

# The Dynamics of Non-Being

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## 1. Nozick on the Power of Nothingness

Why is there something rather than nothing? In his *Philosophical Explanations*, Robert Nozick explored some candidate answers. One of them has always intrigued me. Perhaps, he says, there is a “very powerful force toward nothingness, one any other forces have to overcome”:

Imagine this force as a vacuum force, sucking things into non-existence or keeping them there. If this force acts upon itself, it sucks nothingness into nothingness, producing something or, perhaps, everything, every possibility. If we introduced the verb “to nothing” to denote what this nothingness force does to things as it makes or keeps them nonexistent, then (we would say) the nothingness nothings itself. (123)

This is one of the most awesome passages in recent metaphysics. It is accompanied by the single most awesome diagram in recent metaphysics (figure 1): a graph of the “amount of nothingness force it takes to nothing some more of a given nothingness force being exerted.”

Now, I don’t really think that Nozick’s story about the nothingness force correctly explains why there is something rather than nothing. But presenting the correct explanation was not Nozick’s goal anyway. He was more interested in what a candidate explanation might look like than he was in whether any of the candidates he considers is correct. So he achieves his aim as long as the candidate explanation in the quoted passage is intelligible. But is it? It certainly sounds profound. And we should keep in mind Nozick’s remark that “any approach [to the question] that stands a chance of yielding an answer will look extremely weird. ... [W]e must be prepared to accept strangeness or apparent craziness in a theory that answers it” (116). But one cannot shake the feeling that Nozick’s candidate answer has passed beyond weird, strange, and crazy, and entered the realm of nonsense.

What I want to do is make sense out of the nonsense. I will propose two interpretations of Nozick’s candidate explanation that make it perfectly intelligible. (Along the way I will propose an interpretation

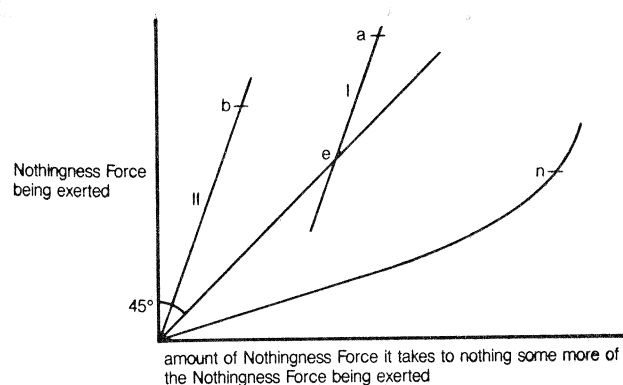


FIGURE 2.1

Figure 1: Figure 2.1 from Nozick's *Philosophical Explanations*

of Nozick's diagram.) Unfortunately, neither interpretation does what Nozick wants. On neither interpretation is it possible for the nothingness force to nothing itself and produce something. Finally, I propose a third model for the action of the nothingness force which can explain why there is something rather than nothing. This explanation does not work in quite the way that Nozick wanted, but it is worth exploring in its own right.

## 2. On the Suspicion that Nozick's Explanation is Nonsense

Let's begin by getting the suspicion that Nozick's explanation is nonsense out in the open. I will go through one reason to think that it is nonsense. This will serve as a warning: the interpretation I offer of Nozick's explanation had better not fall into the same traps.

Heidegger asked, "Does the Nothing exist only because the Not, i.e. the Negation, exists?", and later, famously, asserted that "The Nothing itself nothings" (*What is Metaphysics?*, quoted in [Carnap 1959: 69]). Carnap accused Heidegger of uttering nonsense. One mistake Heideg-

ger made, says Carnap, was treating "nothing" as a noun, when ("in a correct language") it is a quantifier.

(Peter van Inwagen [2002: 130-132] makes a similar complaint. His complaint is directed at the claim that "nothingness is unstable" — which is a good summary of Nozick's explanation.)

It is tempting to say that Nozick's explanation is nonsense for a similar reason. It is not that Nozick fails to recognize that "nothing" is a quantifier. Instead, some parts of his explanation seem to treat it (and related words like "nothingness") as quantifiers, and other parts seem to treat them as nouns, and there seems to be no consistent way to make sense of his usage. Nozick says that the nothingness force acts on itself. So we begin by speaking as if there is such a thing as the nothingness force. We might even put this by saying that Nothing exists. But why should the action of the nothingness force on itself cause there to be something? Why doesn't it just cause the nothingness force itself to cease to exist, reducing rather than augmenting the number of things there are? Because we slide into treating "nothing" as a quantifier. When the nothingness force acts on itself, it "sucks nothingness into nothingness." The result is equivalent to adding a negation to "nothing exists"; but "nothing exists" means "it is not the case that there is something," so adding a negation and canceling gives us — voila! — that there is something.

This is not a model of good philosophy. If we are going to take serious interest in Nozick's explanation, this had better not be all that it amounts to.

## 3. Metaphysical Dynamics: Preliminaries

When we ask why there is something rather than nothing, we may be asking a *modal* question, or we may be asking a *temporal* question. Consider the set of all possible worlds. One of those worlds is the *empty world*: the world in which there is nothing at all.<sup>1</sup> When we ask the

1. For those who believe that there are abstract objects like numbers, and that abstract objects exist necessarily, the modal question looks like it has an easy

modal question, we are asking why that world is not actual. Nozick's candidate explanation does not appear to address the modal question. Instead it addresses the temporal question: why is it that, right now, there is something rather than nothing? When we ask this question we are treating the state in which there is nothing at all as an instantaneous state of the world, and asking why, of all the possible instantaneous states the world could be in now, it is not in the nothingness state.

