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MODALS AND TENSE*

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Abstract

Several recent works on modals and tense argue that epistemic modals and similar types of predicates are deprived of temporal properties. This article takes a different stand. Although epistemic modals typically express what may be dubbed "unchanging truths", there exist examples to demonstrate that these types of predicates are still *able* to express a shift in temporal reference. This being the case, epistemic modals cannot be "outside the scope of tense altogether", as claimed by Cinque (1999) and many others. This is as expected on the tense system I outline here, since I defend the idea that any verb is inherently temporal; specifically, that every verb contains a tense element, partaking in a temporal chain where only the topmost member is finite; the remaining members are non-finite. By means of this system, I investigate the temporal construal of root and epistemic modal constructions.

1. Introduction

My point of departure in this article is the set of data in (1). It has often been observed in the literature on modals that a modal preceding a perfective auxiliary (*ha* 'have') gets an epistemic reading, cf. the Norwegian data in (1). However, what has received less attention is the fact that one can facilitate a root reading of a modal followed by a perfective auxiliary by means of an adverbial (sentence) denoting a point in the future; cf. (1 b). If this adverbial denotes a time in the past, the reading of the modal is once again epistemic; cf. (1c).

(1) a. Jon må ha spist. **Epistemic**
Jon must have eaten
'Jon must have eaten'

b. Jon må ha spist før han kommer. **Root**
Jon must have eaten before he arrives
'John must have eaten before he arrives'

c. Jon må ha spist før han kom. **Epistemic**
Jon must have eaten before he arrived
'John must have eaten before he arrived'

The alternating (natural) interpretation of the modal is accompanied by a shift in temporal construal of the modal construction. Specifically, a reading where the main predicate is construed as 'future' with respect to the modal's evaluation time facilitates the root reading of the modal, whereas a construal of the main predicate as 'past' with respect to the modal's evaluation time forces an epistemic reading of the modal. The particular temporal construal of a modal construction is dependent on various factors, e.g. aspectual properties of the

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predicates involved, the nature of the subject (e.g. specific vs. generic) and the presence of temporal adverbials[1], the latter is illustrated in (1).
In this article, I attempt to explain some essential temporal properties of modal constructions in Norwegian, while entertaining the assumption that the conclusions are valid for several other Germanic languages. A perhaps more modest goal is to explain the pattern of readings examplified in (1). As a means to this end, I need an adequate theory about how the tense system works in (at least some) Germanic languages, examplified by Norwegian, since this is my native language. Since I have found no theory about tense which fully serves my purpose, I propose an alternative tense system where tense semantics is inherent in, but underspecified by the morphological markers of each and every verb, finite and non-finite. In this system, tense is not simply an operator with sentential scope. Instead, temporal relations are construed compositionally, by combining the tense elements which reside in every verb.

The article is organized as follows. In section 2, I discuss some recent proposals on modals and tense. Section 3 is concerned with the temporal properties of the modal in a modal construction, focussing on epistemic modals. Section 4 investigates the temporal properties of the modal's complement, and finally, section 5 outlines the alternative tense system and its capability to explain the data at hand.

2. Some recent proposals

Cinque (1999) proposes that there exists a universal hierarchy of functional projections, where each projection has its specific semantic features. In this hierarchy, epistemic modality resides in a projection high in a clausal structure; root modalities are lower in the hierarchy. Tense, also expressed by separate projections, resides lower than epistemic modality, but higher than root modality[2]. Cinque supports this claim with data such as (2):

(2) a. A ben kan nyan. b. A kan ben e nyan. (Sranan, Surinam)
he PAST can eat. he may PAST PROG eat
'He could eat. 'He may have been eating.'

The modal particle *kan* 'may' sometimes surfaces to the right of the tense particle *ben* 'past' (as in 2a), in which case the modal particle gets a root reading. When the modal particle occurs to the left of the tense particle, as in (2b), the modal particle gets an epistemic reading. Cinque claims that these (and other) data strongly suggest that tense scopes over root modalities, whereas epistemic modality scopes over tense. Thus, epistemic modality is "outside the scope of [...] tense altogether" (p.79), and the once-and-for-all ordering of modals w.r.t. tense is the one in (3):

(3) $\text{Modal}_{\text{epistemic}} > \text{Tense} > \text{Modal}_{\text{Root}}$

Stowell (2000) adheres to these assumptions about the relative scopal ordering between epistemic modals, tense and root modals, and he adds:

[1] Purpose clauses function in a similar manner, i.e. when added to a modal construction, they facilitate a deontic reading of a modal construction which would otherwise give rise to an epistemic reading.
[2] In fact, Cinque proposes three different projections for tense: T(Past), T(Future) and T(Anterior), the latter is placed lower in the hierarchy than root modality. However, Cinque mentions (p. 73) that "it is not easy to tell apart anterior tense from perfect aspect", which indicates that this is a tense very different from the other two, which is one reason for discarding this T-head in this discussion. More importantly, T(anterior) does not seem to play any significant part in Cinque's own discussion on the hierarchical ordering of tense and modalities.

> These generalizations hold regardless of the syntactic ordering relation of tense/modal pairs within a single clause; thus we encounter cases of tense/modal reversal, where the modal is syntactically subordinate to the tense but is obligatorily construed above it [...]. This is suggestive of a logical (LF?) checking domain for the epistemic modals above the tense (LF modal movement?).

