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Economics

# Hayek Meets Information Theory. And Fails.

Modern economic theories of prices-as-information are seventy years out of date.




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By Jason Smith

The inspiration for this piece came from a [Vox podcast](#) with Chris Hayes of MSNBC. One of the topics they discussed was which right-of-center ideas the left ought to engage. Hayes says:

The entirety of the corpus of [Friedrich] Hayek, [Milton] Friedman, and neoclassical economics. I think it's an incredibly powerful intellectual tradition and a really important one to understand, these basic frameworks of neoclassical economics, the sort of ideas about market clearing prices, about the functioning of supply and demand, about thinking in marginal terms.

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the time to understand all of that. There is a tremendous amount of incredible insight into some of the things we're talking about, like non-zero-sum settings, and the way in which human exchange can be generative in this sort of amazing way. Understanding how capitalism works has been really, really important for me, and has been something that I feel like I'm a better thinker and an analyst because of the time and reading I put into a lot of conservative authors on that topic.

Putting aside the fact that the left has fully understood and engaged with these ideas, deeply and over decades (it may be dense writing, but it's not exactly quantum field theory), I can hear some of you asking: Do I have to?

The answer is: No.

Why? Because you can get the same understanding while also understanding where these ideas fall apart – that is to say understanding the limited *scope* of market-clearing prices and supply and demand – using information theory.

## Prices and Hayek

Friedrich Hayek did have some insight into prices having something to do with information, but he got the details wrong and vastly understated the complexity of the system. He saw market prices aggregating information from events: a blueberry crop failure, a population boom, or speculation on crop yields. Price changes purportedly communicated knowledge about the state of the world.

However, Hayek was writing in a time before information theory. (Hayek's *The Use of Knowledge in Society* was written in 1945, a just few years before Claude Shannon's *A Mathematical Theory of Communication* in 1948.) Hayek thought a large amount of knowledge about biological or ecological systems, population, and social systems could be communicated by a single number: a price. Can you imagine the number of variables you'd need to describe crop failures, population booms, and market bubbles? Thousands? Millions? How many variables of information do you get from the price of blueberries? One. Hayek dreams of compressing a complex multidimensional space of possibilities that includes the state of the world and the states of mind of thousands or millions of agents into a single dimension (i.e. price), inevitably losing a great deal of information in the process.

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communication over telephone wires mathematically if you focused not on what was being communicated in specific messages but rather on the complex multidimensional *distributions* of possible messages. A key requirement for a communication system to work in the presence of noise would be that it could faithfully transmit not just a given message, but rather *any* message drawn from the distribution. If you randomly generated thousands of messages from the distribution of possible messages, the distribution of generated messages would be an approximation to the actual distribution of messages. If you sent these messages over your noisy communication channel that met the requirement for faithful transmission, it would reproduce an informationally equivalent distribution of messages on the other end.

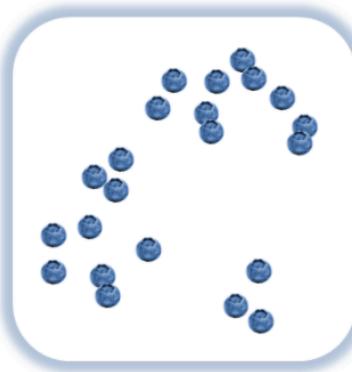
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We'll use Shannon's insight about matching distributions on either side of a communication channel to match distributions of supply and demand on either side of market transactions. Let's start with a set of people who want blueberries (demand) and a supply of blueberries. These represent complex multidimensional distributions based on all the factors that go into wanting blueberries (a blueberry superfood fad, advertising, individual preferences) and all the factors that go into having blueberries (weather, productivity of blueberry farms, investment).



Distribution of demand



Distribution of supply

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balance of crop failures and crop booms (supply), population declines and population booms (demand), speculation and risk-aversion (demand) — the *distribution* of demand for blueberries is equal to the *distribution* of the supply of blueberries. Prices represent information about the *differences* (or changes) in the distributions. And differences in distributions mean differences in information.

