A *scenario S* based on default theory $< W, D, < >$ is any subset $S \subseteq D$ of defaults recognized within the theory. The *belief set* or *extension E* generated by a scenario S on a theory $< W, D, < >$ is $Th(W \cup Conclusion(S))$, the union of the set of facts and the set of conclusions of defaults in that scenario.

Most such extensions are uninteresting. Suppose our theory consists of one default, that if Tweety is a bird, then Tweety can fly, and one fact, that Tweety is not a bird. Then the logical closure of the set {*Tweety is not a bird, Tweety can fly*} is an extension that tells us nothing useful. The extensions that matter are those whose defaults are *triggered*. A default is triggered if it is "applicable in the context of a particular scenario" (25)—that is, if its premise is entailed by the conclusions of the defaults in that scenario together with the facts.

$$Triggered_{W,D}(S) = \{\delta \in D : W \cup Conclusion(S) \vdash Premise(\delta)\}$$

Horty defines *reasons* as premises of triggered defaults. So, that Tweety is a bird would be a reason to believe that Tweety can fly. That Jim promised to attend would be a reason for him to go. The *would* here is meant simply to avoid commitment to the truth of the component sentences; *That Jim promised to attend is a reason for him to go* seems to entail or presuppose that Jim promised to attend.

Reasons, of course, can conflict with one another. You may have reasons to do something and reasons not to do it. Call a default *conflicted* if the agent is already committed to denying its conclusion.

$$Conflicted_{W,D}(S) = \{\delta \in D : W \cup Conclusion(S) \vdash \neg Conclusion(\delta)\}$$

A default is *defeated* in a scenario if the scenario triggers a stronger default with a conflicting conclusion, and *binding* if it is triggered and neither conflicted nor defeated.

A *stable scenario* based on a default theory contains all and only the defaults that are binding on it. A *proper scenario* based on a default theory is (roughly) any stable scenario on that theory. (For a more precise characterization, see the discussion of exclusionary reasons below.) A *proper extension* of a default theory is an extension of a proper scenario based on that theory. A proper extension extends the facts by using all and only the binding defaults: those that are triggered but neither conflicted nor defeated.[2]

Horty is now in a position to define *ought*. He offers two definitions, based on credulous and skeptical strategies:

- *Credulous ought*: OA holds in a default theory iff A holds in some proper extension of that theory.
- *Skeptical ought*: OA holds in a default theory iff A holds in every proper extension of that theory.

Credulous *ought*s reflect something like *pro tanto* obligations, ones that might well be conflicted or overridden given the facts on hand, while skeptical *ought*s reflect a considered judgment about what ought to be done given the facts and defaults under consideration. They are not "all things considered" *ought*s in any absolute sense; they are still defeasible. They are something like "*these* things considered" *ought*s.

These definitions are surprising, for they are just the standard default logic definitions of credulous and skeptical entailment. In general, a default theory T skeptically defeasibly implies ($\approx\!\!\!\mid$) A iff A holds in every proper extension of T. So, Horty's skeptical definition means that $T \mid\!\approx OA$ iff $T \mid\!\approx A$. That has the counterintuitive consequence that, for all facts $A \in W$, $< W, D, <> \mid\!\approx OA$. So, the premises of (1) imply *Jim ought to have promised to attend* as well as *Jim ought to go*. "Whatever is, is right," indeed![3]

Horty defines conditional *ought*s separately. He again offers two definitions. Let the fixed priority default theory amplified by X, $\Delta[X]$, be $< W \cup \{X\}, D, <>$.

- *Credulous ought*: $O(A/X)$ holds in a default theory iff A holds in some proper extension of $\Delta[X]$.
- *Skeptical ought*: $O(A/X)$ holds in a default theory iff A holds in every proper extension of $\Delta[X]$.

It is easy to see that default logic handles our Tweety inference. $W = \{Bt\}$; $D = \{Bt \to Ft\}$; we have one proper extension $E = Th(\{Bt\} \cup Conclusion(Bt \to Ft)) = Th(\{Bt\} \cup \{Ft\})$. Nothing contradicts the conclusion that Tweety flies (Ft), so every proper extension includes that information as well. We may thus conclude that Tweety flies.

The promise example is similar. $W = \{p\}$; $D = \{p \to g\}$; we have one proper extension $E = Th(\{p\} \cup Conclusion(p \to g)) = Th(\{p\} \cup \{g\})$. Nothing contradicts the conclusion that Jim goes (g), so every proper extension includes that information as well. Hence we can conclude that Jim ought to go.

3. Epistemic and Practical *Ought*

Note how different the practical reading of defaults is, however: we should read the default itself as *Jim's promise would be a reason for him to go* and the conclusion of the inference as a whole not as *Jim goes* but as *Jim has reason to go* (on the credulous reading) or as *Jim ought to go* (on the skeptical reading). That Tweety is a bird would be reason to believe that Tweety flies; it would not be a reason for Tweety to fly, or a reason why Tweety ought to fly. It imposes no obligation to fly on Tweety. It is an epistemic reason, but not a motivating or normative reason. In practical reasoning, however, the defaults work differently. That Jim promised to go would be a reason for Jim to go and a reason why Jim ought to go. It imposes, other things being equal, an obligation on Jim to go. Defaults in practical reasoning express, underpin, or ground normative reasons.

Horty intends his theory to be neutral about the relation between practical and epistemic reasons (18). It is not obvious, however, that an adequate theory can be neutral about this. (For some reasons to worry, see Raz 2009, 41–46, and Parfit 2011, 47–50.) Note the difference between

(3) a. Promises are kept.
b. Jim will go.

which are descriptive, and permit at best a prediction about Jim's behavior, and

(4) a. Promises ought to be kept.
b. Jim ought to go.

which are normative and convey something about obligations—not merely obligations to *believe* something, but obligations to *do* something. Treating arguments using these propositions as having the same form commits us not only to their being defeasibly valid in exactly the same circumstances—which is perhaps reasonable enough—but as being vulnerable under exactly the same conditions, which seems wrong. Consider the contrast between these two arguments, with an additional premise about Jim's unreliability:

(5) a. Promises are kept.
Jim promised to attend.
Jim rarely keeps promises.
∴ Jim will go.

b. Promises ought to be kept.
Jim promised to attend.
Jim rarely keeps promises.
∴ Jim ought to go.

The first seems bad—Jim's unreliability undermines our confidence that he will go—but the second seems fine, since his unreliability has no obvious bearing on his obligations.

An *ought*s-first view has no trouble explaining this difference, and, more generally, the difference between an epistemic reading and a practical reading in such cases. What distinguishes practical from theoretical reasoning, on such a view, is the essential presence of *ought* or some similar normative term. If we think in terms of defaults, and use O as a deontic operator, the difference would be between $A \rightarrow B$ and $A \rightarrow OB$.

A reasons-first view cannot make use of such a reply. The normative *ought*, independent of any epistemic *ought*—and note that the epistemic *ought* does not disappear in the normative cases, for an argument to the effect that Jim ought to go is also an argument to the effect that we ought (epistemically) to believe that Jim ought (practically) to go—must somehow be generated from the inference; it is not present in the premises or conclusion of the inference. Where does it come from? If nothing in the form of the inference marks the distinction between a theoretical default such as *Promises are kept* and a practical default such as *Promises ought to be kept*—or, put alternatively, between something's being a promise being an *epistemic* reason to conclude that it will be kept and something's being a promise being a *normative* reason for it to be kept—it is hard to see what in the inference could generate a practical *ought*.

One could argue that there are two independent forms of default, $\rightarrow_e$ and $\rightarrow_o$, expressing epistemic and normative reasons, respectively, and obeying the same logical rules. That would complicate the account, since we would have to distinguish conclusions derived solely from epistemic defaults from those derived from practical defaults. It would moreover generate problems of its own. First, the fact that the two kinds of defaults obey the same rules would itself cry out for explanation. Second, could such a view give a compositional account of the presence of *should* or *ought* in English conditionals? A compositional account of the meaning of English sentences such as *If you promised to be there, you ought to go* would, it appears, first assign some meaning to such components as *if* and *ought* and then specify the meaning of the sentence as a function of them. The analysis would go in the opposite direction, defining the *ought* in terms of the meaning of the sentence as a whole. Third, if $\rightarrow_o$ works exactly like $\rightarrow_e$ except that it permits detachment of a practical *ought*, what objection could there be to treating $A \rightarrow_o B$ as $A \rightarrow OB$?