Iatridou (1990), investigating what she dubs "metaphysical predicates", could be considered another exponent for this line of thought. "Metaphysical predicates" are predicates of possibility and probability, i.e. predicates which are semantically very similar to (at least some) epistemic modals. Iatridou observes that metaphysical predicates, unlike predicates like *evident*, are incompatible with past and future tenses; cf. (4).

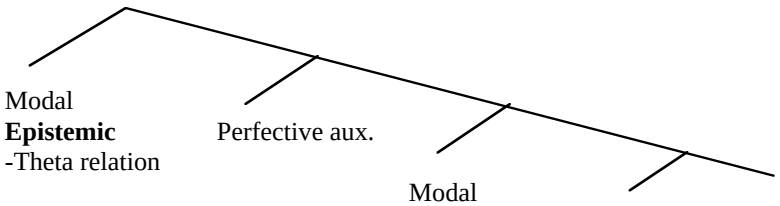
(4) a. It was/will be evident that John stole the tapes.
b. * It was/will be possible that John stole the tapes.

Iatridou concludes that metaphysical predicates "lack a time variable", they are "temporally independent" and "incompatible with [real] tense". Their apparent tense marking is "pleonastic" and is not semantically interpreted. Fagan (2001) exploits Iatridou's hypotheses to account for the often made observation that an epistemic modal does not occur in the perfect. The perfect involves temporal alteration (in the words of Dyvik 1999, the perfect is "a relative past tense"), and epistemic modality is incompatible with temporal alteration. This follows if epistemic modals lack a time variable. "The [epistemic] modality simply cannot be tensed. The perfect of the [epistemic] modal [...] is therefore impossible " (p. 19), and the only reading of the modal in (5) is the root reading.

(5) Er hat noch auf dem Sportplatz sein können.
'He was still able to be on the sport field'

A number of authors have made this observation, that a modal following a perfect auxiliary gets a root reading, never an epistemic reading. On the other hand, a modal *preceding* a perfect auxiliary, (typically) does get an epistemic reading, cf. e.g. Picallo (1990) for Catalan, Barbiers (1995) for Dutch, Dyvik (1999) for Norwegian, Wurmbrand (2001) for German. These authors, working within various generative frameworks, explain this effect to syntactic ordering principles, summed up and depicted as in (6) (note that not all of these authors make all these claims, but all authors make some of the claims).

(6)



a.	*må*	*ha*	*kunnet*	*spille* (piano)
	must	have	canPERF	play the piano
	'must have been able to play the piano'			
b.		*har*	*måttet*	*spille* (piano)
		has	must PERF	play the piano
	'has been obliged to play the piano'			

Finally, we note another widespread assumption about epistemic modals and their combination with tense, namely the assumption that epistemic modals cannot occur in the

infinitive, cf. e.g. Plank (1984), van Kemenade (1985), Vikner (1988), Denison (1993). Thus, it would seem that epistemic modals are subject to a finiteness-requirement, since they cannot appear in the perfect (according to the claims above) and neither in the infinitive.To sum up, the assumptions about modals and tense reported in this section are the following.

(7) **I.** Epistemic modals are outside the scope of tense/lack a time variable;
thus, they are incompatible with non-pleonastic tense and temporal alteration.
II. Epistemic modals never occur in the perfect,
thus, a modal following a perfect inevitably gets a root reading.
III. A modal preceding a perfect auxiliary gets an epistemic reading.
IV. Epistemic modals never occur in the infinitive,
which, along with **II**, is to say that they are subject to a finiteness requirement.

Now, I will present evidence showing that neither of these assumptions holds without exception for Norwegian.

3. Temporal properties of the modal

We start out by examining point IV in (7), the claim that epistemic modals do not occur in the infinitive. Although this is true for a great number of sentences in Norwegian, there exist data showing that this cannot be a *universal* restriction on epistemic modals. When embedded under a predicate of reporting, claiming, believing, assuming etc., Norwegian epistemic modals are in fact quite comfortable in non-finite embedded contexts. That is, infinitival modals may very well get an epistemic reading in Norwegian, which is the case in (8):

(8) a. Marit påstås å skulle være morderen.
Marit claimPASS to shall be the killer
'Marit is claimed to be supposed to be the killer.'

b. Jon antas å måtte være ungkar.
Jon supposePASS to must be bachelor
'Jon is supposed to have to be a bachelor.'

c. Ti tusener blir rapportert å kunne være drept.
Ten thousands reportedPASS to may be killed
'Tens of thousands are reported to possibly have been killed.'

Point III in (7) states that a modal preceding a perfect auxiliary gets an epistemic reading. However, root readings of modals preceding a perfect auxiliary are in fact quite common, as noted by a several authors arguing against this widespread claim. As noted in section 1, the root reading is facilitated if the sentence contains an adverbial (sentence) denoting a point in the future, seen from the modal's evaluation time.

