

On the Independence of belief and credence

Elizabeth Jackson

Toronto Metropolitan University,
Toronto, ON, Canada

Correspondence

Toronto Metropolitan University, Toronto,
ON, Canada

Email: lizjackson111@gmail.com

Abstract

Much of the literature on the relationship between belief and credence has focused on *the reduction question*: that is, whether either belief or credence reduces to the other. This debate, while important, only scratches the surface of the belief-credence connection. Even on the anti-reductive dualist view, belief and credence could still be very tightly connected. Here, I explore questions about the belief-credence connection that go beyond reduction. This paper is dedicated to what I call *the independence question*: just how independent are belief and credence? I look at this question from two angles: a descriptive one (as a psychological matter, how much can belief and credence come apart?) and a normative one (for a rational person, how closely connected are belief and credence?) I argue that those committed to minimal normative independence should accept more radical normative independence, and that cases of descriptive independence support belief-credence dualism. This suggests that belief and credence are more independent than one might think.

KEYWORDS

Belief, Credence, Agnosticism, Belief-Credence Dualism, Independence, Epistemic Rationality, Doublemindedness, Credal Reductivism, Lockean Thesis

1 | INTRODUCTION

I believe many things: for instance, that $1+1 = 2$ and that it will rain tomorrow. According to the tripartite model, there are three doxastic attitudes one can take toward a proposition p : believe

p , disbelieve p , and withhold belief (being undecided on whether p). But consider: I believe both $1+1 = 2$ and that it will rain tomorrow, but my attitude toward these propositions isn't exactly the same; I take the former to be more probable. To capture this, some epistemologists appeal to another mental state called *credence*. Credences are more fine-grained than beliefs and are often given a value on the $[0,1]$ interval, where 0 represents maximal confidence some proposition is false, and 1 represents maximal confidence it is true. For example, I have a ~ 0.9999 credence $1+1 = 2$, but only a ~ 0.9 credence it will rain tomorrow. Unlike belief, there are (at least in principle) an infinite number of credences one can take toward a proposition.

Much of the current belief-credence literature has revolved around *the reduction question*: does one attitude reduce to the other (Jackson, 2020b; Sturgeon, 2019)? On the **belief-first** view, belief is the fundamental attitude and credence reduces to belief.¹ A prominent version of this view holds that credences are beliefs about probabilities or epistemic modals (e.g. probably, might, definitely). A 0.5 credence *the coin will land heads* is the belief *the probability the coin will land heads is 0.5*; a high credence it will rain tomorrow is the belief *it will probably rain tomorrow*. The numerical structure is part of the content rather than part of the attitude, and the attitude is simply belief.

A second view is the **credence-first** view. On this view, credence is the fundamental attitude, and belief reduces to credence. The most common credence-first view is the view that belief reduces to credence above some threshold, where the threshold may be 1, a fixed value less than 1, or vary with context or stakes.²

People often opt for the reductionist views because of Kaplan's Bayesian Challenge. Kaplan (1996) asks: why would we have two independent, irreducible attitudes: beliefs and credences? Historically, most have challenged the role of *belief* in action/assertion. Either beliefs make the same prescriptions as credences, or they do not. If the prescriptions are the same, beliefs seem superfluous. If the prescriptions are different, we should trust our credences, because, e.g., they capture subtle probabilistic differences, do better in lottery/preface cases, etc. Note that a belief-firster could make a parallel Belief-First Challenge, involving credences and probability-beliefs: why would we have both? Why posit a separate attitude, credences, when probability-beliefs can play the relevant roles?

A final view is called **dualism**; on this view, belief and credence are equally fundamental.³ This view is more complex, but proponents of dualism maintain it nonetheless better explains our epistemological concepts and mental lives. Dualists answer the Bayesian Challenge by arguing that beliefs play roles that threshold-passing credences cannot: e.g., beliefs provide stability (Weisberg, 2020), simplify reasoning (Ross & Schroder, 2014, p. 286),⁴ allow us to take a stand and have a view of the world (Foley, 1993), and are indispensable to our practices of praise and blame (Buchak, 2014). Dualists answer the Belief-First Challenge by arguing that credences play roles that probability-beliefs cannot: e.g. explaining the actions of children and animals (Frankish, 2009, p. 77; Lee, 2017a, pp. 278–9). The central dualist commitment is that belief-credence reducibility fails in both directions.

Dualism posits minimal independence between belief and credence, i.e., belief cannot be reduced to credence, and credence cannot be reduced to belief. Dualism is nonetheless consistent with the idea that belief that p is *correlated* with a high credence in p (Sturgeon, 2008, pp. 146–8). For example:

Correlative belief-as-credence-1 view: S believes p iff S has a credence 1 in p .

Correlative threshold view: S believes p iff S has a credence in p above a threshold.

Along similar lines, a dualist could affirm that credences don't reduce to probability-beliefs, but nonetheless are directly correlated with them:

Correlative probability-belief view: S has a credence of n in p iff S believes the probability of p is n .

On any of these views, belief and credence could be two distinct, irreducible states; they just happen to go together. This suggests that there are noteworthy questions about belief and credence that go beyond the reduction question.

Just how independent are beliefs and credence, then? How much do they come apart? I call the question of how much belief and credence come apart *the independence question*.⁵ There are two versions of the independence question:

Descriptive independence: As a psychological matter, how much can belief and credence come apart, if at all?

Normative independence: For a rational person, how much can belief and credence come apart, if at all?

Upon considering these questions about independence, it is initially plausible that belief and credence constrain each other in certain ways. It's odd to think that one's belief in some proposition would float free from one's credence in that proposition. As Alan Hájek (1998, p. 204) notes, "we should generally associate agnosticism with 'middling' probability assignments, belief with 'high' probability assignments, and disbelief with 'low' probability assignments." This rule of thumb is natural and intuitive. But here, I push back on Hájek's suggestion, advancing a picture on which belief and credence are more independent than they might seem at first blush.

More specifically, I do four things. First, I carve out logical space, laying out all the possible ways belief and credence might come apart. Second, I synthesize the existing literature on the independence question. Third, I consider additional cases in which belief and credence might come apart, and fourth, I explore upshots of various answers to the independence question, including how the independence question interacts with the reduction question.

There are two key upshots of this paper. First, as I discuss in 5.1, a commitment to minimal normative independence provides a reason to accept more radical normative independence; once we pull belief and credence apart in certain cases, positing other necessary normative connections between them is more difficult. This may push readers into two camps: one that rejects virtually all normative independence, and another that embraces extreme normative independence. Second, as I discuss in 5.2, virtually undeniable forms of descriptive belief-credence independence cause problems for both the credence-first view and the belief-first view. I argue that dualism best explains descriptive belief-credence independence.