4. Benchmark Problems

Horty illustrates his theory by considering some of the classic benchmark problems from the nonmonotonic logic literature (Lifschitz 1989). To maintain a focus on practical reasoning, I will substitute practical versions of those benchmark problems, and relegate the originals to footnotes.

Diamond Inferences.[4] Conflicting information should in general allow us to draw no conclusions:

(6) a. $A \to C$
b. $B \to \neg C$
c. $A \wedge B$
d. $\therefore$??

Many practical dilemmas have just this form.

Sartre's Diamond

(7) a. That your country needs you would be a reason for you to join the resistance. ($c \to r$)
b. That your mother needs you would be a reason for you not to join the resistance. ($m \to \neg r$)
c. Your mother and your country both need you. ($m \wedge c$)
d. $\therefore$ You should (not) join the resistance.* ($(\neg)r$)

Default logic gives the right prediction on Sartre's Diamond. Let D consist of the resistance defaults and W the facts that your mother and your country need you. There is a proper extension in which you join the resistance, one that extends the scenario containing only the triggered default $c \to r$; there is another, extending the scenario containing only the triggered default $m \to \neg r$, in which you don't. So, neither conclusion follows in the skeptical *ought* sense. Both follow in the credulous sense. But that makes sense. You have a *pro tanto* obligation to join the resistance and a *pro tanto* obligation not to. You have a "these things considered" obligation to do neither.

Trolley Diamond

(8) a. That flipping the switch would save four lives would be a reason for you to flip it. ($s \to f$)
b. That flipping the switch would kill someone would be a reason for you not to flip it. ($k \to \neg f$)
c. Flipping the switch will save four lives, but also kill someone. ($s \wedge k$)
d. $\therefore$ You should (not) flip the switch.* ($(\neg)f$)

Again there is a proper extension in which you flip the switch and another in which you don't. So, you have *pro tanto* obligations to do both, but a "these things considered" obligation to do neither.

Penguin Inferences. More specific information should take precedence over less specific information.[5]

(9) a. A
b. B
c. $A \to C$
d. $(A \wedge B) \to \neg C$
e. $\therefore \neg C$

Penguin inferences have the same structure as diamond inferences, except that the antecedent of one default is logically stronger than the antecedent of the other. Evidently there is an extension in which C, and another in which $\neg C$. So, without reference to any priority ranking, we would get *pro tanto* obligations but no "these things considered" obligations, just as with diamond inferences. Horty's default logic builds in priority rankings, however, requiring that more specific defaults take precedence. So, the only proper scenario has $(A \wedge B) \to \neg C$; its proper extension contains $\neg C$.

Here is a practical instance of such an inference:

Plato's Penguin

(10) a. That you promised to return the weapon would be a reason for you to return it. $(p \to r)$
b. That you promised to return the weapon, but the owner is intent on mayhem, would be a reason for you not to return it. $((p \wedge m) \to \neg r)$
c. You promised to return the weapon. (p)
d. The owner is intent on mayhem. (m)
e. $\therefore$ You shouldn't return it. $(\neg r)$

The more specific default, $(p \wedge m) \to \neg r$, is stronger than $p \to r$ since $p \wedge m$ entails p, but p does not entail $p \wedge m$. So, the only proper scenario includes $(p \wedge m) \to \neg r$ but not $p \to r$; its proper extension includes $\neg r$. So, we can conclude that you should not return the weapon.

This is surely the right result. But does it hold for the right reason? Why does more specific information about returning a weapon to someone intent on mayhem trump less specific information about returning borrowed items (Brewka 1994)? Nothing in the theory explains why more specific information trumps less specific information. That condition is imposed on the priority rankings by stipulation. It's a reasonable stipulation, and I recommend no other. But a stipulation is not an explanation. On ABM, as we shall see, no such stipulation is required.

5. Problems with Horty's Account

The lack of an explanation for specificity inferences stems not from the reasons-first aspect of Horty's account but from his choice of nonmonotonic logic. An *oughts*-first view built on default logic would have the same difficulty.

The choice of default logic raises a number of other issues. One is obvious: Defaults are rules. They are metalinguistic inference tickets. They do not appear within logical operators or one another, and never appear as conclusions of arguments. Defaults also represent reason statements, statements that in combination with factual statements generate normative conclusions, such as *That Jim promised would be a reason for him to go* or *If Jim promised, he ought to go*.

It would be possible to embrace the limited role of defaults, holding on philosophical or semantic grounds that reason statements lack truth values. Many people (e.g., Edgington 1986) hold a similar view of conditionals, to which reason statements are closely connected. Makinson (1999) distinguishes norms from statements about norms, and treats norms as having no truth values.

But it would also be possible to treat the limited role of defaults as a design choice reflecting not a theoretical commitment but an isolation of one dimension of a complex phenomenon. Advocates of pivotal-rule-based theories such as Horty's could accommodate intuitions that reason statements have truth values, play explanatory roles, can identify motivating as well as normative reasons, etc. They could provide a semantics for defaults, allow them to appear embedded within logical operators, and provide introduction as well as elimination rules for them.

But default logic, and pivotal-rule-based approaches more generally, tend to have difficulty explaining inferences involving disjunction (Delgrande, Schaub, and Jackson 1994, Brewka, Dix, and Konolige 1997, Antoniou 1999). Horty (1997) recognizes and discusses this; it affects his theory's ability to represent many common forms of practical reasoning. Default logic does not permit reasoning by cases. Given that birds fly and airplanes fly, and that Tweety is either a bird or an airplane, we cannot conclude that Tweety flies.

The general form of disjunctive inference is this:

(11) a. $A \vee B$
b. $A \to C$
c. $B \to C$
d. $\therefore C$

To see why it generates problems for default logic, consider the fixed priority default theory $< \{A \vee B\}, \{A \to C, B \to C\}, \emptyset >$. Neither $A \to C$ nor $B \to C$ is triggered. So, proper extensions fail to include C.

The theory's impotence regarding disjunction generates a series of difficulties for practical reasoning. We need to be able to draw practical conclusions from our information even in the face of partial information. Indeed, that is one of the major motivations for nonmonotonic logic. If we can narrow the possibilities down to a few options, all of which support the same action, we can reasonably decide on that action. Thus, for example, this should be an acceptable form of defeasible inference:

Deontic Disjunction

(12) a. Meeting at Corazon would be reason to walk west. ($c \to w$)
b. Meeting at Z'Tejas would be reason to walk west. ($z \to w$)
c. We're meeting at Corazon or at Z'Tejas. ($c \vee z$)
d. So, we should walk west. (Or, we have reason to walk west.) (w)

But this fails in Horty's system. $D = \{c \to w, z \to w\}$; $W = \{c \vee z\}$. The defaults are not triggered. Neither c nor z follows from W. So, $E = Th(W) = Th(c \vee z)$; it does not contain w.

The following is essentially the same argument form. But here the disjunction results not from a partial narrowing of possibilities but instead from recognition of a practical dilemma: a course of action can bring about a benefit only at a high cost. So, either the action fails to produce the benefit, or it comes at a high cost.

Disjunctive Dilemma

(13) a. Failing to produce significant military benefits would be reason not to bomb the encampment. ($\neg m \rightarrow \neg b$)
b. Killing large numbers of civilians would be reason not to bomb the encampment. ($k \rightarrow \neg b$)
c. Bombing the encampment would either fail to produce significant military benefits or would kill large numbers of civilians. ($\neg m \vee k$)
d. So, you shouldn't bomb the encampment. ($\neg b$)

Once again, the argument fails; neither default is triggered.

Since existential quantifications play a role similar to that of disjunction, we can generate analogous problems involving existential quantifiers.

Quantificational Inferences

(14) a. Some people are close to the scene. ($\exists x Cx$)
b. Being close to the scene would be a reason to rush to help. ($\forall x(Cx \rightarrow Rx)$)
c. So, some people should rush to help (or, have reason to rush to help). ($\therefore \exists x Rx$)

This symbolization is not quite right, for $\forall x(Cx \rightarrow Rx)$ is not well-formed in the theory as it stands. But we might take it as shorthand for a collection of defaults $Ca \rightarrow Ra$, $Cb \rightarrow Rb$, ... , $Cn \rightarrow Rn$ for all people $a, b, \ldots, n$ who are close to the scene. Similarly, we could take the existential quantifier as equivalent to a disjunction $Ca \vee Cb \vee \cdots \vee Cm$ for all people in the contextual domain. But then the difficulty is familiar. None of the defaults is ever triggered, so proper extensions fail to include the desired conclusion $\exists x Rx$, any of its instances, or the disjunction of all its instances.