(9) a. Du bør ha gjort ferdig leksene dine før du går på kino. (Norwegian)
you should have done finished homework yours before you go to movies
' You ought to have finished your homework before going to the movies.'

b. Jan moet morgen zijn kamer opgeruimd hebben (Dutch; Barbiers 1995)
John must tomorrow his room cleaned have
'John must have cleaned his room (by) tomorrow.'

c. Students must have taken calculus by the start of their senior year. (Brennan 1997)

Point II in (7) regards the claim is that it is impossible to get an epistemic reading of a modal in the perfect, a pattern which seems to hold for many languages examined. However, not even this widely attested incompatibility constitutes a universal restriction, since non-standard Norwegian dialects allow for an epistemic reading of the modal even in the perfect; cf. (10 a-b). Likewise, examples that go against this restriction are found in Danish, cf. (10 c-d[3]).

(10) a. Han har måtta arbeidd med det i heile natt.
he has mustPERF workPERF on it in all night
' He must have worked on it all night through.'

b. Hu har kunna vorre her og forre igjen.
she has canPERF bePERF here and leavePERF again
'She may have been here and left again.'

c. Han har skullet bo i Århus.
he has shallPERF liveINF in Århus
'He is said to have lived in Århus'

d. Der har måske nok kunnet være tale om en fejl.
there has maybe PTL canPERF be talk of a mistake
'It might have been a mistake'

The claim stated in point I in (7) is not so easily dismissed. Recall that this is the claim that epistemic modals are outside the scope of tense/lack a time variable, that they are incompatible with non-pleonastic tense and resist temporal alteration, just like (Iatridou's) metaphysical predicates (cf. 11c)[4]. Thus, as predicted, the modals *måtte* in (11a) and *skulle* in (11b) have root readings only.

(11) a. Marit vil måtte være på kontoret.
Marit will must-INF be in office-DEF
'Marit will have to be in her office'; root reading only of *måtte*'.

b. Hovmesteren skulle være morderen.
Butler-DEF supposed-to-PAST be the killer
'The butler was supposed to be the killer'; root reading only of *skulle*'
(unless Sequence-of-Tenses).

c. *It was/will be possible/probable that John stole the tapes.

However, there exist contexts where epistemic modals and metaphysical predicates accept the preterite. These are Sequence-of-Tenses (SoT) contexts, where the past marking is imposed on the predicate from its surroundings, e.g. in reported speech or narrative.

(12) a. Marit påstod at Jon måtte være morderen.

[3] These examples are taken from Vikner (1988), who ascribe these data to Davidsen-Nielsen (1988). Although Vikner describes this phenomenon as "misplaced perfect", where the perfect semantically belongs to the main verb, he admits that these examples exists, and that they are "not completely unacceptable".
[4] Generic sentences are also very similar with regard to temporal properties; cf. Eide (2002).

Marit claimed that Jon mustPAST be killer-DEF.
'Marit claimed that Jon had to be the killer'

b. Colombo said that it was possible that John had stolen the tapes.

According to Iatridou (1990), these examples do not constitute counterevidence to her generalization that metaphysical predicates are temporally independent; cf. also Fagan (2001) who extends this generalization to epistemic modals. The embedded tense in SoT is not an instance of "real" tense, Iatridou says, because the embedded tense is irrelevant to anchoring the embedded clause in time. Thus, the claim remains that the tense marking on epistemic modals is always pleonastic and not assigned a semantic interpretation.

Now, if we can make a case for the idea that the embedded past in SoT is a "real" tense, i.e. a tense involving temporal alteration, this would imply that epistemic modals, like generic sentences and metaphysical predicates, are *not* opaque to temporal alteration. If this is tenable, then epistemic modals cannot be "outside the scope of [...] tense altoghether" (Cinque 1999, Stowell 2000, Roberts and Roussou 2000), or deprived of a time variable (Iatridou 1990, Fagan 2001).

Firstly, we exploit Enç (1987), who objects to the assumption that the embedded past tense marking in SoT contexts is pleonastic, i.e. that "the semantics is blind to the past" and that the SoT rule simply involves a morphological copying of the matrix past onto the complement predicate. If this were merely a morphological copying, she says, how come

(13) a. this rule only affects past-present pairs, not present-past?
b. this rule is optional?
c. The a-and b-versions in (14) are not synonymous? If the Sequence-of -Tenses rule is semantically vacuous, how come it has interpretational effects?

(14) a. John heard that Mary was pregnant.
b. John heard that Mary is pregnant.

Comrie (1985) suggests that the present tense on the complement clause in such cases, unlike the past tense, signals that the complement proposition has present relevance. Enç sets out to make this notion more precise. She says that the present tense on the complement forces the embedded proposition to be evaluated at the speech time (S)[5], whereas the past tense on the complement temporally relates the complement proposition to the matrix past[6]. This past-past relation has two possible interpretations. Either the embedded past is interpreted as simultaneous with the matrix past (e.g. for (14a), Mary could still be pregnant at the time when John heard about it), or the embedded past is interpreted as prior to the matrix past (John heard that Mary had been pregnant). The latter is what is referred to as the "shifted reading". In either case, the semantics has to "see" the past tense on the complement clause; hence, the past marking on the complement clause cannot be semantically vacuous.