This paper is structured as follows. I devote each of the next three sections to each of the three belief-like attitudes: belief (**section 2**), withholding belief (**section 3**), and disbelief (**section 4**). I consider cases where each attitude might be normatively and descriptively consistent with five different credal states in the same proposition: credence 1, a high credence (less than 1), a 0.5 credence, a low credence (greater than 0), and credence 0. I explore epistemic situations where one could and should have each combination of attitudes; the chart at the end of section 4 summarizes my results. Finally, I consider upshots and questions for further research (**section 5**).

Before I begin, two clarifications about rationality. First, I'm concerned with *epistemic* rationality, as opposed to, e.g. practical or all-things-considered rationality. Second, epistemic rationality

is ambiguous between *permissions* and *obligations*. While I prefer the claims below to be understood in terms of rational permissions, rather than obligations, it is controversial whether there are permissions in epistemology. Thus, I'm open to understanding the claims below in terms of either obligations or permissions.

2 | BELIEF

2.1 | Belief and credence 1 or high credence

For most propositions we believe, we (do or should) have a high credence in them. There are three views on the relationship between belief and credence 1.

On the first view, belief sometimes, but not always, is accompanied by credence 1. In other words, we (do or should) have credence 1 in some things we believe, and a credence of less than 1 in other things we believe. Normatively, many think we should have credence 1 in necessary truths (or known necessary truths; see [Hájek, MS](#)). However, rational people believe and have a high credence (<1) in contingent truths (or at least those supported by their evidence). Descriptively, belief that p plus a high credence in p is common; we believe many of the things of which we are maximally confident (e.g. $1+1 = 2$) and many things in which we are highly confident (e.g. it will rain tomorrow).

According to a second view, we shouldn't (or don't) have credence 1 in anything. According to decision theory, we should bet anything on propositions in which we have credence 1. However—the reasoning goes—we should not stake our life the truth of *any* proposition, even on basic mathematical propositions or the *Cogito*. And given that, many people *wouldn't* bet anything on these propositions (e.g. you get a dollar if it is true, and are tortured for the rest of your life if it is false), descriptively, most people actually don't have credence 1 in anything.

On third view, defended by Levi (1991), Wedgwood (2012), Clarke (2013), Greco (2015), and Dodd (2016), belief is certainty or credence 1. That is, descriptively, believing p reduces to having credence 1 in p . A related view is the view that *rational* belief requires credence 1, the belief-analog to infallibilism about knowledge.⁶ Authors who defend these views often argue that (rational) belief is context-sensitive, so we do (or should) give up a belief when offered certain bets.

The aim of this paper isn't to settle on one of these views. The main point is that many accept that belief and high credence are normatively and descriptively connected.

2.2 | Belief and a 0.5 or low credence

2.2.1 | Normative independence

Consider a person who believes p and has a credence in p between $(0, 0.5]$. This seems like an odd combination of states; it's hard to see how it could be rational.⁷ However, there are several cases where it may be appropriate to believe something with a credence of 0.5 or lower.

First, consider the preface paradox. Suppose you write a book, and you should believe every claim in your book. Given a basic closure principle, you should also believe the conjunction of all the claims in your book. However, you're aware of your fallibility, and thus your credence in the conjunction of all the claims in your book should be quite low—depending on factors like the length of the book, lower than 0.5. In preface cases, it may be rational to believe p (the conjunction

of the claims in your book) even though your credence in p is between $(0, 0.5]$ (see Cevolani, 2017; Smith, 2016, 72ff).

Consider a second case. Suppose a student walks into your introduction to philosophy class believing that they have hands. Then, you discuss Descartes and Hume, and the student is moved by their arguments for skepticism. The student drastically decreases their confidence that they have hands. However, they don't cease believing that they have hands—even though their credence is less than 0.5. It isn't obvious that this student is being irrational; generally, cases of rational doubting may drastically decrease our confidence in certain propositions without forcing us to give up our beliefs.⁸

Hawthorne, Rothschild, & Spectre (2016) discuss a third case. Suppose there is a 3-horse race, and horse A is 48% likely to win, horse B is 28% likely to win, and horse C is 27% likely to win. Even though the probability that horse A wins is below 50%, it is rational to believe *horse A will win*, since A is the most likely of the live options. This need not commit us to the general principle that it *always* rational to believe the most likely salient alternative—but merely that this is sometimes rational, even if your credence in that alternative is below 0.5.⁹

Martin Smith (2016, 86ff) discusses cases where we learn of a base rate or get statistical evidence *against* some proposition for which we previously had good evidence. He argues that, in these cases, one can rationally believe a proposition, even though one ought to have a low credence in it. For example, suppose a bus hits someone on a busy street, you have reliable testimonial evidence that the bus was owned by the Blue Bus Company. Then, you learn that, on the day of the incident, only 5% of the buses operating in that part of town were owned by the Blue Bus Company. That doesn't seem like a good reason to give up your belief that the Blue Bus Company was responsible—after all, you have reliable testimonial evidence supporting this proposition.¹⁰ Nonetheless, learning this statistic affects the probability that the Blue Bus Company was responsible. Given the eyewitness is 85% reliable, you can use Bayesian likelihoods to calculate the probability the Blue Bus Company did it—and this turns out to be around 23%.¹¹

Patrick Maher (1993, 183ff) gives a final case: “It is certainly rationally permissible (if not obligatory) to give major scientific theories a low probability of being literally correct. But we also pre-theoretically suppose that it is rational to accept our best current theories.” Because of the ways that we've seen science develop and correct itself in the past, pessimistic meta-induction provides reason that we should assign scientific theories a low credence. However, it may be rational to believe them anyway—they are the best we have right now. Maher uses the term ‘accept,’ rather than believe, but closely-related considerations may also justify belief in our best scientific theories.¹²

To be clear, in this section, my primary goal is not to make a sustained defense of the claim that rational belief that p is consistent with rational credence in p between $(0, 0.5]$. I realize that some readers will balk at this claim. My main goal here is to identify the most plausible cases of this, and, for the sympathetic reader, paint a picture of what it might look like for belief and credence to be quite normatively independent. In section 5, I discuss several controversial upshots of my project that don't depend on this radical independence.

2.2.2 | Descriptive independence

Is it psychologically possible to believe p and have a low credence in p ? Suppose Jim is a paranoid and jealous person. He is worried that his partner is cheating on him, and finds himself believing she's been unfaithful. When he asks himself what evidence he has for this belief, it is minimal;

she has some attractive colleagues and works late sometimes, but that's about the extent of his evidence. He acknowledges that the probability she's cheating is actually quite low; he's not at all confident she's cheating. Nonetheless, he's attached to her and has a paranoid and jealous personality, and as a result, he's experiencing cognitive dissonance—he can't shake the belief.