The failure of default logic to handle disjunctive inferences generates additional problems, for it means that the theory does not obtain intermediate conclusions that could conflict with or defeat other defaults. Think of diamond inferences in which a conflicting inference is disrupted by the presence of a disjunction. The problem then is not merely that we do not obtain desirable conclusions; we obtain undesirable ones (Poole 1989). Here is an example inspired by John Stuart Mill's *On Liberty*:

Disjunctive Diamond

(15) a. If an option affects mostly you, it lies within your sphere of liberty. ($Aa \rightarrow La$; $Ab \rightarrow Lb$)
b. *A* affects mostly you. (Aa)
c. *B* affects mostly you. (Ab)

d. If an option violates someone's rights, it does not lie within your sphere of liberty. ($Va \rightarrow \neg La$; $Vb \rightarrow \neg Lb$)
e. Either option A or option B violates someone else's rights. ($Va \vee Vb$)

Horty is forced to conclude that both lie within your sphere of liberty ($La \wedge Lb$). Why? Consider the default theory specified as follows. Let $W = \{Aa, Ab, Va \vee Vb\}$ and $D = \{Aa \rightarrow La, Ab \rightarrow Lb\}$. Then $La, Lb \in E$; the other defaults are never triggered, and so do not enter into the proper extensions. So, the things that ought to conflict with defaults never enter, and we obtain conclusions we should not be able to derive.

The same can happen with what should be seen as defeated defaults.

Disjunctive Penguin

(16) a. That you promised to return the weapon would be reason for you to return it. ($p \rightarrow r$)
b. That you promised to return the weapon but the owner is intent on mayhem would be reason for you not to return it. ($(p \wedge m) \rightarrow \neg r$)
c. That you promised to return the weapon, but the owner is wanted by the police, would be reason for you not to return it. ($(p \wedge w) \rightarrow \neg r$)
d. You promised to return the weapon. (p)
e. The owner is either wanted by the police or intent on mayhem. ($w \vee m$)
f. You shouldn't return it. ($\neg r$)

Horty cannot obtain the desired conclusion. In fact, he obtains the opposite conclusion, that you *should* return the weapon. Our set of facts consists solely of p and $w \vee m$. The more specific defaults $(p \wedge m) \rightarrow \neg r$ and $(p \wedge w) \rightarrow \neg r$ take priority over $p \rightarrow r$, but neither is ever triggered. Recall the definitions: A default is conflicted if the agent is already committed to denying its conclusion, and defeated if the scenario *triggers* a stronger default with a conflicting conclusion. The default $p \rightarrow r$ is not conflicted, for the agent is not committed to denying r; the defaults that should have led to $\neg r$ are never triggered, so $p \rightarrow r$ is not defeated either. But $p \rightarrow r$ is triggered, since p is among the facts, and, since it is neither conflicted nor defeated, it is binding. So, every proper extension contains r. But that seems utterly perverse. The premises support the conclusion that you should *not* return the weapon.

The problems outlined in this section affect Horty's account, but not reasons-first accounts *per se*. They do however allow us to draw an important conclusion: Any adequate theory of reasons, whatever its nature, must allow reasoning by cases.

6. The ABM Theory of Reasons

There is an alternative account of reasons that explains the presence of *should* or *ought* in practical conditionals compositionally, gives such conditionals truth values without making them equivalent to their component sentences, explains the priority of more specific information, allows for the introduction as well as the exploitation of reason statements, and permits reasoning by cases.

Recall Setiya's dictum that "A reason for action is a premise of practical reasoning." Say that a *practical conditional* is a conditional with an *ought* in its consequent, such as *If you promised to go, you ought to go*. Then we may define reasons very straightforwardly:

Reasons are (true) antecedents of true practical conditionals.

Thus, A *is* a reason for B (roughly) iff A and $A > OB$. A *would* be a reason for B iff $A > OB$. A reason is a ground for a defeasible obligation, and, thus, a defeasible ground for an obligation.

ABM rests on common-sense entailment, a pivotal-valuation-based conception of defeasible reasoning quite different from that of default logic. Say that $X \models A$ iff there are no models in which every sentence in X is true but A is false. Say, in other words, that $X \models A$ iff there are no *counterexamples* to X; A. This definition guarantees monotonicity, for there is no way to extend the information in X to yield $\neg A$.

To define a defeasible implication relation, we need to allow counterexamples. Extending the information in X may indeed yield $\neg A$. Of course, if counterexamples are rampant, then the argument should count as invalid even defeasibly. We want to say, very roughly, that X defeasibly implies A iff counterexamples to X; A are sufficiently rare.

If counterexamples are nonexistent, of course, they are as rare as we could want. So, anything classically valid is also defeasibly valid. Thus, we must adopt a weak logic of the conditional. Modus ponens, chaining, and the like should be valid only defeasibly.

What specific theory of the conditional we adopt is for our purposes here relatively unimportant. I will start with the basic conditional logic **C** (Priest 2008, 84–87), since it makes few commitments. I will read a conditional $A > B$ as *If A, then normally (typically, generally, other things being equal, provided conditions are suitable) B*. Let $[A]$ be the set of A-worlds, the worlds in which A is true. Let f be a Lewis-style selection function: $f_w[A]$ is the set of A-worlds in which conditions are suitable for assessing (relative to w) what happens when A. According to the truth condition for defeasible conditionals, $A > B$ is true at w iff all A-worlds in which conditions are suitable for assessing (relative to w) what happens when A are B-worlds:

$A > B$ is true at world w iff $f_w[A] \subseteq [B]$, that is, iff B is true in all normal A-worlds.

C is weak, validating weakening of the consequent ($A > B \models A > (B \vee C)$), consequent conjunction ($A > B, A > C \models A > (B \wedge C)$), $A > \top$, and substitution of logical equivalents.

I will assume a *facticity* constraint that

$$f_w[A] \subseteq [A]$$

requiring that worlds suitable for assessing what happens when A are all A-worlds and thus validating $A > A$. I will also assume that the selection function obeys a *disjunction* constraint:

$$f_w[A \cup B] \subseteq f_w[A] \cup f_w[B]$$

This validates the inference $A > C, B > C \models (A \vee B) > C$. It says, in effect, that the test cases for determining what is normally the case when $A \vee B$ are among the test cases for A or for B. It plays a role in the analysis not of disjunctive but of specificity inferences.

In ABM, modus ponens, transitivity, strengthening of the antecedent, modus tollens, and contraposition all fail. This particular semantics for the conditional thus appropriately sets the stage for nonmonotonic inference, allowing some of the above to be valid defeasibly without being valid deductively.

How can we make precise the idea that some conclusions are reasonable even though their truth is not guaranteed? The idea, from Morreau 1997, is that some worlds are more regular than others, in the sense that they involve fewer exceptions than others.

> World w is *irregular with respect to* A iff, at w, for some B, $A > B$ and A are true at w but B is false at w.

That is, there is a modus ponens failure with respect to A.

> World w is *irregular*, simpliciter, iff w is irregular with respect to some A.

> World w is *as regular as* w' if, whenever w is irregular with respect to A, so is w'; w is *more regular* than w' if w is as regular as w' but not vice versa.

A world is a *counterexample* to an argument if, in that world, the premises are true and the conclusion is false.

> A counterexample to an argument is *gratuitous* if there are more regular *models* of the argument, worlds in which its premises and conclusion are all true.

> An argument is *deductively valid* if it has no counterexamples, and *defeasibly valid* if all counterexamples to it are gratuitous.

That is, for every counterexample to a defeasibly valid argument, there is a more regular model of it. If an argument is defeasibly valid, its premises *defeasibly imply* its conclusion.

ABM understands practical conditionals as object language conditionals having the form $A > OB$, where O is an obligation operator interpreted in terms of standard deontic logic: where $i(w)$ is a nonempty set of ideal worlds assigned to each world w,

> OA is true at w if and only if $i(w) \subseteq A$.

Since $i(w)$ is nonempty, OA contradicts $O\neg A$. ABM permits embedded conditionals; practical conditionals may serve as conclusions as well as premises of arguments. For detailed discussion of its character as a deontic logic, including its treatment of deontic paradoxes, see Bonevac 1998.