The answer to one of these questions may rely on an answer to another. An answer to the modal question can help answer the temporal question: perhaps there is something rather than nothing right now because matter cannot be created or destroyed, and the actual world is not the empty world. And, going the other way, an answer to the temporal question can help answer the modal question: perhaps the empty world is not actual because there just is no empty world. The metaphysical dynamics ensures that no world can be in the nothingness state for all time. (In fact, using this strategy Nozick's answer to the temporal question can be turned into an answer the modal question.)

(There is one reason to doubt that an answer to the temporal question can help answer the modal question. The temporal question seems to presuppose that there is such a thing as *time*, so an answer to the temporal question will not say why time itself exists. But if we have only explained why there are temporal things, and not why time itself exists, then we have not explained why there is something rather than nothing. I know of two good responses to this problem. First, we might just deny that time exists. That is, we might be relationalist about time, and say that while the universe is temporal, facts about the temporal

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answer: there is something because it is *impossible* that there be nothing — there is no empty world. But things are not really this easy. If there are necessarily existing abstract objects, then the question we have in mind when we ask why there is something rather than nothing is: why is there anything concrete, rather than no concrete things at all? Even if all worlds contain abstract objects, there may still be one that contains nothing else. To keep things simple I will ignore the existence of abstract objects in this paper.

aspects of the universe are not to be made sense of by appealing to instants of time. But even if we accept that there is such a thing as time there is a second response. I think of time (or spacetime) as a kind of “framework” in which the history of the universe unfolds. There is a way to hear the question “Why is there something rather than nothing?” as asking why there is anything in that framework, and not as asking, in addition, why the framework itself exists. And I think that when we hear the question that way, it is an interesting question, and closely corresponds to what people who do not have any sophisticated understanding of the debates about the existence of time have in mind when they ask it.)

Nozick mentions that the temporal question presupposes, or at least suggests, that the nothingness state is the “default” state: the state the world goes into when left alone, when it is not interfered with. To explain why there is something rather than nothing, under this presupposition, is to cite the force(s) that cause the world to deviate from its default state.

Nozick suggests that the nothingness state gets to be the default state in virtue of the constant operation of a nothingness force. There are two problems with this claim. First, it does not line up with the usual way of understanding what it is for a state to be the default state of some system. Usually we think that the default state is the state the system goes in to when no forces at all operate on it. Second and more importantly, by saying that there is a nothingness force that pushes things into the nothingness state Nozick appears to make his explanation self-undermining. As Nozick himself mentions, explaining why there is something rather than nothing is difficult in part because any factor introduced to play a role in the explanation will be *something*, and so the fact that it exists is one of the facts to be explained. And it seems illegitimate to use a fact to explain itself.

Now, I am not sure that a fact can never explain itself (see footnote 8). But surely it couldn't happen in this case. Even if the operation of the nothingness force explains why there are ordinary material things, it is hard to see how the existence of the nothingness force could ex-

plain itself. And it is no good to equivocate, as Carnap accused Heidegger of doing, using “nothing” as a noun when giving the explanation and then, when this problem arises, using it as a quantifier.

The solution is to deny, unequivocally, that there is any such thing as the nothingness force. The nothingness force is not to be found among the furniture of the universe. How, then, is talk of the nothingness force to be understood? It is to be understood as an aspect of a certain *dynamical law*. This dynamical law is not a *thing* to be included in the inventory of what exists, any more than Newton’s second law is.<sup>2</sup> (Unlike Newton’s second law, though, our law will be a dynamical law of metaphysics, not a dynamical law of physics. One of the fascinating features of Nozick’s discussion is that it describes a *metaphysical dynamics*. There aren’t many of them out there.)

At a very abstract level, dynamical laws can be thought of like this. We start with the set of all possible instantaneous states of the universe. A function from time into this set, then, assigns an instantaneous state to each time; so it represents a formally possible history of the universe. Dynamical laws are devices for picking out which formal

possibilities are possible in some stricter sense: physical laws tell us which are physically possible, and metaphysical laws tell us which are metaphysically possible.

I am going to write down sentences and equations that express potential dynamical laws. They will contain the letter “*F*,” which I will use to name numbers, and I will sometimes say that *F* measures the strength of the nothingness force. But this is just for ease of expression and should not be taken with ontological seriousness. All that I am doing, when I discuss these laws, is discussing various ways to specify which formally possible histories are metaphysically possible.

I have more to say about the role that “*F*” plays in the dynamical laws. But before I can say it, and before I can discuss any potential dynamical laws in detail, I have to say what the set of possible instantaneous states of the world looks like. But this is not physics; we are not interested in the way physicists carve up the space of possible instantaneous states (into, say, possible positions and momenta of all the material bodies). The relevant instantaneous states that we, as metaphysicians, are interested in do not concern the intrinsic properties and spatial arrangement of what exists; they concern only “how much” existence there is. What kind of structure does the set of instantaneous states have, when carved up in this way?

There are several ways we could develop the theory from this point. First, we could say that the relevant instantaneous states are given just by specifying how many things exist. Then the set of instantaneous states has the structure of the natural numbers (or, if there are infinitely many things, the cardinal numbers).