Generally, cases of double-mindedness like the above aren't uncommon. Sometimes we find ourselves with a belief—based on wishful thinking, paranoia, or self-deception—that we know is unlikely to be true. If we know p is unlikely on our evidence, we normally have a low credence in p . Thus, it seems psychologically possible to both believe p and have a low credence in p at the same time. This possibility doesn't require the belief that p and the low credence in p to be simultaneously occurrent or conscious. Further, given that many epistemologists acknowledge the possibility of believing p and believing *not- p* (da Costa et al., 1990; Williams, 1982), it's hard to see why it wouldn't similarly be psychologically possible to believe p and have a low credence in p .

Second, consider the cases from the previous section—the preface case, the student who encounters skeptical arguments, the Blue Bus case, etc. Some maintain that the people in those cases are irrational. Even if they are irrational, however, this doesn't mean that those combinations of doxastic states are *impossible*. This seems especially true when people believe *of themselves* that they are appropriately responding to their epistemic situation. For example, Martin Smith might believe the conjunction of all the claims in his 2016 book, but simultaneously have a low credence in the conjunction; these doxastic states are sustained by his genuine conviction that this is the correct response to the preface paradox. Thus, even if these cases don't establish normative independence, they support radical descriptive independence.

2.3 | Belief and credence 0

Believing p while having a credence of 0 in p is an odd state. However, Sarah Moss (2018a, p. 32) suggests the following case:

...suppose that you are throwing darts, and suppose that your next dart is equally likely to hit each of the uncountably many points on the dartboard, including its point-sized bullseye. You believe that you might hit the bullseye with your dart, and you do not believe that you might hit the Eiffel Tower, though you assign 0 credence to both of these events.

This is a (potential) case of rational belief and credence 0. While there's disagreement about Moss's verdict, I mention it because some readers might find it interesting, and because cases of belief with credence 0 are rarely discussed.¹³

Those convinced by the preface case above may find a related case persuasive: the infinite preface case.¹⁴ Suppose you write an infinitely long book—i.e. it contains an infinite number of propositions. Or consider all of your beliefs. (If you think you have only a finite number of beliefs, consider the propositions you are disposed to believe.) In any of these cases, there's a large conjunction that you believe (or are disposed to believe), but since it is infinitely large, you should assign it a 0 credence.¹⁵

When it comes to descriptive independence, considerations from doublemindedness again support that it is psychologically possible to believe with credence 0. It may be impossible for these states to be simultaneously occurrent or conscious, but it's not clear why having this combination of doxastic states would be impossible.

3 | WITHHOLDING BELIEF

3.1 | Withholding belief and credence 1

One withholds beliefs in p when, roughly, one hasn't made one's mind up about whether p .¹⁶ Jane Friedman (2013a, p. 59) defines withholding as being "effectively neutral or undecided." Could it ever be rational for someone to withhold belief on p yet have a credence of 1 in p ? I'll consider three possible examples. While intuitions about these cases will, of course, not be universally shared—e.g. some may reject them altogether, others might think we should instead have credences infinitely close to 1—for the sake of completeness, it is nonetheless worth considering this possibility.

Consider a variant of Moss's dart case. Those sympathetic to Moss's verdict will likely also think that rational person has credence 1 that *the dart will not hit the point-sized bullseye*, but withholds belief (since the person takes hitting the bullseye to be a live possibility).

Williamson (2007) provides another case: suppose a fair coin will be tossed an infinite number of times. Williamson argues that one should have credence 0 that *there will be an infinite sequence of heads*; from this, it follows that one should have credence 1 that *there won't be an infinite sequence of heads*. However, these infinite sequences are 'live' possibilities, and thus one should plausibly withhold belief on both propositions. So, one ought to withhold belief that *the coin won't land heads every time* but should have credence 1 in this proposition.¹⁷

Friedman (2013) argues that withholding belief in a proposition is rationally consistent with having any standard credence in that proposition, including 0 and 1. Friedman considers an ordinary contingent proposition that one has no evidence for or against. She argues for the absence of evidence norm—that, if one has no evidence for or against an ordinary contingent proposition p , one is epistemically permitted to suspend judgment about p . Suppose you add these contingent propositions together in strings of conjunctions and disjunctions. The longer the conjunction gets, the lower your credence should get; the longer the disjunction gets, the higher your credence should get.¹⁸ Nevertheless, given the absence of evidence norm, it is rationally permissible to suspend judgment on these strings of propositions. Finally, she considers infinite disjunctions of contingent propositions; she argues that a rational person can suspend judgment on the infinite disjunction, even though her credence is 1. For example, a rational person might have credence 1 but suspend judgment on propositions like the following: *the length of the tail of the oldest cat in the world is not n* (2013-a, p. 71), *the president's credence it will rain tomorrow is not n* (2013-a, p. 71), *the number of birds in France is not n* (2013-a, pp. 76–7).

Concerning descriptive independence, the doxastic states described by Moss and Friedman seem psychologically possible, even if irrational—especially for one who believes they are rational. Thus, withholding belief is plausibly psychologically consistent with credence 1.

3.2 | Withholding belief and high credence

Withholding belief that p while having a high credence in p (short of 1) is quite widely discussed in the belief-credence literature. Let's start with a simple example. Suppose you are about to roll a fair, six-sided die. Should you believe *it won't land a six*? No, many will likely respond you should withhold belief; landing a six is a live possibility. Nonetheless, your credence that *it won't land a six* should be relatively high: ~ 0.833 .

The dice case is a simple version of a lottery-style case; several authors have recently argued that high credence plus withholding is a rational response to the lottery paradox. That is, you ought to have a high credence and withhold belief that *your ticket will lose*.¹⁹ Why think this? Well, if you know the number of tickets in the lottery, you can calculate the epistemic probability you will lose, and proportion your credence to this probability (so, e.g. if there are 100 tickets, you ought to have a 0.99 credence that you will lose). There are two arguments that you shouldn't *believe* you lost. The first is simple. Knowledge is the norm of belief; you don't know you lost the lottery; thus, you shouldn't believe you lost the lottery. Second, suppose you should believe your ticket lost. But there's nothing special about *your* ticket—you should believe every ticket will lose. Then, by a closure principle, you should believe a conjunction: <ticket 1 will lose and ticket 2 will lose and... ticket n will lose.> But you also believe the negation of this conjunction, as you believe one ticket will win. Thus, you must reject one of the previous assumptions, and it's natural to reject that you should believe your ticket is a loser. Lotteries are a natural case of rational withholding and high credence.

A second popular case of rational high credence and withholding are cases of “naked statistical evidence.” Several authors have argued that if all your evidence for *p* is statistical, then you shouldn't believe *p*, but you should proportion your credence to the statistic.²⁰ Lara Buchak (2014) gives several examples of this, including the following (p. 292):

You leave the seminar room to get a drink, and you come back to find that your iPhone has been stolen. There were only two people in the room, Jake and Barbara. You have no evidence about who stole the phone, and you don't know either party very well, but you know (let's say) that men are 10 times more likely to steal iPhones than women.