Imagine you have blueberries randomly spread over a table. If you draw a grid over that table, you could imagine deciding to place a blueberry on a square based on the flip of a coin (a 1 or a 0). That is one bit of information. Maybe for some of the squares, you flip the coin two or more times. That's two or more bits.

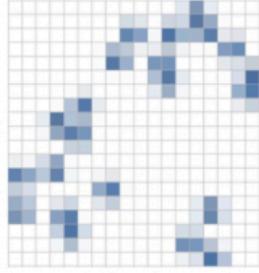
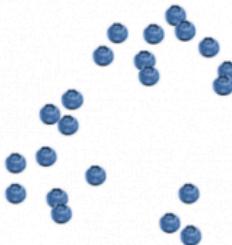
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#### *Distribution → Information*



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Now say you set up a distribution of buyers on an identical grid using the same process. If you flipped more coins for the buyers than the blueberries on the corresponding squares, that represents a difference in information (and likely an excess demand).

There can be an information difference even if there's no difference between the results of the coin flips. For example, you can get one blueberry on a square because you flipped a coin once and it came up heads or you flipped a coin twice and it came up heads once and tails once. However as the number of coin flips becomes enormous in a huge market, the difference between the results of the coin flips (excess supply or demand) will approximate the difference in the information in the coin flips. This is an important point about when markets work that we will come back to later. It is also important to note that these are not just distributions in space, but can be distributions in time. The future distribution of blueberries in a functioning market matches the demand for

Coming back to a stable equilibrium means information about the differences in one distribution (i.e. the number of coin flips) must have flowed (through a communication channel) to the other distribution via transactions between buyers and sellers at market prices. We can call one distribution  $D$  and the other  $S$  for supply and demand. The price is then a function of changes ( $\Delta$  or “delta”) in  $D$  and changes in  $S$ :

$$p = f(\Delta D, \Delta S)$$

Price is a function of changes in demand and changes in supply. That's Economics 101. But what *is* the function describing the relationship? We know that an increase in  $S$  that's bigger than an increase in  $D$  generally leads to a falling price, while an increase in  $D$  that is bigger than the increase in  $S$  generally leads to a rising price. If we think in terms of *distributions* of demand and supply, we can try

$$p = \Delta D / \Delta S$$

for our initial guess. Instead of aggregating information into a price, which we can't do without throwing away information, we have a price *detecting the flow of information*. Constant prices tell us nothing, but price changes tell us information has flowed (or been lost) between one distribution and the other. And we can think of this information flowing in either space *or time* if we think of the demand distribution as the future allocation of supply.

This picture also gets rid of the dimensionality problem: the distribution of demand can be as complex and multidimensional (i.e. depend on as many variables) as the distribution of supply. The single dimension represented by the price now only measures the single dimension of information flow.

## Marginalism and supply and demand

Chris Hayes also mentions marginalism. It's older than Friedman or Hayek, going back at least to William Jevons. In his 1892 thesis, Irving Fisher tried to argue (crediting Jevons and Alfred Marshall) that if you have gallons of one good  $A$  and bushels of another good  $B$  that were exchanged for each other, then the last increment (the marginal unit) was exchanged at the same rate as  $A$  and  $B$ , i.e.

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calling both sides of the equation the price of  $B$  in terms of  $A$ . Note that the left side is our price equation above ( $p = \Delta D / \Delta S$ ), just in terms of  $A$  and  $B$  (you could call  $A$  the demand for  $B$ ). In fact, we can get a bit more out of this equation if we say

$$p_a = \Delta A / \Delta B = A / B$$

We add a little subscript  $a$  to remind us that this is the price of  $B$  in terms of  $A$ . If you hold  $A$  constant and increase  $B$  (supply), the price goes down. For fixed demand, increasing supply causes prices to fall – a demand curve. Likewise if you hold  $B$  constant and increase  $A$ , the price goes up – a supply curve. However if we take tiny increments of  $A$  and  $B$  and use a bit of calculus ( $\Delta A / \Delta B$  becomes  $dA/dB$ ) the equation becomes a differential equation that can be solved. In fact, it is one of the oldest differential equations to be solved (by Bernoulli in the late 1600s). However, the solution tells us that  $A$  is linearly proportional to  $B$ . It's a quite limited model of the supply-demand relationship.