I do not think that this is a good way to set things up. With this state space Nozick’s dynamical law would have to say something about how the number of things that exist changes over time. Suppose, for example, that the nothingness force operates to decrease the number of things that exist by one. Then the nothingness force is *selective*: each time it acts it (somehow) selects one thing to suck into nonexistence, and leaves all the others. Also, its action is *discontinuous*: the world’s instantaneous state does not vary continuously as time passes, but jumps

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2. I suppose that some might think that there is such a thing as Newton’s second law — it is a proposition, a certain kind of abstract object. I discussed in footnote 1 why I am ignoring the existence of abstract objects. There is another point worth mentioning here. Nozick is as interested in whether we can explain everything (explain, for each *P*, why *P* is the case) as he is in whether we can explain why there is something rather than nothing. He repeatedly points out that this or that potential explanation of the fact that there is something rather than nothing cites some fact that has not itself been explained. It is important to keep these two explanatory demands separate. The move I am making allows (metaphorical) talk of the nothingness force to appear in an explanation of the fact that there is something rather than nothing. But it does not help if the task is explain everything. It just moves the bump in the carpet: even if we say that there is no such thing as the nothingness force, we will still need to explain why the metaphysical dynamics is as it is. But if we are only using the dynamics to explain why there is something rather than nothing, we do not need to explain why the dynamics is as it is. (*P* can explain *Q* even if *P* itself is unexplained.) I do not deny, though, that if we are unable to explain why the dynamics is as it is, this may weaken the explanation we use the dynamics to provide. I will say something about this at the end of the paper.

between discrete values. Both of these, especially the first, are undesirable features. Insofar as I have some intuitive understanding of the nothingness force, it does not discriminate, but acts on each material thing equally. Nothing is safe, everything is in danger. (Discontinuous action is troubling mostly because it makes it difficult to formulate a quantitative law.)

Another approach is to say that the relevant instantaneous states are given by specifying how much matter there is.<sup>3</sup> If we suppose that the amount of matter at any time is measured by the (non-negative) real numbers, rather than the natural numbers, then the nothingness force is not required to act discontinuously. It is also not required to act selectively — or, at least, not as selectively as before. Suppose that between two times the nothingness force acts to decrease the amount of matter in the world by half. It could achieve this by decreasing by half the amount of matter at each point of space. Then it has not discriminated in favor of the matter in any particular region of space.

But I do not like this approach either. It makes a substantive assumption about the physical world: that (as a matter of necessity) there are no smallest bits of matter. I don't think this assumption is true.

I prefer a third approach. Like the second approach it uses real numbers rather than natural numbers, but it puts them to work in a different way. On this approach, each thing is to have a *degree of existence*, represented by a number between 0 and 1. If something exists to degree 1 it is wholly present; if it exists to degree 0 then it is completely absent; and if it exists to some intermediate degree, then it straddles the two, occupying the shadowy realm between being and non-being.

Different things exist to different degrees. I exist to degree 1 while my older brother exists to degree 0 (I do not have an older brother). But to simplify my presentation I will assume that as a matter of necessity everything (every material thing) always exists to the same degree.

3. Of course, there might be non-material things, like cartesian egos, or divine angels, that the nothingness force acts on as well. But I will make the simplifying assumption that everything is material.

Then we can speak of the degree of existence of the material world as a whole. (This assumption is certainly false: it is necessary that all round squares exist to degree 0, so if everything exists to the same degree there is nothing at all.) Our set of instantaneous states, then, has the structure of the closed real interval  $[0, 1]$ .

The notion of a degree of existence could use some clarification. Unfortunately, I do not have much clarification to offer. It has been suggested to me<sup>4</sup> that quantum mechanics might help us get a better grip on what degrees of existence are and to connect them to physics: when Schrödinger's Cat is in the superposition  $\alpha |\text{alive}\rangle + \beta |\text{dead}\rangle$ , then the cat exists to degree  $|\alpha|^2$ . But this approach does not appear to leave room for fundamental particles to exist to degrees between 0 and 1. And even if it did, it would not fit with the work degrees of existence are doing in my interpretation of Nozick. According to that interpretation, by now nothing should exist to any degree other than 0 or 1. Maybe a better approach is to understand degrees of existence by connecting them to indeterminacy: when something exists to a degree other than 1 or 0, it is indeterminate whether that thing exists, and the degree to which it exists somehow quantifies this indeterminacy.<sup>5</sup>

I shall also not try to defend the claim that existence comes in degrees — a claim that Kant accepted and Chisholm called "monstrous."<sup>6</sup> For the use I make of this notion, I do not need to: I aim to find an interpretation of Nozick's explanation that makes it intelligible, not one that makes it true.

4. I owe this suggestion to Justin Curry.

5. See, for example, [van Inwagen 1990: chapter 19] for an approach to indeterminate existence. (Van Inwagen himself does not believe that it can be indeterminate whether a given fundamental particle exists. He believes that the only things that can exist to degrees other than 0 and 1 are living organisms. However, his semantics for a language that permits indeterminate existence is compatible with any view about what kinds of things can enjoy intermediate degrees of existence.)

6. See [Chisholm 1989: 55-56] for both Chisholm's view and the attribution of this thesis to Kant. (I thank Fred Feldman for telling me about Chisholm's discussion.)

Probably many people will continue to insist that talk of degrees of existence is unintelligible. Even still, they should regard the interpretations of Nozick's explanation that I will describe as improvements over Nozick's own presentation. For one thing, on my interpretation the nonsensicality is confined to just one part of the explanation: the use of degrees of existence. And for another, even if it makes no sense to speak of degrees of existence, the formal manipulations of degrees of existence that appear in the explanation are perfectly intelligible.