In this case, you shouldn't *believe* that *Jake stole your phone*—you don't have evidence that he in particular stole the phone. However, based on the statistic, you should have a high credence (~0.91) that Jake stole it. Or, suppose someone gets hit by a bus, and you are trying to figure out which company is responsible. The only evidence you have is that the Blue Bus Company was operating 90% of the buses in town that day. This doesn't provide grounds to believe *the Blue Bus Company is guilty*, even though you should have a 0.9 credence that they did it.²¹ Cases of naked statistical evidence seem to be ones where rational credence can reach any value short of 1, but license withholding belief.

Friedman's (2013) argument, considered earlier, concludes that when it comes to contingent, finite disjunctions of propositions on which you rationally withhold belief, you ought to withhold belief in the whole disjunct, even though your credence in that disjunct is quite high.

While it is now widely thought that rational withholding is consistent with a relatively high credence in a proposition, some resist this conclusion, and argue that mere statistical evidence can justify belief, or that you shouldn't proportion your credences to known statistics. However, it's quite hard to deny that it is psychologically possible to withhold belief that *p* but have a high credence in *p*—again, especially for those who think this is the rational thing to do. Thus, these cases at least count toward descriptive independence.

3.3 | Withholding belief and credence 0.5

Withholding belief that *p* and credence 0.5 in *p* is a common case, both normatively and descriptively. When your evidence for *p* and your evidence for not-*p* are balanced (or you lack evidence for

and against p), you should withhold belief that p and have a credence in p around 0.5. Whether *a fair coin will land heads* or whether *there is an even number of stars* are common examples. Descriptively, credence 0.5 is correlated with withholding belief. Note also that withholding belief seems uncontroversially both normatively and descriptively consistent with credences slightly lower or higher than 0.5, e.g. in the $[0.4, 0.6]$ range.

3.4 | Withholding belief and low credence

Consider a variant on the dice case discussed earlier—you are about to roll a fair, six-sided die; should you believe *it will land a six*? Again, it seems like you should withhold belief; landing a six is a live possibility. Nonetheless, the probability that *it will land a six* is relatively low— ~ 0.1667 . Add sides to the die for cases where withholding belief is consistent with even lower credences.

Generally, the negation of the propositions in the cases discussed in section 3.2 are cases where one ought to have a low credence in some proposition but withhold belief on it. This includes: *my ticket will win the lottery*, *Jake did not steal my cell phone*, *the Blue Bus Company is innocent*, and large conjunctions of propositions on which you withhold belief. Further, again, these cases seem like ones where the combination of states is psychologically possible, even if not rational.

3.5 | Withholding belief and credence 0

One should think that withholding belief and having credence 1 is rationally possible if one is convinced by the cases in section 3.1. The negation of those propositions are ones in which one should have withhold and have credence 0. In Moss's case, a rational person has credence 0 that *the dart will hit the point-sized bullseye*, but withhold belief. In Williamson's case, a rational person has credence 0 that *there will be an infinite sequence of heads*, but withholds belief. In Friedman's cases, a rational person would have credence 0 in an infinite conjunction of their withholdings, but withhold belief on the conjunction—for instance, that *the length of the tail of the oldest cat in the world is n* . And again, these cases count toward descriptive independence, even if they don't count toward normative independence.

4 | DISBELIEF

Most epistemologists think disbelieving p is simply believing not- p . Then, insofar as section 2's arguments motivate that belief is consistent with a wide range of credences, there are parallel arguments that disbelief that p is rationally consistent with the same range—simply add a negation to the proposition in question. For example, those convinced by Moss's dart case may think you should disbelieve *the dart definitely won't hit the point-sized bullseye*, even though you assign this credence 1. Similarly, you should disbelieve, of your infinitely long book, the negation of the conjunction of all the propositions in the book—but you should assign the negation of this conjunction credence 1.

Likewise, if you can rationally believe with a credence on the $[0, 0.5]$ interval, then, parallel cases exist in which you can rationally disbelieve with a credence on the $(0.5, 1]$ interval. In a preface case, you might disbelieve the negation of the conjunction of the claims in your book, but nonetheless assign the negation of this conjunction a high credence. Or you might disbelieve *the*

Blue Bus Company is guilty if someone reliable reports that the Blue Bus Company is not guilty, but then learn that the Blue Bus Company operated 95% of the buses that day. You should raise your credence in their guilt, but continue to disbelieve. And again, the possibility of doublemindedness gives us a reason to think these states are psychologically possible, even if irrational. Finally, it's uncontroversial that disbelief and low credence are normatively and descriptively correlated.

The following chart summarizes section 2 through section 4 above. The three big sections of rows correspond to each of the three belief-attitudes: B(p) is believe p, W(p) is withhold on p, and D(p) is disbelieve p. There are five rows within each larger section of rows that correspond to each of the five credal categories discussed above, with a column for descriptive independence and a column for normative independence. The rows in grey denote uncontroversial doxastic combinations.

5 | UPSHOTS AND FURTHER QUESTIONS

5.1 | The nature of belief and credence: Normative issues

The above cases shed light on rational belief and credence. First, a natural thought is that rational belief and rational credence are sensitive to different features of one's epistemic position (Buchak, 2014, p. 295). For instance, rational credences conform to known epistemic probabilities; that is, if S knows the probability of (p|S's evidence) is n, then S should have a credence of n in p. However, rational belief is not sensitive to epistemic probabilities in the same way. Instead, rational belief is sensitive to what possibilities are "live" for a person; it may be that, often, one ought not believe p if not-p is a live or salient possibility (Jackson 2019a, 2020b). Further, when both p and not-p are live possibilities, withholding belief is often appropriate. There are non-probabilistic theories of rational belief that explain the above cases, for instance, Martin Smith's normic support view (2016).

One might wonder how belief and credence could be sensitive to different features of one's epistemic situation. If those features are epistemic relevant, then both beliefs and credences should be sensitive to them; and if those features are irrelevant, then neither beliefs nor credences should be sensitive to them.²² Those who accept normative independence will respond to this by saying that some features are relevant for rational belief, whereas others are relevant for rational credence, and this is due to the different functional profiles of belief and credence. For example: beliefs are coarse-grained, and credences are fine-grained. Because credences are fine-grained, they'll be sensitive to small changes in one evidence that beliefs will not be sensitive to—if the chance of rain tomorrow drops from 90% to 85%, my credence that it will rain tomorrow will change, but my belief that it will rain tomorrow may not. Furthermore, part the function of belief is to let us treat p as settled, even if p is uncertain. For that reason, rational belief is sensitive to the possibility of not-p being live; high non-extreme credences in p are not.