I adopt Enç's arguments and proposals referred above, with one slight modification. I agree that the embedded present signals that the embedded proposition should be evaluated at the speech time S, whereas the embedded past signals that the proposition should be evaluated at some time previous to S. In Enç's proposal, this previous time is inevitably related to the

[5] That is, in languages like English, and unlike languages like Russian, where the present tense on the complement clause may denote a pont in time simultaneous to the matrix past.
[6] In fact, Enç's proposal is much more complex. She defends the view that "complement tenses are not directly linked to the speech time [...]. Instead, they are linked to higher tenses[...]" (p.642). Thus, the embedded tense is in fact never directly linked to S, only indirectly, either the embedded tense is present or past.

matrix past. This is where we diverge. Instead, I assume that the embedded past does *not* establish a fixed temporal relation to the matrix past, only a temporal relation to the speech time S. This relation is the relation 'past with respect to S', just like a matrix past. The temporal relation between the embedded past and the matrix past is established on conceptual grounds; not by the morphologically encoded tense system.

Enç herself mentions that an embedded past may be construed as 'simultaneous' or 'previous' to the matrix past, depending on the aspectual nature of the embedded predicate. If this predicate is stative, a simultaneous reading is possible, whereas a non-stative predicate forces a "shifted reading". It seems unlikely to me that the morphologically encoded tense system should make reference to the aspect and aktionsart of the predicates involved. Moreover, in addition to the shifted reading and the 'simultaneous' reading of the embedded past, it is also possible to force a 'future' construal of the embedded past; i.e. a reading where the embedded event is in the future with respect to the matrix event, cf. (17):

(15) Jon er en stor spåmann. Han forutså at du strøk på prøven.
Jon is a great fortune teller. He predicted that you failed testDEF
'Jon is a great fortune teller. He predicted that you would fail the test.'

The only natural reading of (15) is the one where your failing the test is in the future, seen from the matrix prediction-event, because otherwise it would not have been a prediction. I admit that the more natural way of expressing this would be to equip the embedded clause with a future marker, typically the modal *ville* 'would'. However, even if (15) is a more marginal way of expressing this, it is not an unacceptable or ungrammatical way.

Thus, an embedded past under a matrix past does not force any particular temporal ordering of the two events. This relation can be construed as all three logically possible relations between two events, namely e_1 as simultaneous to e_2, e_1 as previous to e_2, and e_1 as subsequent to e_2. It depends on the predicates involved how we conceptualize this relation. We conclude that this is not a relation imposed by the morphologically encoded tense system.

Instead, we exploit Farkas (1992), who proposes that for the interpretation of argument clauses, truth has to be relativized to worlds and individuals. Thus, propositions must be "individually anchored"(cf. also Quer 1998), i.e. true according to some specific individual's model of the actual world. For the proposition expressed by a matrix clause, this individual anchor is typically the speaker, unless another anchor is implied by context. For an embedded proposition, the individual anchor is typically explicitly mentioned in the matrix clause, but not necessarily (e.g. *It is often said that* p). We extend this idea to tense marking, and suggest that even the tense marking is important to pick out the relevant model of the actual world, the model according to which the truth of a proposition should be evaluated. We propose the following. By endowing the embedded clause with past tense, the speaker signals that the proposition expressed by this embedded sentence belongs to *some individual's belief system at some previous point in time*, without asserting anything about this individual's belief system at the present point in time. Present tense marking in a clause embedded under a matrix past signals that the speaker has reason to believe that *the proposition belongs to some individual's current model of the actual world*. Hence the following contrast:

(16) a. #Jeg trodde at Jon må være morderen, men det tror jeg ikke lenger.
I believed that Jon must be the killer, but that believe I not longer
'I believed that Jon must be the killer, but I no longer believe that.'

b. I trodde at Jon måtte være morderen, men det tror jeg ikke lenger.
I believed that Jon mustPAST be the killer, but that believe I not longer

I believed that Jon had to be the killer, but I no longer believe that.'

Note that the epistemic reading of the modal *måtte* 'must' is the natural reading. That past tense signals a previous model of the world is also evident in (17), embedded in the following context. Say we have the opportunity to study the records of the police inspector investigating the killings of Jack the Ripper in the 19th century, and we utter (17).

(17) a. Notatene viser at prinsen godt kunne/#kan være Jack the Ripper.
The records indicate that the prince could/??may be Jack the Ripper'

b. Noen av utsagnene tilsier at prinsen faktisk måtte/#må være Jack.
'Some of the statements suggest that the prince actually had to/??must be Jack'

The matrix tense here is the present, and still the past seems more natural in the embedded sentence, because it signals a previous model of the world, that of the police inspector who wrote these records, and the witnesses interviewed[7]. Importantly, the epistemic modals have the past reading, not the present hypothetical reading often possible with a preterite modal.

If these ideas have some merit, we must conclude that embedded pasts in SoT are "real" tenses. They do anchor the embedded proposition w.r.t. the moment of utterance S, in signalling whether the reported proposition belongs to a present model of the world or some previous model of the world. If so, then metaphysical predicates and epistemic modals are subject to temporal alteration, contrary to the claim in (7), point I.

However, it is still a valid generalization that these types of predicates are *reluctant* to undergo temporal alteration. Epistemic modals and metaphysical predicates are "predicates of propositions"(e.g. Iatridou 1990) and "qualify a truth value" (Platzack 1979). That is, these predicates deal with what is ontologically possible or necessary given an individual's model of the actual world. If this model is a *coherent* model of the actual world, what is construed as 'possible' or 'necessary' is not likely to switch value from one moment to another. Thus, to utter (18a) truthfully, the speaker has to admit that his own present model of the world is an unreliable one, a contradiction resembling Moore's Paradox[8].