Now for my comment about the role that "*F*" plays in the laws I will describe. The laws I will describe are laws governing the evolution of the universe's degree of existence in time. The nothingness state, the state in which its degree of existence is 0, is the default state (at least initially — but more on that later): the state toward which the universe's degree of existence tends, when there are no forces acting. For reasons I have already mentioned, the nothingness state's status as the default state is *not* derived from the existence of a nothingness force (though it will be useful below to talk as if it is). The universe's approach to its default state in Nozick's metaphysical dynamics is no more caused by the operation of a nothingness force than unaccelerated motion in Newtonian mechanics is caused by the operation of an "inertial force." The approach to the default state is, instead, what happens when no forces act.<sup>7</sup> Now if the universe's degree of existence is non-zero, there are lots of ways for its degree of existence to move

7. Some people might find the idea that nothingness is the default state hard to take seriously. But there are some theists who believe it, and believe that it is only because God acts in the world that the universe has not vanished into nothingness. For example, here is Peter van Inwagen: "[T]hese particles were (and are) not capable of maintaining themselves in existence or of conserving their own causal powers. For one of them to continue to exist, it is necessary for God continuously to hold it in existence" [1995: 43]. Harry Frankfurt finds a similar idea in Descartes: "According to the Cartesian account, the existence of finite things or of the world will cease unless it is continually sustained by an external force," a force that turns out to be God's creative activity [1999: 57]. (I should mention that Peter van Inwagen has told me that he thinks the language in these passages is misleading, and that theists do not believe that nothingness is the default state, as I have explained that phrase.)

toward zero. I use "*F*" as a device to describe in precise, quantitative terms just how the universe's degree of existence changes over time as it heads towards its default state.

#### 4. Developing the Dynamics — I

The nothingness force acts to reduce the universe's degree of existence. Nozick's remarks suggest two ways of modeling the action of this force. In this section I develop the first way.

Suppose that the nothingness force has a certain strength, and that its strength determines the rate at which the universe's degree of existence decreases. So, in the limiting case, if the strength of the nothingness force is zero, then the universe's degree of existence does not change. If we let  $E(t)$  be the universe's degree of existence at time  $t$ , and  $F$  represent the strength of the nothingness force, then the simplest quantitative dynamical law that fits these ideas is

$$\frac{dE}{dt}(t) = -kF. \quad [1]$$

Here  $k$  is just a coupling constant, giving the conversion factor between strength of the nothingness force and rate at which material reality is going out of existence. So if  $k$  is very, very small, even a strong nothingness force will only nudge things slowly out of existence.

Under the action of this law, the universe's degree of existence decreases linearly until it reaches zero (see figure 2). So the nothingness force is acting in an intelligible way. But this simple metaphysical dynamics fails to achieve Nozick's aim. We do not see nothingness acting on itself to produce something.

To get what we want we need to complicate the dynamics. We want the nothingness force to act on itself as well as on material reality.

When the nothingness force acts on itself it pushes itself out of existence. What could that mean? After all, I have said that there is no such thing as the nothingness force. So it cannot act on itself in the same way it acts on material reality. Instead, we need to incorporate some kind of self-reference into the dynamical law. The following pic-

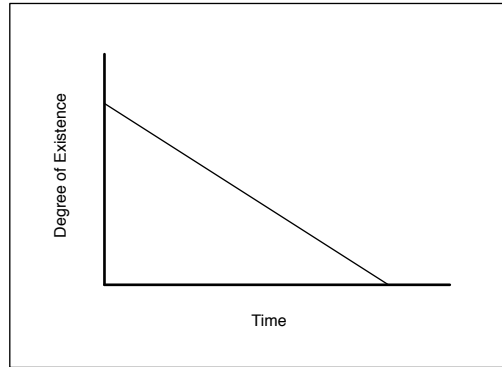


Figure 2: Graph of a solution to equation [1]

ture, though imperfect, might help. The dynamical laws do not just act on the universe, bringing about change in the universe's state over time. They also act on themselves, bringing about change over time in the laws governing the universe.

We now allow the strength of the nothingness force to change over time. Let us also imagine that the *strength* of the nothingness force indicates the *degree* to which the nothingness force exists. So the nothingness force acts to decrease its own strength as well as to push material reality out of existence. Then we have to amend [1], allowing  $F$  to change with time:

$$\frac{dE}{dt}(t) = -k_1 F(t). \quad [2]$$

and we need an additional law governing how  $F(t)$  changes with time. The simplest is:

$$\frac{dF}{dt}(t) = -k_2 F(t). \quad [3]$$

The coupling constant  $k_2$  here may be different from the constant in

equation [2] — intuitively, perhaps it is easier, or harder, for the nothingness force to decrease its own degree of existence than it is for it to decrease material reality's degree of existence.

These laws also do not do what Nozick wants. They do not provide a framework in which the nothingness force can act on itself and produce something. Instead, these laws lead to metaphysically quite boring behavior. Suppose both  $k_1$  and  $k_2$  are 1. Then (assuming  $F$  has strength 1 at the initial time  $t = 0$ ) the interesting solution to equation [3] is  $F(t) = e^{-t}$ ;  $F$  quickly drops in strength, approaching but never reaching strength 0. So even if there is nothing at all (material reality's degree of existence is 0), the nothingness force never annihilates itself. It certainly does not annihilate itself and produce something. Instead, as it pushes itself out of existence, it weakens, becoming less able to push itself further out of existence. (The nothingness force does get *arbitrarily close* to pushing itself out of existence, as time goes on. But in this context having strength arbitrarily close to zero is very different from having strength zero.)

That is what happens if  $E = 0$  for all time. On the other hand, if there *is* something at some time — in particular, if material reality's degree of existence starts out at 1 — then the nothingness force also does not succeed in reducing material reality's degree of existence to 0. As the nothingness force acts on itself and becomes weaker, it becomes less able to decrease the universe's degree of existence. (In this case equations [2] and [3] say that  $E(t)$  is also equal to  $e^{-t}$ .) So in this case it turns out that these dynamical laws do allow us to explain why there is currently something rather than nothing — the nothingness force is just not powerful enough to push material reality out of existence. But this is not the kind of explanation Nozick is aiming at. The same goes for the other, boring, solution to equation [3]:  $F(t) = 0$ . In this case the nothingness force does not act at all and the universe's degree of existence is constant.

### 5. Developing the Dynamics — II

The first way of modeling the action of the nothingness force did not give us the exciting result Nozick announced. The first model also does not help us understand Nozick's awesome diagram. I think this is because the diagram does not fit the first way of modeling the action of the nothingness force. Instead, the diagram suggests a second way of modeling the action of the force.