Further, those committed to minimal normative independence face pressure to accept more extreme versions of normative independence. Take, for instance, the cases from Buchak (2014), Smith (2016), Staffel (2016), Friedman (2013), and Jackson (2020a) of rational high credence without rational belief: e.g. the dice, the lottery, the cell phone case, and the Blue Bus case. Many epistemologists are friendly to this possibility. However, opening oneself up to this may have radical consequences. Less controversially, those who argue that rational agnosticism is consistent with high credences should also maintain it is consistent with low credences. Since many hold that rationally withholding belief that p is consistent with any credence between [0.5, 1), given

	Rationally possible?	Psychologically possible?
(1) $B(p) \ \& \ Cr(p) = 1$	(Known?) necessary truths	Very common
(2) $B(p) \ \& \ Cr(p) = \text{high}$ (<1)	(Known?) contingent truths	Very common
(3) $B(p) \ \& \ Cr(p) = 0.5$	Preface scenarios (Smith, 2016); Rational doubting/skepticism; Horse Race case (Hawthorne et al, 2016); Statistical evidence (Smith, 2016); Scientific theories (Maher, 1993)	<< these cases, even if irrational; Double-minded person (more awareness possible?); Irrational doubting
(4) $B(p) \ \& \ Cr(p) = \text{low}$ (>0)		<< these cases, even if irrational; Double-minded person (less awareness possible?); Irrational doubting
(5) $B(p) \ \& \ Cr(p) = 0$	Infinite preface scenarios; A point-sized dart might hit the bullseye (Moss, 2018a)	Double-minded person (cannot be simultaneously occurrent?)
(6) $W(p) \ \& \ Cr(p) = 1$	"A point-sized dart won't hit the bullseye" (Moss, 2018a); Infinite contingent disjunctions of withholdings (Friedman, 2013); "This coin won't land head an infinite number of times" (Williamson, 2007)	<< these cases seem psychological possible, even if irrational (because e.g. a credence infinitely close to, but falling short of, 1 is rationally required)
(7) $W(p) \ \& \ Cr(p) = \text{high}$ (<1)	Dice cases ("it won't land a 6"); Lotteries ("my ticket will lose"); (Staffel, 2016); Statistical evidence (Buchak, 2014); Disjunctions of your withholdings (Friedman, 2013)	<< these cases, even if irrational

(Continues)

	Rationally possible?	Psychologically possible?
(8) $W(p) \ \& \ Cr(p) = 0.5$	Cases where evidence is balanced between p and not-p	Very common
(9) $W(p) \ \& \ Cr(p) = \text{low}$ (>0)	Dice cases ("it will land a 6"); Lotteries ("my ticket will win"); Statistical evidence; Conjunctions of your withholdings (Friedman, 2013)	<< these cases, even if irrational
(10) $W(p) \ \& \ Cr(p) = 0$	Point-sized dart (it will hit the bullseye) Infinite conjunctions of withholdings (Friedman) This coin will land heads an infinite number of times (Williamson, 2007)	<< these cases, even if irrational (because e.g. an infinitesimal credence is rationally required)
(11) $D(p) \ \& \ Cr(p) = 1$	The negation of propositions in (5), e.g., "It's not the case that it might hit the bullseye"; Infinite preface cases	Double-minded person (cannot be simultaneously occurrent?)
(12) $D(p) \ \& \ Cr(p) = \text{high}$ (<1)	The negation of propositions in (3–4), e.g., The negation of conjunction of claims in your book; "The Blue Bus Company is guilty"; "Horse A will lose"; "Our best scientific theory is false"	<< these cases, even if irrational Double-minded person (less awareness possible?)
(13) $D(p) \ \& \ Cr(p) = 0.5$		<< these cases, even if irrational; Double minded person (more awareness possible?)
(14) $D(p) \ \& \ Cr(p) = \text{low}$ (>0)	(Known?) contingent falsehoods	Very common
(15) $D(p) \ \& \ Cr(p) = 0$	(Known?) necessary falsehoods	Very common

basic symmetry principles (e.g. if S withholds belief on p , S ought to withhold belief on not- p ; if S has credence n in p , S should have credence $(1-n)$ in not- p) they should likewise maintain that withholding is consistent with any credence on the $(0, 0.5]$ interval. This implies that withholding belief is consistent with all standard credences, except maybe 0 and 1. This implication may seem obvious, but it is rarely discussed (except Friedman, 2013).

More controversially, those committed to certain minimal normative independence face pressure to accept much more radical versions of normative independence. Suppose rationally agnosticism is consistent with all standard credences on the $(0, 1)$ interval. What is special about agnosticism? If rational withholding is consistent with such a large range of credences, why would rational *belief* be different? This question is one I have yet to see answered in the literature. Several have suggested to me in conversation that the answer might have to do with the non-committal nature of agnosticism. Belief and disbelief involve commitments that agnosticism does not.²³ This suggestion, while interesting, suggests a dis-analogy between belief and credence: belief-commitment has entirely different features than credal-commitment. One can form a high credence in p , committing to p 's having decisive evidential support, but rationally withhold belief in p . But, by contrast, one cannot rationally believe p but have a credence in p around 0.5 or slightly below. What explains these differences between credal commitment and belief commitment?

The main idea is this: generally, once we allow a certain level of belief-credence independence, it is difficult to see how it could be contained in a non-ad-hoc way. This point is accentuated further when we consider the general principles that govern rational belief and rational credence formation. As discussed above, plausibly, rational belief and rational credence are sensitive to different features of a body of evidence—*kind* of evidence, not just amount, matters. This opens the door to radical belief-credence independence. The possibility of rational belief and low credence then seems natural—the attitudes are sensitive to different features of one's body of evidence.

Thus, generally, a commitment to minimal normative independence seems to open the floodgates to radical normative independence. Of course, some may view this as an interesting feature of the view and others may view it as a reductio, and instead embrace a strict Lockean picture that posits tight normative connections.²⁴ But the popular commitments in epistemology today push many away from Lockeanism. Many epistemologists should be friendlier to radical belief-credence normative independence.

5.2 | The nature of belief and credence: Descriptive issues

Throughout sections 2–4, we noted that, while cases of normative independence are more controversial, descriptive independence is plausible. This for at least two reasons: one is that considerations of double-mindedness that arise from e.g. wishful thinking, paranoia, or self-deception. These considerations motivate the idea that believing p is psychologically consistent with a low credence in p , and disbelieving p is psychologically consistent with a high credence in p . Two is that many people genuinely believing their attitudes are epistemically rational, even if they're wrong. Rational or not, belief and credence come apart.