7. Benchmark Problems Revisited

Defeasible Modus Ponens

Common-sense entailment has the effect of allowing us to apply modus ponens to conditionals with A as antecedent so long as doing so does not contradict any available information. So, modus ponens, though not deductively valid, is defeasibly valid: any counterexamples to $A > B$, $A \models B$ would have to be gratuitous. We can legitimately reason:

If Tweety is a bird, Tweety can fly.
Tweety is a bird.
So, Tweety can fly.

To evaluate this argument, (2), we contrast a counterexample world making premises true and conclusion false with a model of the argument making premises and conclusion all true.

Counterexample: $b > f, b, \neg f$
Model: $b > f, b, f$

The former is irregular with respect to b. The latter is not. So, the counterexample is gratuitous. The argument is thus defeasibly valid.

In general, the idea is this. Contrast a counterexample with a model. If the model is more regular than the counterexample, the argument is defeasibly valid. More precisely, the argument is defeasibly valid if and only if, for every counterexample to that argument, there is a more regular model of it.

Notice that if we already have information that Tweety does not fly, we have a modus ponens failure in both counterexample and model. The model is then no more regular than the counterexample, so the argument fails to be valid defeasibly.

The situation is analogous in practical reasoning. Let's return to (1):

If Jim promised to attend, Jim should go. ($p > Og$)
Jim promised to attend. (p)
$\therefore$ Jim should go. (Og)

So, we contrast the models

Counterexample: $p, p > Og, \neg Og$
Model: $p, p > Og, Og$

The model is more regular, for it lacks the irregularity on p present in the counterexample. So, the counterexample is gratuitous, and the argument is defeasibly valid.

A reason is a true antecedent of a true practical conditional. So, in any world in which the premises p and $p > Og$ are true, p is a reason why Og—that Jim promised to attend is a reason why Jim should go, i.e., a reason for Jim to go.

Sartre's Diamond

If we have conflicting information, we can draw no conclusions. Consider Sartre's Diamond:

(17) a. That your country needs you would be a reason for you to join the resistance. (If your country needs you, you should join the resistance.) ($c > Or$)
b. That your mother needs you would be a reason for you not to join the resistance. (If your mother needs you, you should not join the resistance.) ($m > O\neg r$)
c. Your mother and your country need you. ($m \wedge c$)
d. ∴ You should (not) join the resistance.* ($O(\neg)r$)

Given that Or contradicts $O\neg r$—the set of ideal worlds is nonempty—we should not be able to draw any conclusion. Indeed, that is what the theory predicts. Suppose we tried to draw the conclusion that you should join the resistance. That forces an irregularity with respect to your mother needing you. The counterexample is irregular with respect to your country needing you.

Counterexample: $c > Or, m > O\neg r, m \wedge c, \neg Or$
Model: $c > Or, m > O\neg r, m \wedge c, Or$

If we try to draw the conclusion that you shouldn't join, there's an irregularity with respect to your country needing you, but the counterexample is irregular with respect to your mother needing you. Neither world is more regular than the other, so nothing follows.

Counterexample: $c > Or, m > O\neg r, m \wedge c, \neg O\neg r$
Model: $c > Or, m > O\neg r, m \wedge c, O\neg r$

The argument establishes neither Or nor $O\neg r$ defeasibly. Your country's need is a reason for you to join the resistance, but your mother's need is a reason for you not to join. In the absence of any further information, these reasons counteract each other, and you can draw no conclusion about what to do. There is no model that avoids both irregularities.

Plato's Penguin

(18) a. That you promised to return the weapon would be a reason for you to return it. (If you promised to return the weapon, you should.) ($p > Or$)
b. That you promised to return the weapon, but the owner is intent on mayhem, would be a reason for you not to return it. (If you promised to return the weapon, but the owner is intent on mayhem, you should not return it.) ($(p \wedge m) > O\neg r$)
c. You promised to return the weapon. (p)

d. The owner is intent on mayhem. (m)
e. You shouldn't return it. ($O\neg r$)

We want more specific information to trump less specific information. Cases of returning a weapon to someone intent on mayhem are unusual cases of returning something borrowed. Knowing that the weapon's owner intends to use it to do harm suspends considerations that apply to promises in general if they conflict with what applies to this unusual kind of case. When conflicting default rules apply, only the consequent of the most specific default rule (if there is one) is inferred. That should follow as a matter of logic, not substantive ethics.

Asher and Morreau (1995) produce exactly that result, and moreover explain why more specific principles take precedence over less specific ones. The selection function obeys a disjunction constraint, which suffices to let more specific defaults take precedence over less specific ones. It lets us show, in effect, that cases of promising to return something borrowed are not normally cases of promising to provide murder weapons.[6] How do we get from this result to the desired result in Plato's Penguin, that you should not return the weapon? The idea is that both model and counterexample entail an abnormality with respect to returning something borrowed.

The symmetry that seems to be present, and to assimilate this case to a diamond inference, is only apparent:

Counterexample: $p > Or$, $(p \wedge m) > O\neg r$, p, m, $\neg O\neg r$, $p > \neg m$
Model: $p > Or$, $(p \wedge m) > O\neg r$, p, m, $O\neg r$, $p > \neg m$

The model exhibits a modus ponens failure with respect to p; the counterexample, at first glance, with respect to $p \wedge m$. But they are not on a par, because, more subtly, the counterexample also involves a modus ponens failure with respect to p. In the presence of facticity and disjunction, the premises entail $p > \neg m$. So, the premises p and m already trigger a modus ponens failure with respect to p. Both model and counterexample, therefore, are irregular with respect to p; only the counterexample is irregular with respect to $p \wedge m$ as well. And that irregularity is gratuitous. The argument is thus defeasibly valid.

ABM, as a theory based on a pivotal-valuation approach, has no difficulty in dealing with disjunctive inferences. Let's review the arguments that gave Horty's theory trouble, symbolized as ABM specifies.

Deontic Disjunction

(19) a. Meeting at Corazon would be reason to walk west. (If we're meeting at Corazon, we should walk west.) ($c > Ow$)
b. Meeting at Z'Tejas would be reason to walk west. (If we're meeting at Z'Tejas, we should walk west.) ($z > Ow$)
c. We're meeting at Corazon or at Z'Tejas. ($c \vee z$)
d. So, we should walk west. (Ow)

The analysis is simple. Any model of $c \vee z$ contains either c or z. Assume without loss of generality that the countermodel contains c:

Counterexample: $c > Ow$, $z > Ow$, $c \vee z$, c, $\neg Ow$, $(c \vee z) > Ow$
Model: $c > Ow$, $z > Ow$, $c \vee z$, c, Ow, $(c \vee z) > Ow$

The premises $c > Ow, z > Ow$ entail $(c \vee z) > Ow$, by the disjunction principle, so the counterexample contains a gratuitous irregularity on $c \vee z$, while the model involves no irregularity. But the same result follows without relying on the disjunction principle; the counterexample contains a gratuitous irregularity on c. So, the argument is defeasibly valid.

Disjunctive Dilemma

(20) a. Failing to produce significant military benefits would be reason not to bomb the encampment. (If bombing the encampment wouldn't produce any significant military benefits, you shouldn't bomb it.) ($\neg m > O\neg b$)
b. Killing large numbers of civilians would be reason not to bomb the encampment. (If bombing the encampment would kill large numbers of civilians, you shouldn't bomb it.) ($k > O\neg b$)
c. Bombing the encampment would either fail to produce significant military benefits or would kill large numbers of civilians. ($\neg m \vee k$)
d. So, you shouldn't bomb the encampment. ($O\neg b$)

Assume a counterexample satisfying $\neg m \vee k$ by satisfying $\neg m$.

Counterexample: $\neg m > O\neg b$, $k > O\neg b$, $\neg m \vee k$, $\neg m$, $\neg O\neg b$, $(\neg m \vee k) > O\neg b$
Model: $\neg m > O\neg b$, $k > O\neg b$, $\neg m \vee k$, $\neg m$, $O\neg b$, $(\neg m \vee k) > O\neg b$

The counterexample contains a gratuitous irregularity on $\neg m$. Again, the argument is defeasibly valid.

Quantificational Inferences
Treating practical conditionals in the object language allows them to interact with quantifiers unproblematically.