According to this second way, the nothingness force is best thought of (for heuristic purposes) as a reservoir of non-being. On the simplest way of developing this idea, there is a constant exchange rate between being and non-being. The exchange rate gives the decrease in the amount of being (or in material reality's degree of existence) that can be purchased by spending one unit of non-being. Suppose, for example, that the exchange rate is 2, that the universe's degree of existence is 1, and that the strength of the nothingness force is  $1/4$ . Then, after a while, the degree of existence of the universe will be  $1/2$ , and the strength of the nothingness force will be 0. At that point the reservoir of non-being will have been exhausted, and the universe's degree of existence will remain at  $1/2$ .

So far we have no way to figure out how long it will take for things to reach this end state. But let's not worry about that just yet. Let's just assume that the strength of the nothingness force and the universe's degree of existence both change continuously. Then we can draw a graph of the universe's degree of existence, as a function of the strength of the nothingness force. (Call this function  $E(f)$ .) Figure 3 depicts the dynamics I have described (time passes from right to left).

This model can be made more complicated, by allowing the exchange rate between being and non-being to depend on the strength of the nothingness force. Perhaps when the nothingness force has strength greater than  $1/2$ , the exchange rate is  $1/2$ , but when its strength is  $1/2$  or less, the exchange rate is 2. Then we get the graph in figure 4. Note that at any point  $(f, E(f))$  on the graph, the slope of the line at that point is equal to the exchange rate between being and

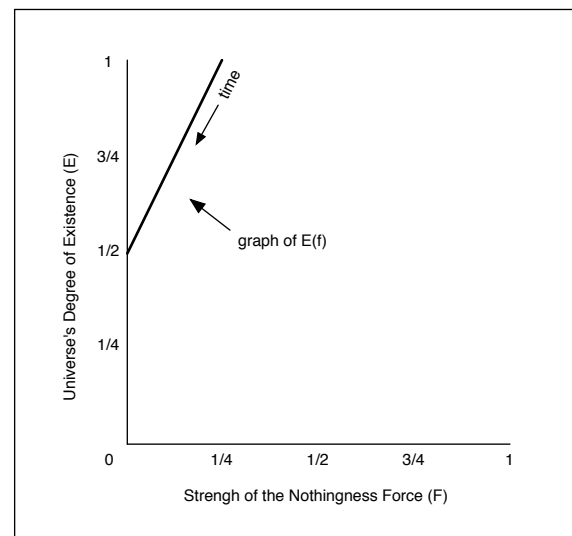


Figure 3: A constant exchange rate

non-being when  $F = f$ . And from here it is easy to imagine a situation in which the exchange rate (and so the slope) varies continuously with  $F$ . Figure 5 depicts such a situation.

As we did with the first model, we need to extend this model to allow  $F$  to act on itself. So we need an exchange rate between non-being and ... non-being itself. What could this possibly amount to? Isn't it necessary that the exchange rate be 1? I don't think so. Here is an analogy that shows it need not be. Suppose you have so many dollar bills in your house that they are starting to get in the way. The haulers come to haul some of the money away. You still need to ask their price: they are not required by logic to charge you one dollar for each dollar they haul. In fact that price is far too steep.

The exchange rate between being and non-being tells us how much non-being it costs to purchase a decrease in non-being of some given

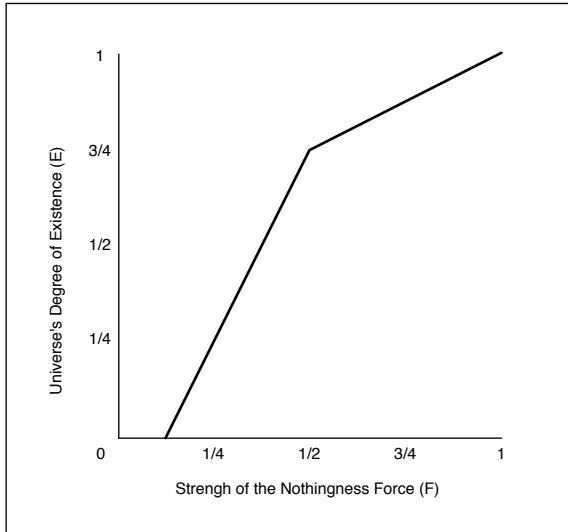


Figure 4: A non-constant exchange rate

amount. But there is still something missing from this scheme. Suppose the exchange rate is 3 to 2: it takes 3 units of non-being to decrease the amount of non-being by 2. So there will be a net decrease of 5 units. But how long will it take for this net decrease to occur? Nothing said so far determines the answer. So we must add, as an extra postulate of the theory, something about the rate at which non-being is spent. Let us suppose that non-being is spent at a constant rate. (More precisely, let us suppose that it is spent at a constant rate, provided that the exchange rate is not of the form “ $n$  to 0.” In other words, non-being is spent at a constant rate provided that it has some buying power. Also, let us adopt units for measuring non-being and time so that the [constant] rate at which non-being is spent is equal to 1.) Then it will take 3 units of time to spend the 3 units of non-being needed to purchase a decrease of 2 units. So the 5-unit decrease in non-being will take 3

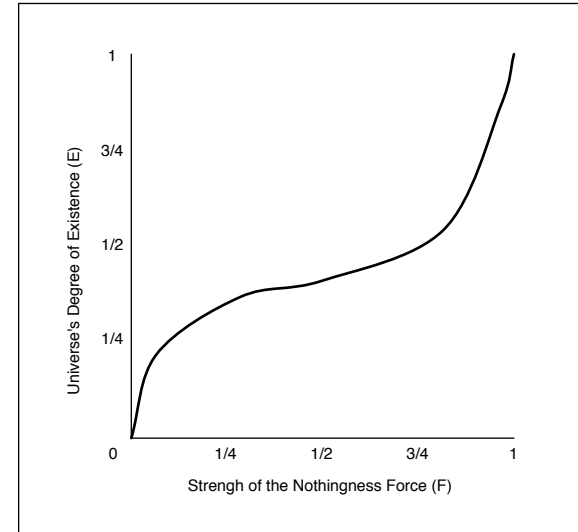


Figure 5: A continuously varying exchange rate

units of time. The exchange rate, together with the law about the rate at which non-being is spent, determines the rate at which non-being decreases — in this case, a constant rate of  $5/3$  per unit time. (I assume here, and for now on, that the degree of existence of material reality is 0, so we are spending non-being only to decrease the nothingness force's degree of existence, and not also to decrease the universe's degree of existence.)