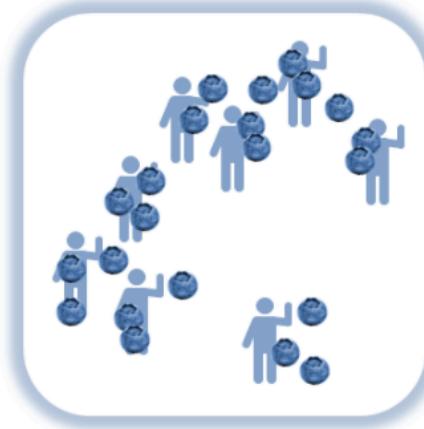
Fisher attempts to break out of this limitation by introducing utility functions in his thesis. However thinking in terms of information can again help us.

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Matching distributions

If we think of our distribution of  $A$  and distribution of  $B$  (like the distribution of supply and demand), each “draw” event from those distributions (like a draw of a card, a flip of one or more coins, or roll of a die) contains  $I_1$  information (a

distribution (a transaction event) will match in terms of information. Now it might cost two or three gallons of  $A$  for each bushel of  $B$ , so the number of draws on either side will be different in general, but as long as the number of draws ( $n$ ) is large, the total information from those draws will be the same:

$$n_1 \cdot I_1 = n_2 \cdot I_2$$

Rearranging, we have

$$n_1 \cdot (I_1 / I_2) = n_2$$

We'll call  $I_1/I_2 = k$  (for reasons we'll get into later) so that

$$k \cdot n_1 = n_2$$

Now say the smallest amount of  $A$  is  $\Delta A$  and likewise for  $B$ . One bushel or one gallon, say. That means

$$n_1 = A/\Delta A$$

$$n_2 = B/\Delta B$$

i.e. the number of gallons of  $A$  is the total amount of  $A$  divided by 1 gallon of  $A$  (i.e.  $\Delta A$ ). Putting this together and rearranging a bit we have

$$\Delta A/\Delta B = k \cdot A/B$$

This is just Fisher's equation again except there's our coefficient  $k$  in it expressing the information relationship, making the solution to the differential equation mentioned above a bit more interesting than being linearly proportional — now  $\log(A) = k \log(B) + b$ , where  $b$  is another constant. The supply and demand relationship found by holding either  $A$  or  $B$  constant and varying the other is also more complex than the one you obtain from Fisher's equation (it depends on  $k$ ). It's essentially a more generalized marginalism where we no longer assume  $k = 1$ . But there's a more useful bit of understanding you get from this approach that you don't get from simple price signaling. What we have is information flowing between  $A$  and  $B$ , and we've assumed that information transfer is perfect. But markets aren't perfect, and all we can really say is that *the most* information that can get from the distribution

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$$n_1 \cdot I_1 \geq n_2 \cdot I_2$$

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Following through with this insight in the derivation above, we find

$$p = \Delta A / \Delta B \leq k \cdot A / B$$

Because the information flow from  $A$  can never be greater than  $A$ 's total information, and will mostly be less than that total, the observed prices in a real economy will most likely fall *below* the ideal market prices. Another way to put it is that ideal markets represent a best-case scenario, one out of a huge space of possible scenarios.