(21) a. Some people are close to the scene. ($\exists x Cx$)
b. Being close to the scene would be a reason to rush to help. (Anyone who is close to the scene should rush to help.) ($\forall x(Cx > ORx)$)
c. So, some people should rush to help. ($\therefore \exists x ORx$)

Counterexample: $\exists x Cx$, $\forall x(Cx > ORx)$, $\neg\exists x ORx$
Model: $\exists x Cx$, $\forall x(Cx > ORx)$, $\exists x ORx$

The premise $\forall x(Cx > ORx)$ entails $\exists x Cx > \exists x ORx$, so this is just a defeasible modus ponens inference. The counterexample contains a gratuitous irregularity on $\exists x Cx$.

Disjunctive Diamond

(22) a. If an option affects mostly you, it lies within your sphere of liberty. ($Aa > La$; $Ab > Lb$)
b. A affects mostly you. (Aa)
c. B affects mostly you. (Ab)
d. If an option violates someone's rights, it does not lie within your sphere of liberty. ($Va > \neg La$; $Vb > \neg Lb$)
e. Either option A or option B violates someone else's rights. ($Va \vee Vb$)

Horty's theory, recall, predicts the conclusion that both a and b lie within your sphere of liberty. Let's contrast a model with a counterexample; assume that the latter satisfies $Va \vee Vb$ by virtue of satisfying Va and satisfies $\neg(La \wedge Lb)$ by satisfying $\neg Lb$.

Counterexample: $Aa > La$, $Ab > Lb$, Aa, Ab, $Va > \neg La$, $Vb > \neg Lb$, $Va \vee Vb$, Va, $\neg(La \wedge Lb)$, $\neg Lb$
Model: $Aa > La$, $Ab > Lb$, Aa, Ab, $Va > \neg La$, $Vb > \neg Lb$, $Va \vee Vb$, Va, $La \wedge Lb$, La, Lb

The model contains an irregularity on Va. The counterexample contains an irregularity on Ab. Neither is more regular than the other; the argument is invalid.

Disjunctive Penguin

(23) a. That you promised to return the weapon would be reason for you to return it. (If you promised to return the weapon, you should.) ($p > Or$)
b. That you promised to return the weapon but the owner is intent on mayhem would be reason for you not to return it. (If you promised to return the weapon, but the owner is intent on mayhem, you should not return it.) ($(p \wedge m) > O\neg r$)
c. That you promised to return the weapon, but the owner is wanted by the police, would be reason for you not to return it. (If you promised to return the weapon, but the owner is wanted by the police, you should not return it.) ($(p \wedge w) > O\neg r$)
d. You promised to return the weapon. (p)
e. The owner is either wanted by the police or intent on mayhem. ($w \vee m$)
f. So, you shouldn't return it. ($O\neg r$)

Say the counterexample satisfies $w \vee m$ by satisfying w.

Counterexample: $p > Or$, $(p \wedge m) > O\neg r$, $(p \wedge w) > O\neg r$, p, $w \vee m$, w, $\neg O\neg r$, $p > \neg m$, $p > \neg w$, $((p \wedge m) \vee (p \wedge w)) > O\neg r$
Model: $p > Or$, $(p \wedge m) > O\neg r$, $(p \wedge w) > O\neg r$, p, $w \vee m$, w, $O\neg r$, $p > \neg m$, $p > \neg w$, $((p \wedge m) \vee (p \wedge w)) > O\neg r$

Both contain an irregularity on p; the counterexample contains a gratuitous irregularity on $p \wedge w$, making the argument defeasibly valid.

8. Epistemic and Practical *Ought*, Revisited

Horty's system and ABM both allow chaining:

(24) a. Birds fly.
b. Sparrows are birds.
c. Tweety is a sparrow.
d. $\therefore$ Tweety flies.

$A \to B, B \to C, A, \therefore C$ and $A > B, B > C, A, \therefore C$ hold in their respective theories.

The theories differ, however, with respect to *deontic* chaining, chaining inferences involving one or more practical *ought*s. Horty's reasons-first view does not distinguish practical defaults from other defaults. So, defaults, it would seem, can be chained together regardless of their status. ABM, however, distinguishes $A > B$ from $A > OB$. $A > B, B > OC, A, \therefore OC$ is a straightforward instance of chaining, but $A > OB, B > C, A, \therefore OC$ and $A > OB, B > OC, A, \therefore OC$ are not.

The views thus differ on inferences such as this:

Deontic Chaining 1

(25) a. If Jim promised to attend the conference, Jim should go. ($p \to g$; $p > Og$)
b. Jim promised to attend the conference. (p)
c. People who go generally stay in a hotel. ($g \to v$; $g > v$)
d. So, Jim should stay in a hotel. (v; Ov)

This is valid in Horty's system, if we represent epistemic and practical reasons alike with $\to$, but it fails in ABM, as it should: Jim is under no obligation, even *pro tanto*, to do whatever people who attend the conference normally do.

Counterexample: $p > Og, p, g > v, \neg Ov$
Model: $p > Og, p, g > v, Ov$

Neither counterexample nor model are irregular. In all worlds that are ideal relative to the countermodel, g, and, in at least one of them, $\neg v$. But that world is not necessarily irregular, for we have no reason to think that $g > v$ holds there.

Deontic Chaining 2

(26) a. If Jim promised to attend the conference, he should go. ($p \to g$; $p > Og$)
b. Jim promised to attend the conference. (p)
c. If Jim goes, he should visit the Arch. ($g \to v$; $g > Ov$)
d. So, Jim should visit the Arch. (v; Ov)

This too looks like regular chaining in Horty's system if nothing marks the deontic character of the connections. In ABM, however, this is not valid, even defeasibly. The first two premises of the inference defeasibly imply that Jim ought to go:

(27) a. If Jim promised to attend the conference, he should go. ($p \to g$; $p > Og$)
b. Jim promised to attend the conference. (p)
c. So, Jim should go. (Og)

Now, we can isolate the remainder of the argument:

(28) a. Jim should go. (Og)
b. If Jim goes, he should visit the Arch. ($g \to v$; $g > Ov$)
c. So, Jim should visit the Arch. (v; Ov)

This inference ABM rejects. Take a counterexample satisfying Og, $g > Ov$, $\neg Ov$, and $\neg g$. Jim's obligation to visit the Arch is contingent on his being in St. Louis, say, for the conference; if he does not fulfill his obligation to go, he is under no obligation to visit the Arch.

An ability to distinguish $O(A > B)$ from $A > OB$ is key to John Broome's (1999, 2001, 2004) concept of normative requirement. Broome analyzes normative requirements as wide-scope obligations of the form, in ABM's terms, $O(A > B)$. (For debate about the appropriate scoping, see Kolodny 2007, Dreier 2009, and Broome 2007, 2013.) A paradigm case: Mary believes that she ought to look for a new job. Her belief normatively requires her to intend to look for a new job (that is, to think she ought but not to form the intention would be a sort of irrationality). But it does not follow, even defeasibly, that she ought to intend to look for a new job. Her belief might be wrong. Putting it from Mary's point of view:

(29) a. I think I ought to look for a new job. t
b. If I think I ought to look for a new job, I ought to intend to look for a new job. $t > Ol$ (defeasibly valid) or $O(t > l)$ (invalid)
c. So, I ought to intend to look for a new job.* Ol

Analyzing such normative requirements requires a normative premise such as $O(A > B)$ that, in combination with A, does not yield the conclusion OB. In Horty's system, however, $O(A \to B)$ is not well-formed, and the only plausible substitute, $A \to B$, would yield that undesirable conclusion. Extending his theory to allow $O(A \to B)$ would require not only permitting defaults to appear within logical operators but altering the understanding of obligation to permit such a sentence to appear as a premise.

9. Differences Between the Theories

I want to examine three other differences between Horty's view and ABM: exclusionary reasons, priority rankings, and floating conclusions.

Exclusionary Reasons

Exclusionary reasons are reasons that exclude other reasons (Raz 1975, 1990, Alexander 1990, Greenspan 2007, Darwall 2010). These are important theoretically as well as practically. Consider Confucius's thought that a superior person thinks of what is right rather than what is advantageous, or Kant's thought that a good will excludes "subjective, particular determinations" from decision making.

Horty introduces constants for defaults and a predicate *Out* applying to them. He defines excluded reasons:

$$\delta \in Excluded_S \Leftrightarrow W \cup Conclusion(S) \vdash Out(d)$$

He correspondingly revises the definition of triggered defaults: Defaults are *triggered* in S if their premises follow from $W \cup Conclusion(S)$ *and* if they are not excluded in S. Exclusion is Horty's way of accounting for undercutting defeaters (Pollock 1987, 1991).