As before, the exchange rate may not be constant. It may instead be  $F$ -dependent. (Maybe, for example, decreases in  $F$  become more expensive when  $F$  is weak.) Since  $F$  is a function of time, so is the exchange rate. So, given the law about the rate at which non-being is spent, at each time the exchange rate at that time determines the (instantaneous) rate at which  $F$  is decreasing at that time. If the exchange rate at  $t$  is  $x$  to  $y$ , then  $F$  is decreasing at a rate of  $(x + y)/x$  at  $t$ . Things are simpler

if we agree to always specify exchange rates in the form “ $x$  to 1,” and then to just call  $x$  the exchange rate; then the rate at which  $F$  decreases at  $t$  is equal to  $1 + 1/x$  — one plus the reciprocal of the exchange rate at  $t$ . (Note that I am now barring exchange rates of the form  $n$  to 0, and that the exchange rate is always a positive number.)

Where are we? The exchange rate at each time determines the slope of  $F(t)$  at each time; so, given an initial value for  $F$ , we can integrate to solve for  $F$ . That is, the exchange rate and an initial value supplies complete information about the dynamics.

Now for the payoff of this long discussion. We can graph the exchange rate as a function of  $F$ . Figure 6 depicts two ways that the exchange rate may vary with  $F$ . (I use “ $X$ ” to name the function from the strength of the nothingness force to the exchange rate when the nothingness force has that strength. Note that  $X$  is a function of  $F$ , not of time.) The top line indicates a constant exchange rate, and the lower line indicates a much stranger exchange rate that varies continuously with  $F$ .

The labeling of the axes in this figure should look familiar. It closely resembles the labeling in Nozick’s awesome diagram. To compare the diagrams, we must first reflect Nozick’s diagram across the  $45^\circ$  line. (I have done so, and drawn in some of Nozick’s curves, in figure 7.)

Both graphs have the strength of the nothingness force on the horizontal axis. My vertical axis represents the exchange rate between the nothingness force and itself: the amount of non-being that must be spent to decrease the strength of the nothingness force by one unit, over one unit of time. On (the reflected version of) Nozick’s graph, the vertical axis represents the “amount of Nothingness Force it takes to nothing some more of the Nothingness Force being exerted.” The difference between the two is that the quantity represented in Nozick’s graph is underspecified. Consider the point, say, 5 units up on Nozick’s vertical axis. At that point, it takes five units of nothingness force to nothing some more of the nothingness force. But *how much* of the nothingness force is nothinged when we spend this five units? There is no answer. And *how long will it take* to nothing some more of the

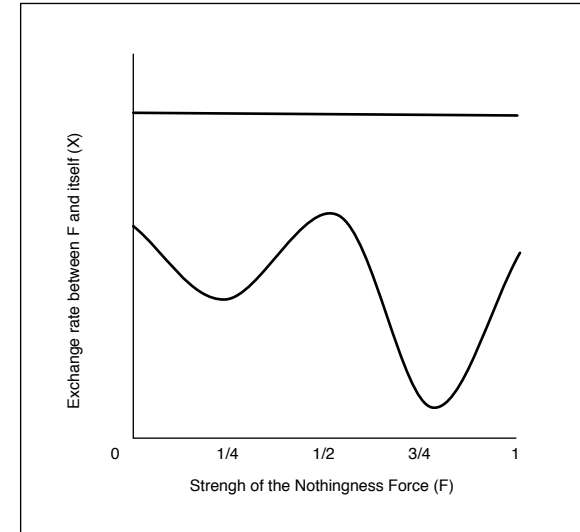


Figure 6: Two exchange rates between  $F$  and itself

nothingness force when those 5 units are spent? Again, there is no answer. Since my model answers both of these questions, I propose it as a precisification of what Nozick says.

If we interpret Nozick’s diagram using my model, then Nozick draws some false conclusions from it. Suppose that line  $I$  gives the correct dynamics, and that at the initial time the strength of  $F$  is 1. Then over time the strength of  $F$  decreases (as it must), and the exchange rate also decreases. Nozick claims that once we reach the point  $e$ , “to nothing some more nothingness force would require more than is being exerted and hence available” (124). But that is not right. Just past  $e$  on the curve the strength of  $F$  is some number  $f$  (slightly less than  $1/2$ ), and the exchange rate is some number  $X$  (also slightly less than  $1/2$ ), and  $f < X$ . Nozick thinks that since  $f < X$ , we don’t have enough non-being left to purchase any more decreases in the amount