There's also another assumption in that derivation – that the number of transaction events is large, as we mentioned before. So even if the information transfer was ideal, the traditional price mechanism only applies in markets that have a large volume of trade. That means prices for rare cars or salaries for unique jobs likely do not represent accurate information about the underlying complex multidimensional distributions of market supply and demand. Those prices are in a sense arbitrary. They might represent some kind of data (about power, privilege, or negotiation skills), but not necessarily information about the supply and demand distributions or the market allocation of resources. In those cases, we can't really know from the price alone.

Another insight we get is that supply and demand doesn't always work in the simple way described in Marshall's diagrams. We had to make the assumption that  $A$  or  $B$  was relatively constant while the other changed. In many real world examples [we can't make that assumption](#). A salient one today is the (empirically incorrect) claim that immigration lowers wages. A naive application of supply and demand (increased supply of labor lowers the price of labor) ignores the fact that more people means not just more labor, but more people to buy goods and services produced by labor. Thinking in terms of information, it is impossible to say that you've increased the number of labor supply events without increasing the number of labor demand events, so you must conclude  $A$  and  $B$  must both change. More immigration means a larger economy; the effect on prices or wages does not simply follow from supply and demand based on a population increase.

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economists) try to convey of not only market failures and inefficiency but more complex interactions of supply and demand. Instead of starting with the best-case scenario, we start with a huge space of possible scenarios — all but one of them less-than-best.

However, it is also possible through collective action to mend or mitigate some of these failures. We shouldn't assume that just because a market spontaneously formed or produced a result, that it is working optimally, and we shouldn't assume that because a price went up either demand went up or supply went down. In that case, the market might have just gotten better at detecting information flow that was already happening. We might have gone from non-ideal information transfer where  $n_1 \cdot I_1 \geq n_2 \cdot I_2$  to something closer to ideal where  $n_1 \cdot I_1 \approx n_2 \cdot I_2$ , meaning the observed price got closer to the higher ideal price.

The equations above were originally derived a bit more rigorously by physicists Peter Fielitz and Guenter Borchardt in a paper published in 2011 titled “[A generalized concept of information transfer](#)” (there is also an [arXiv preprint](#)).

The paper includes both the ideal information transfer (information equilibrium) and non-ideal information transfer scenarios. They call the coefficient  $k$  the information transfer index. As they state in their abstract, information theory provides shortcuts that allow one to deal with complex systems. Fielitz and Borchardt primarily had *natural* complex systems in mind, but as we have just seen, the extension to *social* complex systems — especially pointing out the assumptions necessary for markets to function — is straightforward.

## The market as an algorithm

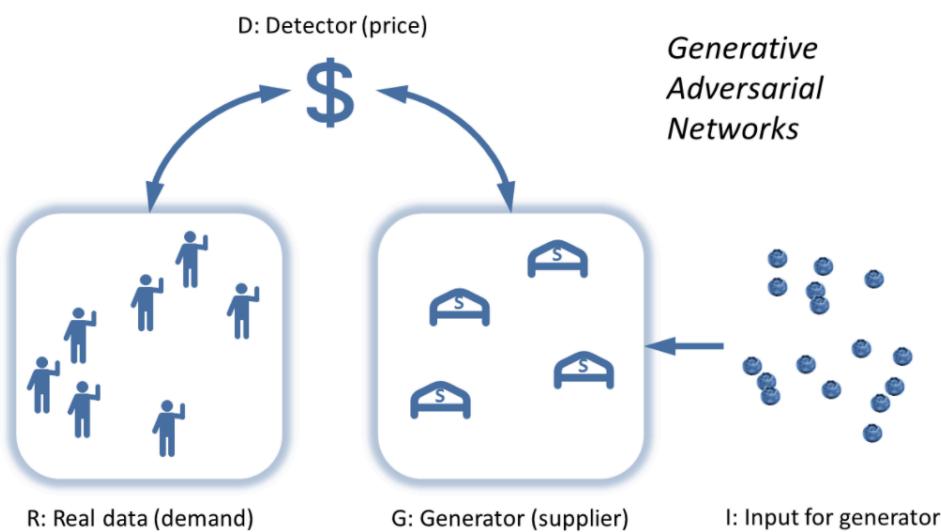
The picture above is of a functioning market as an algorithm matching distributions by raising and lowering a price until it reaches a stable price. In fact, this picture is of a specific machine learning algorithm called [Generative Adversarial Networks](#) (GAN, described in this [Medium article](#) or in the [original paper](#)) that has emerged recently. Of course, the idea of the market as an algorithm to solve a problem is not new. For example [one of the best blog posts of all time](#) (in my opinion) talks about linear programming as an algorithm, giving an argument for why planned economies will likely fail, but the same argument implies we *cannot check the optimality* of the market allocation of resources, therefore claims of markets as optimal are entirely faith-based. The