ABM can handle exclusion and undercutting defeat in any of four ways. Say, to use Horty's terminology, that $\delta = (A \rightarrow B)$ and $C \rightarrow Out(d)$. In such a case, C excludes A from being a reason for B.

- ABM strategy 1: We can represent such exclusion directly in the object language by denying a conditional with a strengthened antecedent, e.g., $\neg((A \wedge C) > B)$.
- ABM, strategy 2: We can represent the exclusion by denying the conditional on the condition that C: $C > \neg(A > B)$. This strategy requires a further adjustment, for C, $A > B$, $C > \neg(A > B)$, A defeasibly imply B in common-sense entailment. To employ this strategy, then, we would need to treat defaults, generally, as prefaced by $\top >$, thus: $\top > (A > B)$. Then, C, being more specific than $\top$, would take precedence, disallowing the inference to B.

  This is not an *ad hoc* move. Many general principles are best represented in such fashion on the ABM approach. In fact, it permits a simple way to capture Dancy's thought (1993, 2004a) that a reason for doing something in general ($\top > (A > OB)$) or in one setting ($C > (A > OB)$) may fail to be a reason for doing it ($C' > \neg(A > OB)$), be a reason it is permissible not to do it ($C'' > (A > \neg OB)$), or perhaps even be a reason not to do it ($C''' > (A > O\neg B)$), in another setting. Horty's theory would need to be extended to capture these distinctions.
- ABM, strategy 3: We can mimic Horty's strategy, interpreting exclusion as a metalinguistic constraint on information allowed in defeasible argument.
- ABM, strategy 4: We could pursue a pragmatic approach such as that of Morreau 1997b, which uses focus of attention to limit the norms available in a given argument.

Let's look at a paradigmatic instance of exclusionary reasons as analyzed in ABM:

(30) a. Dave's desire to please his wife is a reason for him to send his kids to private school. (If Dave wants to please his wife, he ought to send his kids to private school.) ($w > Op$)
b. Dave's desire to save money is a reason for him not to send his kids to private school. (If Dave wants to save money, it's not the case that he ought to send his kids to private school.) ($m > \neg Op$)
c. Dave wants to save money and please his wife. ($m \wedge w$)
d. Dave's desire to please his wife is an exclusionary reason for him not to bring financial considerations to bear on the decision. (If Dave wants

to please his wife, he shouldn't bring financial considerations into the decision.) (The exclusionary premise)

e. So, Dave ought to send his kids to private school. (Op)

Without the exclusionary premise, this would be a Diamond inference, and no conclusions of any interest would follow. The exclusionary premise means to exclude the second premise, $m > \neg Op$, however, to allow the conclusion that Dave should send his kids to private school. If we mimic Horty's strategy, we can of course get that result.

On ABM strategy 1, the test becomes:

Counterexample: $w > Op, m > \neg Op, m, w, \neg((m \wedge w) > \neg Op), \neg Op$
Model: $w > Op, m > \neg Op, m, w, \neg((m \wedge w) > \neg Op), Op$

Handling these inferences correctly requires a treatment of negated defaults (Asher and Mao 2001, Mao 2003). Since that is a complex topic, I will set this strategy aside here, though a simple approximation would be to interpret $\neg((m \wedge w) > \neg Op)$, for example, as $(m \wedge w) > \Diamond\neg\neg Op$, i.e., as $(m \wedge w) > \Diamond Op$, where $\Diamond$ represents something like epistemic possibility, and to alter the definition of irregularity on A in w to include cases in which $A > B$, A, and $\Diamond\neg B$ are true in w. That would yield the test

Counterexample: $w > Op, m > O\neg p, m, w, (m \wedge w) > \Diamond\neg\neg Op, \neg Op$
Model: $w > Op, m > O\neg p, m, w, (m \wedge w) > \Diamond\neg\neg Op, Op$

We would now have a gratuitous irregularity in the counterexample, so the argument would be defeasibly valid.

On ABM strategy 2, the test becomes

Counterexample: $\top > (w > Op), \top > (m > \neg Op), m, w, w > \neg(m > \neg Op), \neg Op$
Model: $\top > (w > Op), \top > (m > \neg Op), m, w, w > \neg(m > \neg Op), Op$

Both model and counterexample have an irregularity on $\top$; the counterexample additionally has a gratuitous irregularity on w. So, the argument counts as defeasibly valid.

ABM thus faces no disadvantage with respect to exclusionary reasons, and enjoys the advantage that it can distinguish these strategies. It can express negations of reason statements, distinguishing $A > O\neg B$, $A > \neg OB$, and $\neg(A > OB)$. And it can distinguish $(A \wedge B) > C$ from $A > (B > C)$ and $B > (A > C)$ and also $A > B$ from $\top > (A > B)$ and $A > (A > B)$.

The last, incidentally, is the key to ABM's analysis of self-protection. Horty argues that some defaults are self-protected in the sense that their premise implies that they are not excluded: $\delta = X \rightarrow Y$ is *self-protected* iff $X \rightarrow \neg Out(d)$. ABM gets the same effect with the nested conditional $X > (X > Y)$.

Priority Rankings

Horty, having introduced constants for defaults, introduces a relational predicate: $\delta < \delta'$ iff δ' outranks δ. He needs this relation to account for the precedence of more specific information. ABM has no need of the ranking for that purpose. But there are other contexts in which such a priority ranking makes sense. Many people recommend lying to the murderer at the door, for example, on the grounds that a life is more important than a lie.

(31) a. If you value the truth, you should reveal the intended victim's whereabouts. $t \to r$
b. If you value life, you should not reveal the intended victim's whereabouts. $l \to \neg r$
c. You value the truth and you value life. $t \wedge l$
d. But the value of life outranks the value of truth. $(t \to r) < (l \to \neg r)$
e. So, you should not reveal the intended victim's whereabouts. $\neg r$

The precedence premise makes the second default fire first, effectively disarming the first in such a case of conflict. All proper extensions contain $\neg r$.

Handling (31) in ABM requires antecedents conjoining the premises of each lower priority default. That is, where $\delta_n < \cdots < \delta_i$, $\delta_j = A_j \to B_j$ for $i \leq j \leq n$, the premises we need to add in ABM for each such δ_j, $j < n$, are $(A_j \wedge \cdots \wedge A_n) > OB_j$. That renders the the precedence premise above as $(t \wedge l) > O\neg r$, which makes the argument valid.

The strategy handles arguments with more than two defaults:

(32) a. If you value the truth, you should reveal the intended victim's whereabouts. $t \to r$
b. If you value life, you should not reveal the intended victim's whereabouts. $l \to \neg r$
c. But if you value the cause, you should reveal the intended victim's whereabouts. $c \to r$
d. You value the truth, life, and the cause. $t \wedge l \wedge s$
e. The value of life outranks the value of truth. $(t \to r) < (l \to \neg r)$
f. The value of the cause outranks the value of life. $(l \to \neg r) < (c \to r)$
g. So, you should reveal the intended victim's whereabouts. r

Suppose that the intended victim is a significant threat to the cause. (Imagine the Nazi in the closet rather than at the door, for example.) Horty's system, by giving the third premise first priority, leads to the conclusion that you should reveal the intended victim's whereabouts. ABM, using the above strategy, yields the same conclusion:

(33) a. If you value the truth, you should reveal the intended victim's whereabouts. $t > Or$
b. If you value life, you should not reveal the intended victim's whereabouts. $l > O\neg r$
c. But if you value the cause, you should reveal the intended victim's whereabouts. $c > Or$
d. You value the truth, life, and the cause. $t \wedge l \wedge s$

e. The value of life outranks the value of truth. $(l \wedge t) > O\neg r$
f. The value of the cause outranks the value of life. $(t \wedge l \wedge c) > Or$
g. So, you should reveal the intended victim's whereabouts. Or

Here we started with a priority ranking. But ABM turns Horty's approach on its head. Horty gets specificity from a priority ranking. ABM gets a priority ranking from specificity: defaults with stronger antecedents have higher priority.

$((A_1 \wedge \cdots \wedge A_n) > B) \leq ((C_1 \wedge \cdots \wedge C_m) > D)$ iff $C_1, \ldots, C_m \models A_1 \wedge \cdots \wedge A_n$

$((A_1 \wedge \cdots \wedge A_n) > B) < ((C_1 \wedge \cdots \wedge C_m) > D)$ iff $((A_1 \wedge \cdots \wedge A_n) > B) \leq ((C_1 \wedge \cdots \wedge C_m) > D)$ and not $((C_1 \wedge \cdots \wedge C_m) > D) \leq ((A_1 \wedge \cdots \wedge A_n) > B)$.