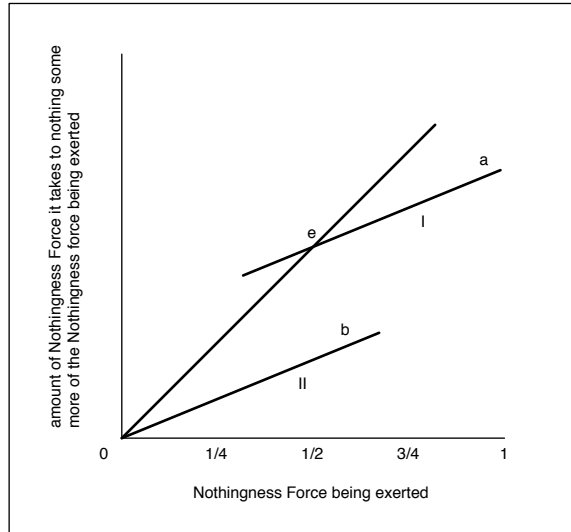


Figure 7: Nozick's diagram, reflected across 45°

of non-being. But (as I am understanding it)  $X$  is an exchange rate, not an absolute cost. We can still get  $F$  to decrease: by spending some very small amount  $\epsilon$  of  $F$ , over a time of  $\epsilon$  the net result is a decrease in  $F$  of (approximately)  $\epsilon(1 + 1/X)$ . Since  $\epsilon$  is very small,  $\epsilon(1 + 1/X) < f$ . That is, at the end of this process there is still some nothingness force left over.

Nozick seems to think that when the exchange rate is  $X$ , we have to spend  $X$  units of non-being to see any decrease in  $F$ . But that is not right. So, despite what Nozick says, on almost any way that the exchange rate might vary with  $F$ ,  $F$  will decrease over time and reach 0.

To be fair, it may be that Nozick is not drawing false conclusions from his diagram, but that my second model of the action of the nothingness force on itself does not provide the correct interpretation of

that diagram. In my defense, the model I have proposed does look like a precisification of what Nozick says, and I cannot think of any other model that fits his diagram better.

## 6. Does the Second Model Improve on the First?

At this point in Nozick's discussion, his focus shifts, and he never gets around to explaining the connection between his diagram and the idea that the nothingness force produces something by acting on itself. Let us take up that topic.

Mathematically, the second model of the action of the nothingness force is a generalization of the first model. The first model pretty much forced us to think that the law governing how  $F$  decreases looked like  $(dF/dt)(t) = -kF(t)$ . By thinking in terms of an  $F$ -dependent exchange rate between non-being and itself, we are considering the more general type of equation

$$\frac{dF}{dt}(t) = \left(1 + \frac{1}{X(F(t))}\right). \quad [4]$$

In the first model  $F$ 's rate of change at  $t$  is determined directly by the strength of  $F$  at  $t$ . In the second model  $F$ 's rate of change at  $t$  is determined by the *exchange rate* at  $t$ , which in turn depends on the strength of  $F$  at  $t$ . The freedom to specify the exchange rate gives us an extra dimension along which possible dynamical laws can vary.

(A side note: I said early on that my discussion of Nozick would take Carnap's critique of Heidegger to heart. I would not reify the nothingness force. But when I presented my second model I said we should think of the nothingness force as a reservoir of non-being. You have may wondered whether in saying this I was betraying my earlier commitment. But now it should be clear that I have not. All that metaphorical talk is cashed out in equation [4].)

Although the move to laws of form given in equation [4] allows for a lot more flexibility in what the dynamics can look like, it does not seem to help with Nozick's project. Since  $X$  is a positive number, all of the laws with this form have  $F$  decreasing toward 0. But this is not of

any metaphysical interest.

There is one way that I can think of to allow the nothingness force's action on itself to produce something. I do not think it is what Nozick had in mind; but it is interesting enough to be worth pursuing.

### 7. A Third Model

Setting aside the metaphor of the nothingness force for the moment, the problem with the first two sets of dynamical laws is easy to see. They both say that the nothingness state is always the default state. And no amount of mathematical sophistication can change the fact that if the nothingness state is the default state, the universe's degree of existence cannot increase to 1 and remain there.<sup>8</sup>

There is a way out of this bind. If the nothingness state's status as the default state were unstable, if (somehow!) the very fact that the nothingness state is the default state itself required that the "somethingness state" (the state of maximal degree of existence) instead become the default state — well, then we might be on to something.

Reverting back to the nothingness-force metaphor, one strategy for implementing this idea is to expand the allowed values for  $F$ . So far I have restricted the values of  $F$  to be between 0 and 1. Let's recall what those values mean. When  $F = 0$ , the nothingness force does not act at all, and so  $E$  does not change. When  $F$  is positive, it does act, and so

8. One option here, of course, is to appeal to a somethingness force that prevents things from moving to their default state. (This is a real somethingness force, not the metaphorical one to be discussed in the text below.) I will not discuss this option in any detail, because it is clearly not an idea that Nozick wanted to use. Somethingness forces are tricky to think about. If we appeal to such a force to explain why there is something rather than nothing, we need to explain why that somethingness force itself exists. I said above that a nothingness force could not explain its own existence; but maybe things are different with a somethingness force. A somethingness force has a degree of existence just like material reality does, and the default state of the somethingness force's degree of existence is zero. But since the somethingness force acts to push things away from the nothingness state, it acts on itself to push itself away from the nothingness state. In this way, we can explain why it *continues* to exist, given that it *does* exist. But have we explained why it (tenselessly) exists?

causes decreases in both  $E$  and  $F$ . What I want to do now is allow  $F$  to take on negative values. To do this, though, I have to say what negative values for  $F$  mean.

If positive values for  $F$  indicate the action of the nothingness force, then negative values for  $F$  must indicate the action of a force opposed to the nothingness force: a *somethingness force* that, in Nozick-speak, pushes things *into* existence, or keeps them there. And this interpretation of negative values for  $F$  is vindicated by equation [2]. That equation says that when  $F$  is negative, the rate at which  $E$  changes is positive, which means that  $E$ , material reality's degree of existence, is increasing.

This is suggestive. Maybe we can get Nozick's result if we contrive for the action of the nothingness force on itself to result in the nothingness force's taking on negative values; then it will start pushing everything into existence rather than sucking everything into non-existence. And that will be why there is something rather than nothing.