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Instead of the complex multidimensional distributions, here we have blueberry buyers and blueberry sellers. The “supply” ( $B$  from above) is the generator  $G$ , the demand  $A$  is the “real data”  $R$  (the information the deep learning algorithm is trying to learn). Instead of the random initial input  $I$  — coin tosses or dice throws — we have the complex, irrational, entrepreneurial, animal spirits of people. We also have the random effects of weather on blueberry production. The detector  $D$  (which is coincidentally the terminology Fiebtiz and Borchardt used) is the price  $p$ . When the detector *can't* tell the difference between the distribution of demand for blueberries and the distribution of the supply of blueberries (i.e. when the price reaches a relatively stable value because the distributions are the same), we've reached our solution (a market equilibrium).

Note that the problem the GAN algorithm tackles can be represented by the two-player **minimax game** from game theory. The thing is that with the wrong settings, algorithms fail and you get garbage. I know this from experience in my regular job researching machine learning, sparse reconstruction, and signal processing algorithms. Therefore depending on the input data (especially data resulting from human behavior), we shouldn't expect to get good results all of the time. These failures are exactly the failure of information to flow from the real data to the generator through the detector – the failure of information from the demand to reach the supply via the price mechanism.

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When asked by Quora what the recent and upcoming breakthroughs in deep learning are, Yann LeCun, director of AI research at Facebook and a professor at NYU, said:

The most important one, in my opinion, is adversarial training (also called GAN for Generative Adversarial Networks). This is an idea that was originally proposed by Ian Goodfellow when he was a student with Yoshua Bengio at the University of Montreal (he since moved to Google Brain and recently to OpenAI).

This, and the variations that are now being proposed is the most interesting idea in the last 10 years in ML, in my opinion.

Research into these deep learning algorithms and information theory may provide insight into economic systems.

## An interpretation of economics for the left

So again, Hayek had a fine intuition: prices and information have some relationship. But he didn't have the conceptual or mathematical tools of information theory to understand the mechanisms of that relationship — tools that emerged with Shannon's key paper in 1948, and that continue to be elaborated to this day to produce algorithms like generative adversarial networks.

The understanding of prices and supply and demand provided by information theory and machine learning algorithms is better equipped to explain markets than arguments reducing complex distributions of possibilities to a single dimension, and hence, necessarily, requiring assumptions like rational agents and perfect foresight. Ideas that were posited as articles of faith or created through incomplete arguments by Hayek are not even close to the whole story, and leave you with no knowledge of the ways the price mechanism, marginalism, or supply and demand can go wrong. Those arguments assume and (hence) conclude market optimality. Leaving out the failure modes effectively declares many social concerns of the left moot by fiat. The potential and actual failures of markets are a major concern of the left, and are frequently part of discussions of inequality and social justice.

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real world vision of economics that recognizes the limited scope of ideal markets and begins with imperfection as the more useful default scenario. **Understanding economics in terms of information flow** is one way of doing that.