The strict ordering is irreflexive and transitive, and ABM's respect for specificity guarantees that $(C_1 \wedge \cdots \wedge C_m) > D$ will take precedence over $(A_1 \wedge \cdots \wedge A_n) > B$.

10. Floating Conclusions

The difference between Horty's account and ABM on disjunction leads to a further difference concerning what are known as floating conclusions (Makinson and Schlechta 1991, Horty 2002, Antonelli 2005). The crucial inference on which Horty and ABM differ:

$$A, B, A > C, B > D, \neg(C \wedge D), C > E, D > E, \therefore E.$$

Horty does not obtain the conclusion E, for the same reason he does not get the conclusions of the disjunctive inferences discussed earlier: default logic makes no room for reasoning by cases. This argument form suggests that either the $A \cdots C \cdots E$ path fails or the $B \cdots D \cdots E$ path fails. Horty's theory does not permit the thought that in either case the other path secures the conclusion that E.

Analyzing the argument in ABM produces the test (assuming a counterexample satisfying $\neg(C \wedge D)$ by satisfying $\neg C$ and D):

Counterexample: $A, B, A > C, B > D, \neg(C \wedge D), \neg C, D, C > E, D > E, (C \vee D) > E, \neg E$
Model: $A, B, A > C, B > D, \neg(C \wedge D), \neg C, D, C > E, D > E, (C \vee D) > E, E$

The counterexample produces a gratuitous irregularity on D; both have an irregularity on A. The argument is therefore defeasibly valid.

Horty gives some arguments against floating conclusions. He rejects, for example, the following argument:

(34) a. Your brother says your mother, but not your father, will leave you \$500,000.
b. Your sister says your father, but not your mother, will leave you \$500,000.
c. Your brother is generally reliable: If your brother says your mother, but not your father, will leave you \$500,000, then your mother, but not your father, will leave you \$500,000.

d. Your sister is generally reliable: If your sister says your father, but not your mother, will leave you \$500,000, then your father, but not your mother, will leave you \$500,000.
e. If either your mother or your father will leave you \$500,000, you ought to put down a deposit on a yacht.
f. So, you should place the deposit.

Horty would advise you not to place the deposit, since he is unwilling to conclude from the two facts and the two defaults that either your mother or your father will leave you \$500,000. That may be reasonable, since it is a large sum of money. But it is not clear that it has any bearing on the defeasible validity of the argument. Both siblings say you're going to inherit the half million; one is confused about who is leaving it to you. That uncertainty is likely to make you refrain from acting because the stakes are high enough to warrant seeking additional information.

The argument above, however, has the same form as one involving a \$5 toy yacht. If we change the scale by making the yacht a toy and making the commitment at issue \$5, the worry about who has the story right no longer seems so acute. The conflict among sources in that case should presumably not undermine your conclusion that you should buy the toy. Horty recognizes similar examples (188–189) and conjectures that they have structural features not represented formally that make them acceptable.

I favor an alternative, pragmatic explanation: When the stakes are relatively low, as they generally are, defeasible validity is enough. When the stakes are high, we demand more.

These examples raise a methodological worry: How do you argue against the defeasible validity of an argument? You can argue against deductive validity using counterexamples. But the existence of counterexamples does not show defeasible invalidity. Counterexamples have to be sufficiently plentiful. In constructing them, moreover, you cannot slip in extra premises. Doing so does not refute defeasible validity; arguments can be defeasibly valid but fail in the presence of additional information. Pointing out that Tweety might be a penguin does nothing to undermine the defeasible validity of (2). Nor can you seek additional information, setting aside the question of what follows from the information you have.

Nor can you raise the stakes, so that the intuitive response is to demand a high degree of confidence, something closer to deductive validity. Otherwise this game would be an argument against the defeasible validity of (2):

> "Behind that door is Tweety. Tweety is a bird, and, of course, birds can fly. Your question: 'Can Tweety fly?' If you answer correctly, you win \$1,000,000! If you answer incorrectly, you will be hanged. Now, can Tweety fly?"

That you would decline to play does not count against the defeasible validity of (2). When the stakes are high, defeasible validity tends not to be enough.

There are surely ways of arguing against defeasible validity—no one will defend $A, B > C, \therefore D$ as defeasibly valid—but one must show that counterexamples are sufficiently plentiful without bringing in any additional assumptions or raising the bar contextually so that what is at stake is no longer defeasible validity but something else. That is not easy to do. Horty's argument raises the bar and so fails to undermine the defeasible validity of the argument.

Horty discusses another argument with a floating conclusion (from Reiter 1980, 86):

(35) a. People tend to live where they work. ($\forall x \forall y(Wxy > Lxy)$)[7]
b. They also tend to live with their spouse. ($\forall x \forall y(Ls(x)y > Lxy)$)
c. Mary works in Vancouver. (Wmv)
d. Her spouse works in Toronto. ($Ws(m)t$)
e. So, Mary lives in either Vancouver or Toronto. ($Lmv \vee Lmt$)

As before, Horty rejects the argument.

The floating conclusion seems plausible in this case. But change the scale:

(36) a. People tend to live where they work.
b. They also tend to live with their spouse.
c. Mary works in College Park.
d. Her spouse works in Alexandria.
e. So, Mary lives in either College Park or Alexandria.

That does not seem plausible at all. Horty takes that as evidence that the argument form is not defeasibly valid, a verdict with which his own theory agrees. If so, that would count against ABM, which counts it defeasibly valid. The problem with (36), however, is not with the form of argument but with the first premise. *People tend to live where they work* is true on a large scale that counts metropolitan areas or even larger areas as a single unit, but is simply false when considered on a smaller scale that subdivides metropolitan areas.

There is nevertheless a more serious argument against floating conclusions and reasoning by cases based on the Miners Paradox (Kolodny and MacFarlane 2010). Consider this argument:

(37) a. The miners are trapped in shaft A or in shaft B. ($a \vee b$)
b. If they're in shaft A, we should block shaft A. ($a > Oc$)
c. If they're in shaft B, we ought to block shaft B. ($b > Od$)
d. So, we ought to block shaft A or we ought to block shaft B. ($Oc \vee Od$)

If we do not know where they are, however, this is the wrong conclusion, since blocking the wrong shaft will kill all the trapped miners, while blocking neither shaft will allow us to save nine of the ten miners no matter which shaft they're in. So, this seems to be a case in which ABM yields the wrong result.

From the perspective of any theory of defeasible reasoning, however, this is misleading, for the conclusion we draw is bound to depend on the information upon which it is based. The premises above capture only some of our information about the case. Given solely the premises, it would be reasonable enough to conclude that we ought to block the shaft the miners are in. This is not because *ought* displays any special information sensitivity but because defeasible conclusions are defeasible; they may have to be surrendered in the face of additional information.

So, consider an argument that supplements the above premises with additional information and leads to the opposite conclusion (omitting some arithmetical details):

Miners' Penguin

(38) a. The miners are trapped in shaft A or in shaft B. $a \vee b$
b. If they're in shaft A, we should block shaft A. $a > Oc$
c. If they're in shaft B, we ought to block shaft B. $b > Od$
d. It is not the case that we should block both shaft A and shaft B (we can't). $\neg(Oc \wedge Od)$
e. We do not know (and cannot find out in time) whether the miners are in shaft A or shaft B. $\neg Ka \wedge \neg Kb$
f. If we block shaft A without knowing whether the miners are in shaft A or shaft B, the *expected* number of miners saved is 5—whether they are in A or B. $(a \wedge c \wedge \neg Ka \wedge \neg Kb) > f$; $(b \wedge c \wedge \neg Ka \wedge \neg Kb) > f$
g. If we block shaft B without knowing whether the miners are in shaft A or shaft B, the expected number of miners saved is 5—whether they are in A or B. $(a \wedge d \wedge \neg Ka \wedge \neg Kb) > f$; $(b \wedge d \wedge \neg Ka \wedge \neg Kb) > f$
h. If we block neither shaft A nor shaft B, the expected number of miners saved is nine—whether they are in A or B. $(a \wedge \neg c \wedge \neg d) > n$; $(b \wedge \neg c \wedge \neg d) > n$
i. If the above premises hold, then blocking neither shaft maximizes the expected number of miners saved. $\cdots > ((\neg c \wedge \neg d) > m)$
j. If blocking neither shaft maximizes the expected number of miners saved, we ought to block neither shaft. $((\neg c \wedge \neg d) > m) > O(\neg c \wedge \neg d)$
k. So, we ought to block neither shaft. $O(\neg c \wedge \neg d)$

This is essentially a Penguin inference. The more specific information about what to do if the miners are in shaft A or B, but we don't know which, takes precedence over the less specific information about what to do if they are in shaft A. We thus conclude, defeasibly, that we should block neither shaft. ABM thus gets the right result once we incorporate all information available in the case.