Recall the reduction question: does belief reduce to credence or credence reduce to belief? Proponents of the credence-first view argue that belief reduces to credence above some threshold. It's not clear how to square this with these cases of descriptive independence. First, what's going on in cases where one believes p and has a low credence in p ? The credence-firster might argue that people in these cases have two credences with the same content—a high credence and a low credence—and their belief is constituted by their high credence.²⁵ But is it really possible

to have two credences with the same content? And even if so, is this a plausible interpretation of these cases? Discussion of the possibility of two credences with the same content is virtually non-existent in the literature, and I suspect that credence-firsters will be hesitant to embrace this explanation—it is a rather odd possibility. And it is not clear that this provides a satisfactory description of the cases in question.²⁶

The credence-firster might instead deny that the cases of doublemindedness (etc.) are actually cases of belief and low credence. Instead, doubleminded people may have a low credence accompanied by other mental states, such as Gendler's "alief" (2008), or other affective states like fear or doubt (see Hookway, 1998).²⁷ I agree that doubleminded people can have fears, doubts, and sometimes even aliefs. But it's hard for me to accept that in no such cases do they believe the proposition in question. Belief is taking p to be the case; people who believe p represent p to be true. Paranoid or doubleminded people don't merely fear that their partner is cheating: in some cases, they genuinely take it to be the case. They represent the world such that their spouse is unfaithful. They may have a variety of other cognitive and affective states along with belief, but in at least some cases in question, they truly believe. Appealing to other mental states, then, does not provide reason to exclude belief from the entire range of cases.

Other cases look even worse for the credence-first view. Consider the cases of high credence without belief: e.g. the dice, the lottery, the cell phone case, the Blue Bus case, etc. Even if irrational, some respond to this evidence with high credence and agnosticism. But it is unclear how a credence-firster explains this possibility. Do the people in question both believe *and* withhold belief at the same time, since their high credence necessarily amounts to a belief? That is a very odd combination of states. And part of the point of these cases is that they don't believe p ; they *merely* have a high credence.²⁸

A credence-firster might respond by arguing for a flexible, context-sensitive threshold for belief. When a person believes and has a low credence, the threshold moves accordingly. In cases of naked statistical evidence, the threshold is higher than one's credence, explaining how one can both withhold and have a high credence.²⁹

First, note that, even if this view is coherent, it is inconsistent with most of the existing credence-first views in the literature. Consider cases where a person believes p and has a low credence in p . For the moving threshold view to explain these cases, the threshold will have to be extremely low—well below 0.5. This is incompatible with the view that belief is credence 1. Further, as Hawthorne et al (2016) note, for credence-firsters, "usually it is thought that the threshold must be at least above 50%."³⁰ But to capture our cases, we have to posit a flexible, descriptive moving threshold: belief is credence above some threshold that varies with stakes or context, and the threshold can move all over the $[0,1]$ interval.

There are additional worries about this attempt to save the credence-first view. First, shifting-threshold views need some account of when and why the threshold for belief moves. A popular suggestion is that the threshold changes with stakes—see Weatherson (2005), Ganson (2008), Bach (2008), and Pace (2011). When the stakes are high, the threshold for belief is higher; when the stakes are low, the threshold for belief is lower. But this doesn't explain our cases. Whether his partner is cheating is surely a high-stakes matter for Jim, but in that case, the threshold for belief must be quite low, since his credence is so low but he nonetheless believes.

Another suggestion on behalf of the credence-first view: what it is to believe p is to have a higher credence in p than in the other live options.³¹ On this view, one wouldn't have to commit to the view that the threshold moves with stakes—instead, the threshold is contextually determined by the probabilities of the other salient propositions. But again, it's not clear how this would account for Jim's belief, since Jim admits that it is more likely than not that his wife has been faithful.

Second, even if we had a plausible account of a moving threshold that captures the case of belief and low credence, there are cases of descriptive independence involving belief and credence 0—cases of doublemindedness and/or cases where the person thinks they are responding appropriately to their evidence.

Consider again the cases of high credence and agnosticism. A credence-firster might argue that in naked statistical evidence cases, the threshold for belief is higher than one's credence. Because one's credence doesn't meet the threshold, one has high credence without belief. However, both credence-first views we've considered—stakes-sensitivity and most-probable-live-option—cannot capture this. First, suppose the threshold is stakes-sensitive. While some cases of mere statistical evidence might be high-stakes, they need not be—statistical evidence supports mundane propositions. Further, one can get statistical evidence that raises one's credence to any value short of 1 without requiring belief; it is hard to see why the threshold for belief would *always* be higher than this value. Second, the view on which one believes the most probable live option doesn't explain these cases, since they are cases of extremely high credences without belief. Finally, it's hard to see how a credence-first view would explain cases where one withholds belief but assigns the proposition credence 1; is the threshold *higher than 1* in these cases?

A final issue is that these views entail a radical context-sensitivity about belief. We might hold a belief in one context but not another, without a change in evidence or other epistemic factors that normally influence belief (see Leitgeb, 2017; Yalcin, 2018). It is odd to think that belief changes radically with stakes and context—another cost to the flexible threshold view.

Things aren't looking great for the credence-first view. What about the belief-first view? Recall, on this view, credences are beliefs about probabilities or epistemic modals. In many of the cases above, the belief-firster will be required to say that, e.g., one simultaneously believes *p* and believes that the probability of *p* is low. While this is more plausible than the credence-first reading, it is also less psychologically realistic than the dualist explanation, since the dualist maintains that it is possible to have a credence *without* an explicit probability-belief. Because the belief-first view requires explicit probabilistic beliefs, this makes these cases of descriptive independence less psychologically realistic.

A second problem for the belief-first view involves cases of belief or withholding and credence 0, and cases of disbelief or withholding and credence 1. Recall that the belief-first view often appeals to modal-beliefs in addition to probability-beliefs—e.g. a high credence *it is raining* is simply believing *it is probably raining*, where 'probably' is an epistemic modal. However, a person's modals beliefs do not correlate with her credences in these cases. For example, I have credence 0 that *there will be an infinite sequence of heads*, but also believe that *it is possible that there will be an infinite sequence of heads*. Contra the belief-first view, there's no modal belief to ground my credence of 0. In these cases, the correlation between credences and modal beliefs breaks down. Overall, then, considerations of descriptive belief-credence independence are best explained by dualism.

5.3 | Implications for other debates in epistemology

Belief-credence independence, especially normative independence, makes space for attractive answers to recent debates in epistemology (see Jackson, 2019c). For instance, consider the debate in the epistemology of disagreement; roughly, *conciliationists* maintain that disagreement with an epistemic peer requires a change in opinion, and *steadfasters* maintain that disagreement with an epistemic peer does not require a change in opinion (Christensen, 2009). Steadfasters point out

that it doesn't seem irrational to hold to our political or religious convictions, even in the face of smart disagreeing peers; conciliationists argue that it seems dogmatic and closeminded to hold to your previous opinion, especially if those who disagree with you are equally reliable on the matter in question.