2017 May 18

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**Manoj Ranchord**

6 years ago edited

For an alternative take on Information Theory as applied to Economics, check out '**Knowledge and Power - the Information theory of capitalism and how it is revolutionizing our world**' by George Gilder. This is a comprehensive Information Theory model of Economics rather than the piecemeal approach described in the above article that is understandable by both practitioners and everyday people -

*"Information theory definition of an economy as human creations or communications as transmissions across a wire, a channel or the world, in the face of noise (resistance) with its outcome gauged by its surprise (i.e. how unexpected it is). That's what Information is what you don't expect rather than what you do expect."*

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C

**ClassicalAustrianeco**

6 years ago

You fell for the same trap most Lefties fall into. You straw man and look at the world with one eye. You mention market failure, but, like many on the Left, never mention Government failure. Well, at least you are consistent.

Besides that 'twas an interesting article to read. Thanks for producing it.

o o Reply

**Andrés Felipe Rodríguez Pérez**

7 years ago

Ok, Hayek had an intuition as Lucrecio had an intuition. But what about government failures in relation with information theory?

o o Reply

R

**RM1948**

8 years ago

My naive understanding is that market theory is based on the transfer of complete information between buyer and seller. (I believe more advanced discussions incorporate incomplete information.) So how could you apply Shannon's bandwidth limitation to market theory?

3 o Reply



### Ted Howard

8 years ago edited

This post is kind of useful in the way it portrays information theory reasonably well. This post is very poor in its presentation of von Hayek's thoughts, as Guilherme and others accurately note. That it ignores evolution is unforgivable.

Like most works, in attempting to simplify a very complex system, it over simplifies to the point of creating chaos.

Any attempt to understand anything to do with humans that does not acknowledge the many levels of dimensions of systems that are present in us from our evolutionary history, both in the genetic sense of the structure of our bodies and brains, and in the cultural sense of our language, knowledge, practices, and domains of embodied wisdom; must fail in many important aspects.

I recall attending a meeting of the International Institute of Fisheries Economics and Trade (IIFET) in 1984, and listening to the mathematical explanations of fisheries markets. They were all simplistic nonsense to me. At that point I had been a practicing fisherman for almost a decade, and had several years involvement in retail and wholesale fish markets. I also had a tertiary background in ecology, computing, psychology and neuro-chemistry. The fish markets I was involved in were all determined by the strength of the human relationships involving

[see more](#)

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### Carl Henning Reschke

→ Ted Howard

8 years ago

@Ted Howard though I am tempted to add to or twist some details, simply great!

@Jason any comments from your side how you would incorporate that in an algorithmic approach?

1 o Reply



### Guilherme

9 years ago edited

This article definitely makes a strawman of Hayek. See what Hayek says in his two MAGNUS OPUS:

"What we must ask the reader to keep constantly in mind throughout this book, then, is the fact of the necessary and irremediable ignorance on everyone's part of most of the particular facts which determine the actions of all the several members of human society. This may at first seem to be a fact so obvious and incontestable as hardly to deserve mention, and still less to require proof. Yet the result of not constantly stressing it is that it is only too readily forgotten." F. A. Hayek, Law, Legislation and Liberty

"The Socratic maxim that the recognition of our ignorance is the beginning of wisdom has profound significance for our understanding of society (...) This fundamental fact of man's unavoidable ignorance of much on which the working of civilization rests has received little attention. Philosophers and students of society have generally glossed it over and treated this

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explain the real world. Its problems are dominated by the "practical difficulty" that our

[see more](#)

7 o Reply 



**Guido Wolf Reichert** → Guilherme

8 years ago

"two MAGNUS OPUS" really hurts - please make it "two MAGNA OPERA" next time. :)

o o Reply 



**Adediran Adeyemi** → Guilherme

9 years ago

Thank you. This is the perfect response. My thoughts exactly.

2 o Reply 



**Tony Hua**

9 years ago

While I do not necessarily agree with the author's interpretation/summary of Hayek's works, I do nonetheless find the author's use of information theory to derive economic relationships interesting. Several of the commentators have criticized the author for attempting to build a better market mechanism, which I believe misinterprets the author's intent. Jason Smith seems to be offering one potential interpretation of the market mechanism, an attempt to build an alternative derivation to standard marginal methods, thereby removing certain assumptions made in (admittedly textbook based) models. Nowhere does Jason makes the claim that machine learning or information theory can build a better marketplace. The chief argument of this article seems centered on better understanding the market mechanism through insights provided by information theory models.

o 1 Reply 



**Jason** → Tony Hua

9 years ago

Thanks Tony.