Moreover, obtaining a floating conclusion actually helps in achieving the result. Premises (38)f and (38)g together entail that, if we block either shaft without knowing where the miners are, the expected number of miners saved is five, less than the number we can expect to save if we block neither shaft. Since we cannot block both shafts, our only options are to block A, block B, or neither. Thinking through the problem requires reasoning by cases, something ABM allows but Horty's theory rejects. Once we include all the information we have about the case, then, Horty's theory, by failing to account for reasoning by cases, proves unable to obtain the correct conclusion, or any other conclusion, for that matter. The Miners Paradox thus provides an argument for choosing ABM over Horty's approach.

11. Conclusion

Study of the logic of reasons is still young, and approaches to both normativity and defeasibility vary considerably. I make no claim that ABM is *the* optimal theory of reasons. Horty's theory makes all its assumptions explicit, which is an advantage in many contexts. There are ways of amplifying a default logic approach to solve some of the problems I've outlined here, by adding disjunctive defaults (Gelfond, Lifschitz, Przymusinska, and Truszczynski 1991) or inference rules between defaults (Brewka 1992). There are kinds and features of reasons that neither account so far explains: enticing reasons (Dancy 2004a, 2004b), the role of choice in acting for reasons as evidenced by the Buridan's ass puzzle (Chislenko 2016), or the use of *reason* as both a mass noun (*more reason*) and a count noun (*many reasons*, *every reason*).

ABM moreover incurs some costs. Accounts of defeasible reasoning resting on pivotal-valuation approaches are generally not compact and thus not computable. ABM's disjunction principle, furthermore, is not needed to handle argument by cases, but instead serves to explain specificity inferences without priority rankings. That is attractive, but worries about a generalized deduction theorem, which fails in nonmonotonic logic (Koons 2013), could transfer to the disjunction principle.[8] Finally, a rule-based account might be able to explain the use of *reason* as a count noun by counting rules; ABM has no obvious alternative strategy.

I intend my arguments to point, however, to criteria for an adequate theory. An acceptable theory of reasons should

- account successfully for benchmark problems (e.g., diamond and penguin inferences)
- allow reasoning by cases
- distinguish epistemic from practical reasons
- explain their interaction in chaining inferences
- allow reason statements to function as conclusions as well as premises of arguments
- allow embedding of reason statements
- distinguish wide-scope from narrow-scope obligation
- account for exclusionary reasons
- allow floating conclusions
- allow for a compositional semantics for sentences involving reasons, obligation, and related concepts, including conditionals.

A reasons-first account of practical reasoning could perhaps satisfy these criteria. It could even turn out that rule-based and valuation-based approaches, suitably elaborated, are equivalent. It is possible, however, that no single approach can do everything. Just as there appears to be no single theory of nonmonotonic reasoning, there might be no such thing as *the* logic of reasons. Much work remains to be done.[9]

Notes

[1] Default logic in its original form tests each B_i separately for consistency; some variants, e.g., that of Brewka (1992), test them jointly, that is, test the consistency of $B_1 \wedge \cdots \wedge B_n$. Since I will limit attention to normal defaults in which the only consistency condition is the conclusion itself, the distinction between these two approaches does not matter here.

[2] The idea of stability carries considerable weight. Consider the plainly bad argument $p, q \rightarrow r, r \rightarrow s, \therefore s$. A relevant default theory has the set of facts $W = \{p\}$ and $D = \{q \rightarrow r, r \rightarrow s\}$. $Conclusion(S) = \{r, s\}$, so $W \cup Conclusion(S) = \{p, r, s\} \vdash r$. Thus, $r \rightarrow s$, perhaps counterintuitively, counts as triggered in this scenario. So, r would be a reason for s. But S is not stable, for it does not contain all and only binding defaults; $q \rightarrow r$ is not triggered. Consider then $S' = \{r \rightarrow s\}$. $W \cup Conclusion(S') = \{p, s\}$, which does not entail r, so $r \rightarrow s$ is not triggered in S'. So, S' is not stable either.

[3] Asher and Bonevac (1997) refer to Horty's theory as a "Pope system" for just this reason. One might object that this feature of Horty's system is harmless, since the implication might be thought to be *It ought to be the case that Jim promised to attend*, with the *ought* read epistemically; $T \mid\!\approx OA$ iff $T \mid\!\approx A$ would say merely that one ought to believe the facts. But is such a reading tenable? The *ought* in the conclusion *Jim ought to go* must still be interpreted practically. What could justify the difference?

[4] The original is the *Nixon Diamond*:

(1) a. Quakers are pacifists. ($Qn \rightarrow Pn$)
b. Republicans are not pacifists. ($Rn \rightarrow \neg Pn$)
c. Nixon is a Republican and a Quaker. ($Rn \wedge Qn$)
d. $\therefore$ Nixon is (not) a pacifist.* ($(\neg)Pn$)

Throughout I shall use an asterisk to indicate a conclusion that does not follow. Horty restricts his discussion to this example; he offers no deontic forms of the argument.

[5] The original is *The Penguin Principle*. Again, Horty discusses only non-deontic forms of the inference.

(1) a. Tweety is a bird. (Bt)
b. Birds fly. ($Bt \rightarrow Ft$)
c. Birds that are penguins do not fly. ($(Bt \wedge Pt) \rightarrow \neg Ft$)
d. Tweety is a penguin. (Pt)
e. $\therefore$ Tweety does not fly. ($\neg Ft$)

[6] Suppose the premises hold. Then in particular $f_w[p] \subseteq [Or]$ and $f_w[p \wedge m] \subseteq [O\neg r]$, which entails, given the semantics for O, that $f_w[p \wedge m] \cap f_w[p] = \emptyset$. Since $[p \wedge m] \subseteq [p]$, $f_w[p \wedge m] \subseteq [p]$ by facticity. $[p] = [p \wedge m] \cup [p \wedge \neg m]$. By the disjunction constraint, $f_w[p] \subseteq f_w[p \wedge m] \cup f_w[p \wedge \neg m]$. Since the selected $p \wedge m$ and p worlds are disjoint, $f_w[p] \subseteq f_w[p \wedge \neg m] \subseteq [p \wedge \neg m] \subseteq [\neg m]$. Thus, cases of promising to return borrowed items are normally not cases of promising to return borrowed items to someone intent on mayhem: $p > \neg m$.

[7] Note that Horty's approach can't directly represent the quantified premises of this argument. He would have to represent it using instances, as $Wmv \rightarrow Lmv$; $Ws(m)v \rightarrow Ls(m)v$; $Wmt \rightarrow Lmt$; $Ws(m)t \rightarrow Ls(m)t$; $Ls(m)v > Lmv$; $Ls(m)t > Lmt$; Wmv; $Ws(m)t$; $\therefore Lmv \vee Lmt$. Additionally, for this to instantiate the argument pattern Horty has in mind, we evidently need the premise that no one lives in both Vancouver and Toronto: $\neg(Lmv \wedge Lmt) \wedge \neg(Ls(m)v \wedge Ls(m)t)$.

[8] Simpson's paradox cases (Simpson 1951), in particular, could lead to trouble for the disjunction principle (Neufeld and Horton 1990). To use Simpson's original example, a drug might appear to make no difference to survival rates when we compare the experimental group to the control group, but might improve survival among men, and improve survival among women, if the proportions of men and women vary between the groups. This could appear to be a case in which men are helped, women are helped, but those in the experimental group (men or women) are not helped. How to think about these cases remains unclear.

[9] I delivered an earlier version of this paper at a joint University of Texas at Austin/Universidad Nacional Autónoma de México conference on reasons. I am grateful to David Sosa, Jonathan Dancy, Jonathan Drake, and an anonymous referee for their comments.

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