(18) a. It will be possible that John is the killer.

b. Yesterday, it was probable that Mary was the killer.

c. I går måtte hovmesteren være morderen.
yesterday mustPRET butler-DEF be killer-DEF
'Yesterday, the butler had to be the killer'

d. I morgen vil Marit kunne være morderen.
tomorrow will Mary canINF be killer-DEF
'Tomorrow, Mary will be a potential killer'

On the other hand, if we could construct new models of the universe from one day to the next, like an author constructing a fictional universe, temporal alteration of metaphysical modalities (cf. (18 a-b)) and epistemic modals (cf. (18 c-d)) would be possible. Say an author is talking

[7] Another possible construction would be a present or past modal with the embedded perfect, *at prinsen godt kan / kunne ha vært Jack* 'that the prince may/might have been Jack', or the "historic present".
[8] Which regards the anomalic character of sentences like *The cat is on the mat, but I don't believe it.*

about his working on a novel, where he is free to change the novel's universe so as to entail a different set of contingent possibilities. In that case, (18 a-d) would all be possible utterances[9].

This section has focussed on the temporal properties of *epistemic* modals and similar predicate-types. As for root modals, Norwegian (like German) modals have all tense forms found with lexical verbs, and their temporal behaviour resembles that of other verbs[10].

4. Temporal properties of the complement.

Modals in Norwegian, like modals in other Germanic languages, take infinitival complements. These complements are bare infinitivals, without an infinitival marker[11]. A special case of an infinitival complement is the perfect construction, where the perfect auxiliary is an infinitive, which in turn takes a past participle as its complement[12]. In addition, Norwegian root modals, like their German counterparts, take non-verbal[13] complements with a directional reading, formally realized as preposition phrases or adverb phrases[14]. The format of this paper does not allow me to discuss the latter type of complements, but cf. Eide (2002).

In the group of epistemic modals, one member shows a special behaviour. This is the modal *ville* 'will', which has the reading 'prediction'. This particular epistemic modal is always "future-projecting", i.e. its complement has a 'future' reading. Other epistemic modals may have a future-projecting reading as well, but these other epistemic modals may also take complements with past or present readings. Not so for *ville.*

Like the epistemic *ville*, root modals are always future-projecting. Their complement refers to a future situation, which may in fact already hold at the modal's evaluation time. Thus, it is possible to utter *This door must be kept closed* in a situation where the door is already (kept) closed. However, the present situation is irrelevant for a root modal; its complement always refers to a future situation. This is a consequence of their semantics. A root modal denotes e.g. that a rational agent X requires/intends/wants/needs/permits Y to hold, where Y is a situation subsequent to the evaluation time of the root modal. A requirement/intention/will/need or permission cannot possibly influence on things that have already occurred. I.e. although I might have wanted my permitting John to have arrived before S to be able to alter the actual events taking place, this is not possible in reality (except in jocular contexs). In the words of Lyons (1977: 843):

> *John may have come yesterday* construed as a permission-granting utterance is semantically anomalous for the same reason that *Come yesterday, John!* is anomalous.

This generalization that only epistemic modals take complements with a 'present' or 'past' construal, whereas root modals take 'future' complements, can be depicted in the following

[9] And once again we find a parallel in generic sentences, e.g. *Hvaler var fisk før, men nå har de vært pattedyr lenge,*' 'Whales used to be fish, but they have been mammals for a long time now.' Note that the natural reading of the sentence is that our model of the world has changed, not the world itself.

[10] Exceptions: Modals do not have present participles, only two of them passivize (*kunne* 'can' and *ville* 'want', and only one modal (*kunne*) occurs in the imperative.

[11] There exist some exceptions to this generalization in Norwegian, since some root modals take complements with the infinitival marker under special cicumstances; cf. Eide (2002).

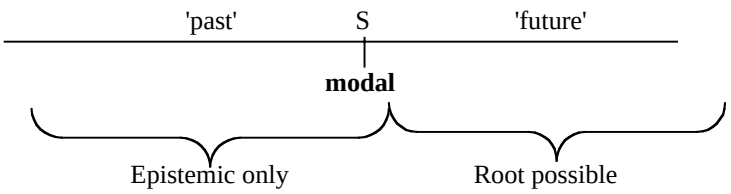
[12] Even here there exists a special case in Norwegian (and Swedish), the phenomenon known as "have-omission", where the perfect auxiliary is omitted. I will not go into this construction here, since it has a counterfactual rather than a temporal reading, cf. e.g Taraldsen (1984).

[13] Although van Riemsdijk (2002), armed with evidence from a range of Germanic languages, argues that these constructions are in fact verbal after all, with a silent infinitive verb GO.