The conservative approach to implementing this idea is to take either the first model or the second model of the action of the nothingness force, and simply allow  $F$  to take negative values in that model. But this turns out not to be enough to get what we want.

Let's begin by looking at the first model. As I mentioned, in that model the action of the nothingness force on material reality works the way we want it to. Negative values for  $F$  cause increases in the degree to which material reality exists. But things don't look so good when we consider how the nothingness force acts on itself in that model. Equation [3] governs the action of the nothingness force on itself. What does this equation say when  $F$  has negative values? The first problem is that equation [3] does not even permit  $F$  to have negative values. But let's set that aside. The basic idea behind the equation is that the strength of the nothingness force determines the rate at which the nothingness force is decreasing in strength. So if the strength of the nothingness force is negative, then the rate at which its strength is decreasing is also negative; which means that it is *increasing* in strength. So if  $F$  did ever manage to take on negative values, it would head back up to

ward positive values, which is not the behavior we are looking for. It is not what we are looking for for two reasons: first, we want  $F$  to stay in negative territory, so it can act to increase  $E$ ; and second, when  $F$  is negative it acts like a somethingness force, and when a somethingness force acts on itself it should increase its own degree of existence, thereby pushing  $F$  further into negative territory.

What about the second model? There the action of the nothingness force on itself gives us what we want: since  $X$ , the exchange rate, is always positive, even when  $F$  is negative it continues to decrease (until it reaches  $-1$ ). So in this case we are getting what we want: once  $F$  crosses 0 and becomes a somethingness force, the somethingness force acts to increase its own degree of existence. But in the second model the coupling between  $F$  and material reality's degree of existence does not make much sense. Remember how I explained that coupling: decreases in  $F$  amount to spending some non-being to purchase a decrease in being. This makes no sense when  $F$  is negative. We would have to be spending *negative amounts of non-being* to purchase increases in being. Maybe in some contexts deficit spending is a good idea, but in this case it strikes me as too far out there. I think that lots of people are too quick to dismiss metaphysics as a meaningless game, but even I draw the line at negative amounts of non-being.

The solution is to create a hybrid dynamics. Negative values for  $F$  make sense in the second model when we consider how  $F$  acts on itself, and they make sense in the first model when we consider how  $F$  acts on material reality. So let's cherry-pick the relevant laws from the two models and combine them. The law governing how  $F$  acts on itself is of the form given in equation [4]. And the law governing how  $F$  acts on  $E$  is equation [2] — so  $F$  directly determines the rate at which  $E$  changes, without our having to “spend” some amount of  $F$  to purchase changes in the value of  $E$ .

Here is what we end up with:  $F$  acts on itself, decreasing its degree of existence until it hits 0. At that point, its degree of existence continues to decrease, but now  $F$  acts like a somethingness force, and it acts to increase its own degree of existence and the degree of ex-

istence of material reality. Or, dispensing with the metaphor, in this dynamics the nothingness state's status as the default state is unstable. The self-reference in the laws results in the nothingness state's losing its status as the default state. The somethingness state subsequently acquires this status, and material reality's degree of existence states heading toward this new default state. Whatever the initial values for  $F$  and  $E$ , eventually  $F$  will be  $-1$  and  $E$  will be  $+1$ .

## 8. Concluding Remarks

I have proposed an interpretation of Nozick's metaphysical dynamics that purports to explain why there is something rather than nothing. But what kind of explanation is it, and is it any good? Wouldn't a better explanation just say that there is no nothingness force, and that the somethingness state was always the default state? It is certainly a simpler explanation. It avoids the need for all the weirdness we have been through. (In fact, this may have been Leibniz's view. He wrote, “since something rather than nothing exists, there is a certain urge for existence or (so to speak) a straining toward existence in possible things” [Leibniz 1989: 150].)

There are two ways that we might understand Nozick's explanation. We might understand it so that so that it purports to give us lots of information about the history of the actual world. If we understand it this way, then the explanation says (among other things) that in our world material reality started out with degree of existence 0.

On the other hand, we might understand Nozick's explanation as an *equilibrium explanation* [Sober 1983]. An explanation like this explains why a system has ended up in a certain state by giving us information about the structure of the system's dynamics, so that we see that the state the system ended up in is a (global, stable) equilibrium state — a state the system will end up in eventually, no matter what state it started in. The explanation says that the system ended up in that state because it *had* to. (For Nozick's explanation, the final default state [the somethingness state] is the equilibrium state.) An equilibrium explanation does not give any detailed information about the

actual causal history of the system's being in the equilibrium state. It just says that all causal histories lead to that state. So if we understand Nozick's explanation as an equilibrium explanation, it makes no commitments about the actual history of the universe's degree of existence. It just says that, no matter where its degree of existence started, the laws entail that it will end up at 1.

I find it more satisfying to understand Nozick's explanation as an equilibrium explanation. Then there is something to be gained from all this discussion of the nothingness force, even if we end up preferring Leibniz's alternative explanation. In fact we get a kind of second-order equilibrium explanation. For suppose that Leibniz was right about what metaphysical dynamical laws operated in our world. We will immediately wonder why those are the true dynamical laws. And in fact it naturally occurs to ask why the somethingness state, rather than the nothingness state, is the default state. Maybe if the nothingness state had been the default state, there would have been nothing? Our Nozick-inspired dynamics can be used to answer this question. If that dynamics is the correct dynamics for the case where nothingness is the default state (a big "if," I know), then we can say that not only must there be something, given the correct (Leibnizian) dynamics; there must also be something, even if the obvious alternative to Leibniz's dynamics had been correct. This answer to the second why-question makes the first explanation more stable, and so more explanatory.<sup>9</sup>

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