Yes, I don't think I am building a better market mechanism, simply attempting to understand the existing one (and exploring what assumptions are implicitly made about it). And if we can understand failures, we can plan for them.

I think e.g. machine learning may be a source of insight, but as I said in the piece: machine learning algorithms sometimes fail. My speculation is that understanding the failure modes of machine learning algorithms may help us understand the failure modes of markets. ... There is an analogy here to the case where failure modes of machine learning algorithms can lead to insights into neuroscience.

3 1 Reply 



**Carl Henning Reschke** → Jason

9 years ago

Now, that is an interesting approach. Using the technical analogy to point out flaws in economic thinking resp. models.

o o Reply 



**Barış Canatan** → Tony Hua

9 years ago edited

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1 1 Reply **Jason** → Barış Canatan

9 years ago

It's not an argument against capitalism.

It's an argument against assuming the market is optimal.

3 0 Reply **Barış Canatan**

9 years ago

If you think that you can write some ML algo. that can decide on the value of an item better than yourself, go ahead write it. Nobody is holding you.

If you want to represent the value of an item using an N dimensional vector, what is the basis for *Economics* is a labor of love, it's free and it's ad-free. We spend hundreds of hours and thousands of dollars spreading the word about The New Evolution of Economics.

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1 1 Reply **Jason** → Barış Canatan

9 years ago

I see you've never encountered a problem where you don't know what a good basis for your space is (trying to understand which basis visual imagery is sparse in is an outstanding problem in image processing).

One of the advantages of the approach above is that the dimensionality problem is dealt with as an effective theory: at leading order the details of the basis are subsumed into the coefficient k (information transfer index).

1 1 Reply **Barbara N Brown**

9 years ago

The other thing that seems to be of great concern given the "fake news" trends becoming visible in recent years is the question of deliberate disinformation. This is NOT noise in the system, but weighted coins if you start with statistics.

So what does information theory tell us happens to economics if NONE of the information the majority of players receives can be trusted? Especially if there is collusion among a small group spreading lies?

2 0 Reply **Jason** → Barbara N Brown

9 years ago

One of the key aspects of information theory is that it helps you characterize a system without getting into the meaning of the messages.

However correlation of agents in the state space would lead to the case I called "non-ideal information transfer", which tends to cause the system to collapse. So in a sense, as long as the "lies" are uncorrelated, then there's no problem. But if they are, beware.

1 1 Reply **Barbara N Brown** → Jason

9 years ago

But of course, in the real markets, the lies are correlated. That's the definition of collusion. And yes eventually this leads to a bubble and then massive

so to many, the price no longer has utility, because the information the supposedly is summarized in the price cannot be trusted.

Perhaps a better use of information theory might be to identify an objective confidence level in the information being received.

o o Reply 



**stephenverchinski**

→ Barbara N Brown

8 years ago edited



Like the collusion we saw prior to the market epic fail in 2008 between Republicans and Democrats to suppress the reporting of the M3 money supply (derivatives etc.). Except that perhaps did not apply to those participating in the suppression. Damn them both to someplace not nice.

1 o Reply 



**Christos D. Papageorgiou**

9 years ago

Let us assume that the proposed remarks of the article about market economy are all true, two very important questions are remaining.

1. Why the non capitalist (non market) economies (Communistic economies) are completely unsuccessful generating poverty ?

2. Why the capitalistic (market) economies operate successfully creating wealth (unequally shared), although various Marxist or Socialist oriented intellectuals discover many theoretical mistakes in the pro-market economy theories of HAYEK or FRIEDMAN and others ?