[14] In Dutch, we even find adjectival phrases as such complements, but not in Norwegian or German.

figure, where ‘past’ and ‘future’ regards the temporal construal of the complement. To simplify the the matters, we have set the modal’s evaluation time to be S (the speech time):

(19)



The (non-perfect) infinitival complement of a modal has two possible temporal readings. Either it is construed as future, seen from the modal’s evaluation time – this is always the case with the complement of root modals – or it is construed as ‘simultaneous’ with the modal. The latter is typically the case with epistemic modals. Now, the aspectual properties of the complement is also very important. If the infinitive is a dynamic verb, the ‘future’ construal is the natural one. On the other hand, if the complement is (construed as[15]) stative, the simultaneous reading becomes possible (and thus, the epistemic reading of the modal):

(20) a. Du må bli arkitekt. **Root** (more natural)
you must become architect
‘You must become an architect.’

b. Du må være arkitekt. **Epistemic** (more natural)
you must be architect
‘You must be an architect.’

A perfect complement of a modal is often interpreted as ‘relative past’, seen from the modal’s evaluation time. However, we have seen (in section 1) that the perfect complement of a modal can be read as ‘future’, if we add an adverbial (sentence) denoting a future point in time:

(21) a. Jon må ha spist. **Epistemic**
Jon must have eaten
'Jon must have eaten'

b. Jon må ha spist før han kommer. **Root**
Jon must have eaten before he arrives
'John must have eaten before he arrives'

That is, there resides an ambiguity in the perfect complement of a modal, since the main predicate can be construed as ‘past’ or ‘future’ seen from the modal’s evaluation time (here, S), just like there resides an ambiguity in the infinitival form, allowing the infintive to be construed as ‘present’ or ‘future’.

5. A compositional tense system

In this section, I propose a tense system which is able to explain the facts about possible temporal construals of (Norwegian) modal constructions as presented in sections 1, 3 and 4. Initially, we will make the following assumptions:

(22) I. Tense elements, expressed by tense affixes, express dyadic relations of temporal

[15] Including habitual, iterative and progressive construals of otherwise dynamic verbs.

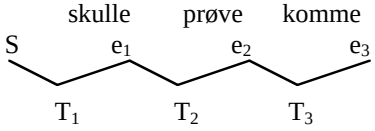
ordering. Each tense element establishes a temporal ordering between two *events*, where the speech event *S*[16] may be one of these events.
II. Any verbal predicate (in Norwegian) contains a tense element; i.e. there are no untensed verbs in Norwegian (except present participles, which are adjectives).
III. Any verbal predicate (in Norwegian) contains an event argument, which is temporally anchored to S, if the verb is finite, and to the previous verb, if it is non-finite. This event-argument also serves as the first argument of the tense element contained in the next verb.
IV. Finite tense elements relate to S, whereas non-finite tense elements relate to the event-argument of the preceding verb.

To exemplify, a sentence like (23) contains three verbal predicates, thus it contains three tense elements, hence three temporal relations. Each relation specifies the temporal ordering of two events – which means that there are four events in all, since S constitutes the topmost event. Thus, these three verbal predicates constitute a tense-chain with four links, with S as the topmost or left-most link in the tense-chain. Note that e.g. *skulle* is shorthand for the tense-element [+PAST, +FINITE] expressed by the preterite form *skulle:*

(23) e_1 e_2 e_3
Marit skulle prøve å komme.--> *skulle* (S, e_1), *prøve* (e_1, e_2), *komme* (e_2, e_3)
Marit should try to come
'Marit would try to come.'

Each verb contains an event argument and a tense element, and each tense element anchors the event argument of its own verb to the preceding event, as depicted in (24).

(24)



We have yet to answer *what* temporal relation is established between the two events. This depends on the tense element at hand. As argued in Eide (2002), Norwegian employs only a past/non-past distinction in its tense system (cf. also Comrie 1985, where he claims that this is the case for a great number of European languages). In addition, the tense elements are specified as to whether they are finite or non-finite. This gives us the following table of Norwegian verb forms and their inherent tense-elements:

(25)

	+Finite	-Finite
+Past	**preterite**	**participle**
-Past	**present**	**infinitive**

[16] We employ the term S for the speech event, although Reichenbach uses this term to refer to the speech *time*.

There are two pieces of information encoded in these tense elements, [+/- PAST] and [+/- FIN(ite)]. [+FIN] encodes that S is the first argument of the tense element, and [–FIN] means that the first argument is the event of the preceding verb. [+PAST] encodes that the first argument is temporally subsequent to the second argument, e.g. ($S > e_1$); S is after the event encoded by the leftmost verb. A non-past relation is a negation of this relation; i.e. "the first argument is *not* subsequent to the second argument"; e.g. $\neg(S > e_{LIKE})$ in (26b). $\neg(S > e_{LIKE})$ thus means that S is either simultaneous or previous to the like-event, which is another way of saying that the like-event, in principle, could be 'future' or 'present' with respect to S. Now, since a non-past tense element encodes simultaneity as well as future, the aspectual properties of the predicates involved are crucial to specify temporal relations in this underspecified tense system. Thus, dynamic non-past predicates typically give rise to a future reading (cf. 26a), whereas stative non-past predicates give rise to a 'present' reading (26b).

(26) a. Marit kommer. *kommer* [-PAST,+FIN] $\neg$ ($S > e_{KOMME}$)
'Marit comesPRES.'

b. Marit liker Jon. *liker* [-PAST,+FIN] $\neg$ ($S > e_{LIKE}$)
'Marit likesPRES John.'