Normative belief-credence independence provides space for a middle ground between conciliationism and steadfastness, enabling us to capture intuitions on both sides. If rational belief and rational credence can come apart, then the correct response to disagreement may require altering one attitude but not another. For instance, one could be a conciliationist about credences, but a steadfaster about belief. Upon meeting a disagreeing peer, one can still maintain one's religious and political convictions via continuing to believe, but they should be less confident (i.e. lower their credence). Further, insofar as belief and credence are normatively independent, one's credence could get quite low but one could continue to believe without compromising rationality (see Buchak, 2021; Jackson, 2021). Alternatively, one could be a steadfaster about credence but a conciliationist about belief; this combination may be less natural, but belief-credence independence allows to us symbiotically combine various positions in the epistemology of disagreement.

Second, belief-credence independence has implications for debates about the nature of evidence. Proponents of *epistemic permissivism* maintain that for a body of evidence and a proposition p , there is more than one rational attitude any person with e can take toward p . For instance, Rosen (2001) argues that jurors who share evidence can rationally disagree about who is guilty. Proponents of *uniqueness* deny permissivism and maintain that there is only one rational attitude, given a proposition and a body of evidence. Uniqueness entails that that disagreeing jurors do not share evidence, and if they do, then one of them responding to the evidence irrationally (for overviews, see Jackson & Turnbull, [forthcoming](#); Kopec & Titelbaum, 2016).

If belief and credence are normatively independent, this allows for interesting combinations of permissivism and uniqueness. For instance, maybe in certain cases, a body of evidence requires a particular belief-attitude, but permits a range of credal attitudes; depending on how much independence we posit, a body of evidence could potentially permit any credence, and this wouldn't require giving up belief-uniqueness. Alternatively, one might maintain that practical or moral stakes can affect rational belief but not rational credence, and thus a body of evidence is permissive about belief, but determines one unique rational credence. Belief-credence independence allows for various combinations of permissivism and uniqueness.

Finally, consider the debate just alluded to: can practical or moral states affect epistemic rationality? *Purists* argue that epistemic rationality is sensitive only to things that are truth-relevant, like evidence. *Pragmatists* think that practical or moral stakes can affect epistemic rationality. Consider an example that motivates pragmatism about belief: if I need to go to the bank to deposit a check with no particular urgency, then the memory that the bank is open tomorrow is sufficient for rationally believing it is open. However, if my mortgage payment is due, and I have to deposit the check by tomorrow on pains of bankruptcy, then the memory the bank is open tomorrow is not sufficient for rational belief; I need to either gather more evidence or withhold belief (Kim, 2017).

Again, radical normative belief-credence independence allows for combinations of pragmatism and purism. For instance, some (Ganson, 2008; Grimm, 2011; Pace, 2011; Ross & Schroeder, 2014) have argued that practical and moral stakes affect rational belief, but not rational credence. Belief-credence independence allows for the possibility that e.g. when my mortgage payment is due, I ought to continue to have a high credence the bank is open, but I should nonetheless withhold belief. Further, it also creates space for pragmatism about credence, but purism about belief. Maybe practical and moral stakes cause my credences to move all around the $[0,1]$ interval,

but only a change in my evidence should affect my beliefs.³² Generally, when it comes to these debates, belief-credence independence offers a “third way” between what initially appeared to be two mutually exclusive options, and in some cases, allows for an attractive way to glean the benefits of each view.

5.4 | A challenge: Unstable mental and actional profiles?

I close with an area of further research for those who accept radical belief-credence independence. Thorough independence of belief and credence raises both normative and descriptive questions.

First, consider some descriptive questions. What is the mental and actional profile of those with independent attitudes? Does one act as if p if one believes p but has a low credence in p ? Does anything prevent one from uttering Moorean sentences such as “I believe p but the chance of p is low”?³³ How, if at all, does the profile of the person who believes p and has a low credence in p differ than the profile of the person who has a high credence in p and disbelieves p ? Further, what’s the difference between someone who believes p and has a 0.7 credence in p and someone who withholds on p and has a 0.7 credence in p ?³⁴

I won’t be able to fully answer all these questions here, here are a few preliminary thoughts. Consider a person whose belief and credence in a proposition come apart. It seems as though that person’s betting behavior will vary to the extent they come apart. So, a person who withholds belief that p but has a high credence in p might reject all bets favorable if the probability of p is below 0.5, but take bets favorable if the probability of p is between ~ 0.5 and the value of their credence. However, a person who, e.g. believes p but has a low credence in p may agree to an even larger range of bets on p . One place to look for an account of this person’s behavior is on the imprecise credence literature (see Bradley & Steele, 2014; Carr, 2015; White, 2009). A person who believes p but has a low credence in p might have a similar profile as a person with a fuzzy or interval credence in p . That said, empirical and psychological work (on, e.g. delusions, doublemindedness, self-deception) is relevant to these descriptive questions as well.

Arguably, even more difficult are the normative questions. I’ve suggested above not only that cases of radical belief-credence independence are possible, but that they are potentially *rational*. But what would the profile of a rational person who believes p and has a low credence in p look like? How would such a person act? What would their mental life be like? These questions pose a challenge to the proponent of radical normative belief-credence independence. Here I note two potential answers. First, recall the discussion in section 1 of Kaplan’s Bayesian Challenge: that is, why would we have both beliefs and credences? Dualists respond that belief and credence have a unique role to play, and these roles are indispensable for our epistemic, mental, and practical lives. One might argue that, however we carve out a role for belief in response to the Bayesian Challenge, belief plays that role in cases of independence. For example, some have argued that whether we rely on our belief-attitude in p or our credal-attitude in p depends on the stakes, and beliefs play an important role in simplifying low-stakes reasoning. Thus, we should rely on beliefs when the stakes are low, but on credences if the stakes become higher (Jackson, 2019b; Ross & Schroeder, 2014; Staffel, 2017).

Second, sometimes it is useful to see a situation in two different ways. Consider a more-rational version of Jim. Suppose he believes his wife has been faithful to him. However, he has some evidence that she’s been unfaithful, so his credence that she has been faithful is slightly below 0.5. In some situations, it might be useful to rely on his credence and maintain a healthy skepticism about her fidelity, but in other cases, he can exemplify trust by relying on his belief. This may

not merely be practically valuable, but also be epistemically valuable—i.e. it contributes to finding the truth about her fidelity. Generally, the ability to see a situation in two different ways can be beneficial, and this is a potential epistemic and practical benefit had by those whose beliefs and credences come apart. More work should be done on the profiles of people whose beliefs and credences are radically independent.