The tense element does not carry any information about whether the temporal relation is 'future' or 'present', only that this is a non-past relation; hence, the matrices of the tense elements in (26a) and (26b) are identical. However, as a default strategy, a dynamic predicate is construed as 'future', whereas a stative predicate is construed as 'present'. Now, a stative predicate with a non-past tense element, which is typically construed as 'present', may be forced to encode 'future' by means of an adverbial denoting a point in the future. This is the case, for instance, in (27) below:

(27) a. Jon spiser. *spiser* [-PAST,+FIN] $\neg$ ($S > e_{SPISE}$)
'Jon eatPRES'
'Jon is eating.'

b. Jon spiser når han kommer. *spiser* [-PAST,+FIN] $\neg$ ($S > e_{SPISE}$)
Jon eatPRES when he arrivePRES
'Jon will eat when he arrives.'

The 'future-adverbial' overrides the default strategy (assign a 'present' reading to the stative predicate), and the future construal of the predicate is the result[17].

We find exactly the same pattern when we look at the non-finite version of the non-past, the infinitive. A non-finite tense element takes as its first argument the event argument of the preceding verb, and the infintive is typically construed as 'future' w.r.t. the preceding verb, if the infinitive is a dynamic predicate. A stative infinitive is typically construed as 'present' w.r.t. the preceding verb, unless a 'future-adverbial' is added. Notice how the 'present' construal of the infinitive yields the epistemic reading of the modal, whereas the 'future' reading of the infinitive facilitates the root reading (recall the figure in 19).

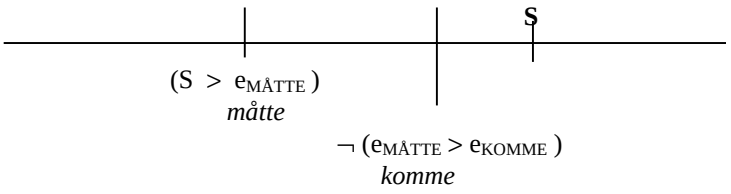
[17] It is also possible to force a present reading of a dynamic predicate, e.g. by adding adverbials forcing a habitual or progressive (i.e. in some sense stative) construal of the dynamic predicate. Since the data in (1) are the focus of interest here, I will not have time to go into these cases.

(28) a. Marit må komme. *komme* [-PAST,-FIN] $\neg$ ($e_{MÅ} > e_{KOMME}$)
'Marit must come.'

b. Jon må være på kontoret (før ni). *være* [-PAST,-FIN] $\neg$ ($e_{MÅ} > e_{VÆRE}$)
'Marit must be in his office (before nine).'

Now, for the two tense elements encoding past-relations, the preterite and the past participle, the aspectual properties do not seem to play the same part in determining temporal relations[18]. The preterite tense element encodes [+PAST, +FIN], which means that it establishes a past relation between its two arguments, where the first argument is S. The preterite version of (28a) *Marit måtte komme* 'Marit had to come' would simply move the whole construction back in time:

(29)

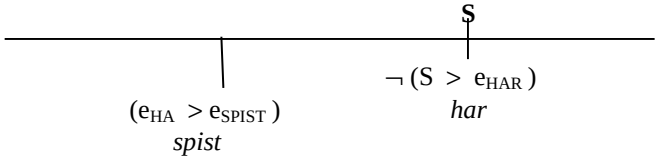


Note that the figure has simplified the non-past relation, placing the come-event in the past, seen from S. But in reality, the come-event could be e.g. future or present w.r.t. S, because all that is encoded by the infinitive tense element is that the event described by this infinitive is 'non-past', seen from the preceding verb. In principle, there is no limit to e.g. how far into the future the come-event could be, e.g. *Marit måtte komme tilbake om femti år* 'Marit had to come back in fifty years'.

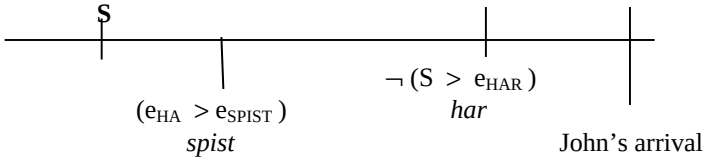
Now, to the participle. The participle is [+PAST, -FIN] which means that it establishes a 'past-relation' between the preceding verb and the event encoded by the participle. For a participle in a perfect construction, the preceding verb is the auxiliary *ha* 'have'. Thus, the participle is 'past w.r.t. *ha*'. *Ha* is a stative verb, and we know that a stative verb is typically construed as 'present', unless a future-adverbial overrides this default interpretation rule and forces the stative verb into a 'future reading'. This is what happens in (30), and the two temporal construals are depicted in (31) and (32):

(30) Jon har spist (når han kommer).
'John has eaten (when he arrives)'.

(31)



(32)



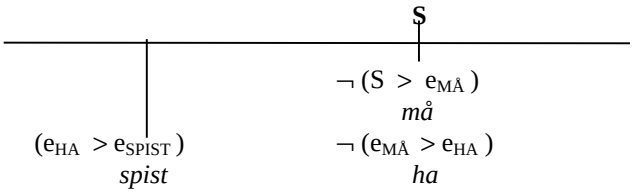
[18] Except for determining the specific pragmatically-based reading of e.g. the perfect. For instance, "the Perfect of Result" is only possible with telic predicates. However, I agree with Julien (2001:148) that the various perfects "are all identical as far as grammar is concerned".

The two construals can be paraphrased as follows. (31): At present, there exists a state (encoded by *har*) consisting in the aftermath of an eating-event, and this event is past w.r.t. *har*. (32): By the time of John's arrival, there will exist a state consisting in the aftermath of an eating-event, and this event is past w.r.t. *har*.

When a perfect is embedded under a modal, the auxiliary *ha* has the form of an infinitive. The infinitive is a non-past, and it has the same properties as the present, except that the infinitive takes the event of the preceding verb as its first tense-argument, whereas the present takes the speech event S as its first tense-argument. As we saw above, the 'present' vs. 'future' construals obey the same rules in both cases; dynamic predicates are typically read as 'future', whereas statives are construed as 'present', unless forced to encode 'future', e.g. by an adverbial. Now, let us turn to the data in (1), repeated here as (33), (35) and (37).

(33) Jon må ha spist. *ha* [-PAST, -FIN] $\neg (e_{MÅ} > e_{HA})$ &
'Jon must have eaten' *spist* [+PAST,-FIN] $(e_{HA} > e_{SPIST})$

(34)

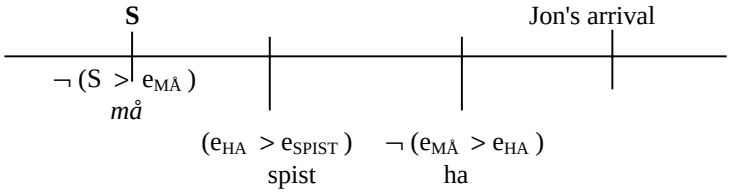


The modal *må* 'must' is present, hence non-past w.r.t. S. Modals are statives, and by default, *må* is construed as 'present', not 'future'. The auxiliary *ha* 'have' is infinitive, hence, non-past w.r.t. the preceding verb, i.e. *må*. *Ha* is also a stative, hence simultaneous with *må* by the same default rule. The participle *spist* 'eaten' is past w.r.t. *ha*, and since *ha* is interpreted as simultaneous to *må*, which is simultaneous to S, the eating-event must be in the past, seen from S. This means that the only possible reading of the modal is the epistemic reading.

In (35), this is different. Note that this is essentially the same case as (32), except that one more verb (the modal) is involved.

(35) Jon må ha spist før han kommer *ha*[-PAST, -FIN] $\neg (e_{MÅ} > e_{HA})$ &
'John must have eaten before he arrives' *spist* [+PAST,-FIN] $(e_{HA} > e_{SPIST})$

(36)

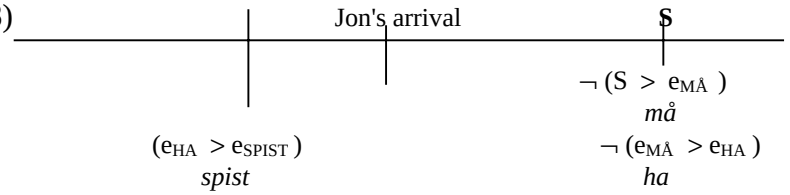


Here, the default rule giving the 'present' construal of the stative *ha* is overridden by the presence of the future-denoting adverbial. Thus, *ha* is forced into a 'future' interpretation, and the participle tags along. The participle is past w.r.t. *ha*, and a future construal of the auxiliary *ha* makes possible a reading where even the eating-event is in the future, seen from S. However, (36) once again simplifies the possible construals, since in principle there is no limit as to how far back into the past the eating-event is construed. The tense element encoded in the participle simply dictates that the participle is past w.r.t. the preceding verb, it has no obligatory relation to S. Note also that the future construal of the modal's complement allows for a root reading of the modal (cf. the figure in 19).

In (37), there is no future-denoting adverbial present in the clause, instead, we have an adverbial sentence denoting a point in the past. This means that the 'future' construal of the stative auxiliary is not available, so *ha* obeys the default rule and is interpreted as 'simultaneous' to the preceding verb *må*. The participle, which is 'past w.r.t. *ha*', is therefore construed as describing an eating-event which is in the past, seen from S, by transitivity. The [-PAST, +FIN] modal is stative, hence simultaneous to S, the stative auxiliary *ha* has the matrix [-PAST, -FIN] and is therefore simultaneous to the preceding verb *må*, and the participle is [+PAST, -FIN], thus past w.r.t. the preceding verb *ha*.

(37) Jon må ha spist før han kom. *ha* [-PAST, -FIN] $\neg (e_{MÅ} > e_{HA})$ &
'John must have eaten before he arrived' *spist* [+PAST,-FIN] $(e_{HA} > e_{SPIST})$

(38)



Note that in this case, the interpretation is not that a certain state has commenced by the time denoted by the adverbial sentence (unlike 35 and 36). Instead, the reading is that there exists a state (encoded by *ha*) at present, consisting in the aftermath of the (past) event of John's eating, and that this eating event took place before John's arrival. Since the future construal of the complement of the modal is not available, this rules out the possibility of a root reading of the modal (cf. once again the figure in (19)).

By means of this compositional tense system, we have arrived at an explanation for the temporal construals and the readings of the modals in (1), which is what we set out to do. I am convinced, though, that this composisional tense system can account for a number of otherwise puzzling problems in a range of construction types. I leave this for future research.

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