6 | CONCLUSION

I've done four things. First, I've carved out logical space and laid out all the possible ways belief and credence might come apart. Second, I've synthesized the existing literature on the independence of belief and credence. Third, I've argued for additional ways that belief and credence might come apart. Finally, argued that one, a commitment to minor cases of normative independence provides reason to accept more radical normative independence, and two, that virtually undeniable forms of descriptive belief-credence independence support dualism. I conclude that a picture on which belief and credence are radically independent is plausible, has fruitful and wide-reaching implications for many debates, and raises questions that deserve further attention.

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ENDNOTES

¹For defenses and discussions of the belief-first view, see Easwaran (2015), Forcehimes (2021), Harman (1986), Holton (2008, 2014), Kauss (2020), Lance (1995), Moon (2018), Moon & Jackson (2020).

²For defenses and discussions of the credence-first view, see Clarke (2013), Dodd (2016), Douven & Williamson (2006), Ganson (2008), Greco (2015), Hunter (1996), Lee (2017a, 2017b), Lee & Silva (2022), Weatherson (2005), Wedgwood (2012).

³For defenses and discussions of dualism, see Bricker (forthcoming), Buchak (2014), Friedman (2013), Jackson (2019a), Jackson & Tan (2022), Ross & Schroeder (2014), Staffel (2017, 2019), and Weisberg (2013, 2020).

⁴On the simplifying role of belief, see also Dinges (2021), Jackson (2019-b), Staffel (2019), Tang (2015), and Weisberg (2020).

⁵Thanks to Fritz Warfield for suggesting I explore this question.

⁶On the claim that knowledge requires certainty/credence 1, see Dodd (2016), Keynes (1921), and Unger (1975).

⁷See also Roeber (2020) who argues that, on all the prominent theories of knowledge, one can know p yet have a credence in p below 0.5.

⁸Thanks to Michael Rea for suggesting this case to me.

⁹Thanks to Blake Roeber.

¹⁰For defenses of the claim that rational belief is insensitive to statistical evidence, see Buchak (2014), Jackson (2020a), and Staffel (2016).

¹¹Call (A) the proposition that 85% reliable an eyewitness testified it was blue and (C) the proposition that 5% of the buses in town that day were operated by the Blue Bus Company, and (B) the proposition that the Blue Bus Company is guilty. Then:

$$\Pr(B|C) = 0.05; \Pr(\sim B|C) = 0.95$$

$$\Pr(A|B\&C) = 0.85; \Pr(A|\sim B\&C) = 0.15$$

$$\Pr(B|A\&C) = (\Pr(B|C)*\Pr(A|B\&C)) / ((\Pr(B|C)*\Pr(A|B\&C) + \Pr(\sim B|C)*\Pr(A|\sim B\&C))$$

Therefore, $\Pr(\text{BlA}\&\text{C}) = (0.05 \cdot 0.85) / ((0.05 \cdot 0.85) + (0.95 \cdot 0.15)) = \sim 0.23$. So, given our evidence (i.e., A and C), the probability that the blue bus is guilty is $\sim 23\%$. See Smith (2016, ch. 4).

- ¹² According to decision theory, it can be rational to accept a proposition even if one's credence in it is quite low, so the independence of credence and acceptance should be quite uncontroversial—likely even less controversial than the independence of belief and acceptance.
- ¹³ Alan Hájek has suggested (in conversation) that we should have a high credence (even credence 1) that the dart might hit the bullseye.
- ¹⁴ Thanks to Moritz Schulz for suggesting this case to me.
- ¹⁵ Lewis (1980) and Skyrms (1980) suggest that we should have infinitesimal credences in these cases. For objections to this proposal, see Easwaran (2014), Hájek (2003), and Williamson (2007). Further, even if Lewis and Skyrms are right, that belief is rationally consistent with all real-numbered and infinitesimal credences entails a strong version of normative independence.
- ¹⁶ See Schroeder (2012). For more on withholding belief, see Friedman (2013, 2017).
- ¹⁷ Thanks to Alan Hájek. For responses to Williamson's argument, see Hájek (MS), Howson (2017), and Weintraub (2008).
- ¹⁸ For just 10 propositions in which S has credence 0.5, S ought to have credence 0.0009765625 in their conjunction. Note that Friedman's argument is not committed to the general claim that agnosticism is closed under conjunction or disjunction (if S is rationally agnostic about p and S is rationally agnostic about q then S is rationally agnostic about p or q or p and q)—you may be rationally agnostic about p and rationally agnostic about not-p, but should believe p or not-p. Rather, for Friedman, agnosticism-closure only holds for a certain class of 'ordinary contingent propositions,' and p or not-p is not contingent. Thanks to Alan Hájek for discussion; see also Hájek (1998).
- ¹⁹ See especially Staffel (2016) but also Hawthorne (2003), Horgan (2017), Kelp (2017), Kyburg (1961), Nelkin (2000), Smith (2016).
- ²⁰ See especially Buchak (2014) but also Cohen (1977), Staffel (2016), and Thomson (1986).
- ²¹ Buchak (2014). For earlier discussions of similar cases, see Schauer (2003) and Thomson (1986); this case originated with a real civil case from the 1940s.
- ²² Thanks to John Greco for raising this worry.
- ²³ Thanks to James Willoughby and Keshav Singh.
- ²⁴ The Lockean thesis is the view that rational belief requires rational credence above some threshold, usually between (0.5, 1]. For defenses of the Lockean Thesis, see Dorst (2019), Fitelson & Shear (2018), and Locke (2014).
- ²⁵ A credence-firster might appeal to fragmentation to explain the possibility of having two credences at the same time. Thanks to David Barnett and Will Fleisher. For a rejoinder to this response, see Jackson & Tan (2022, sec. 4.5).
- ²⁶ See Jackson & Tan (forthcoming) for a longer defense of this argument against the credence-first view. For more on having two credences with the same content at the same time, see Roeber (2020, endnote 17).
- ²⁷ Thanks to Deborah Tollefsen for raising this objection.
- ²⁸ Thanks to Alexander Dinges.
- ²⁹ Thanks to Alan Hájek, Justin D'Ambrosio, and James Willoughby.
- ³⁰ Others who suggest the threshold is plausibly above 0.5 include Chandler (2010, p. 669), Foley (1993, p. 144), Hunter (1996, p. 87), Lee (2017a, pp. 273–4), Pettigrew (2015, p. 13), Worsnip (2016, p. 552).
- ³¹ Thanks to Alan Hájek.
- ³² But very few defend encroachment on credences. Two exceptions are Gao (2019) and Moss (2018-b); see also Fritz & Jackson (2021).
- ³³ See Hájek (2006, p. 2). Thanks to Berislav Marušić.
- ³⁴ Thanks to Pamela Robinson.

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