Keynes gave a sincere reply in the second question “Capitalistic (market) economy is a remarkably successful social machine but we do not know how it operates”

6 1 Reply 



**stephenverchinski**

→ Christos D. Papageorgiou

8 years ago



The framing of the first question give to me a false assumption that Communist economies are not market based and failures at creating wealth. The second question frames it that capitalistic structures are that market based and successful. I find both frames too simplistic. Both have individual greed as the ultimate value at the top with politbureaus and corporatist manipulation. Both create by design imperfect markets and both bypass the impacts long term on biological systems whose accounting system has been always an afterthought..

5 o Reply 



**Mick McDick**

9 years ago

My copy of Road to Serfdom, page 66: "The magnificent motor roads in Germany and Italy are an instance often quoted—even though they do not represent a kind of planning not equally possible in a liberal society... Anyone who has driven along the famous German motor roads and found the amount of traffic on them less than on many a secondary road in England, can have little doubt that, so far as peace purposes are concerned, there was little justification for them."

Yes,  
the famous economist drove the first superhighways in the world and

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~~se "highways"~~

may be useful for, in an economic sense? NO?

Hayek could only see data that supported his foregone conclusions. He shares this shortened vision with many of todays libertarian ideologues.

2 o Reply ↗

**Guilherme**

9 years ago edited

"The understanding of prices and supply and demand provided by information theory and machine learning algorithms is better equipped to explain markets than arguments reducing complex distributions of possibilities to a single dimension, and hence, necessarily, requiring assumptions like rational agents and perfect foresight. Ideas that were posited as articles of faith or created through incomplete arguments by Hayek are not even close to the whole story, and leave you with no knowledge of the ways the price mechanism, marginalism, or supply and demand can go wrong. Those arguments assume and (hence) conclude market optimality."

Wtf, you know nothing about Hayek. Nothing! I doubt even if you read the Wikipedia article about him

3 1 Reply ↗

**Jason**

→ Guilherme

9 years ago

There are lots of claims I know nothing about Hayek, but they rarely cite specific errors.

I get the impression that I may well have read (or understood) more of Hayek than his fans.

1 1 Reply ↗

**Guilherme**

→ Jason

9 years ago

I read a lot of Hayek and I can provide you some quotes from him so that you can see what I'm saying:

See what Hayek says in his two MAGNUS OPUS:

"What we must ask the reader to keep constantly in mind throughout this book, then, is the fact of the necessary and irremediable ignorance on everyone's part of most of the particular facts which determine the actions of all the several members of human society. This may at first seem to be a fact so obvious and uncontested as hardly to deserve mention, and still less to require proof. Yet the result of not constantly stressing it is that it is only too readily forgotten." F. A. Hayek, Law, Legislation and Liberty

"The Socratic maxim that the recognition of our ignorance is the beginning of wisdom has profound significance for our understanding of society (...) This fundamental fact of man's unavoidable ignorance of much on which the working of civilization rests has received little attention. Philosophers and students of society have generally glossed it over and treated this ignorance as a minor imperfection which could be more or less disregarded. But though

[see more](#)

1 o Reply ↗

~~se "highways"~~**SHARE THIS ARTICLE**

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equilibrium, and not so much about the price mechanism that I am talking about.

Coincidentally, David Glasner posted a nice discussion of it a few days after my article was published:

<https://uneasymoney.com/201...>

Additionally, the "hyper-rationality" of agents is actually a potential solution to the information problem I describe (price and utility are both single dimensional variables, so price signal can faithfully represent utility signals).

Per my other reply, Hayek does make optimality claims when he says markets drift in the right direction. Prices and agents may be imperfect, but assuming they move in the right direction (which is not guaranteed by the information theory approach) is an optimality assumption.

If a machine learning algorithm always moved in the right direction, it would be optimal.

1 o Reply 



**Carl Henning Reschke** → Jason  
9 years ago edited

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If a machine learning algorithm always moved in the 'right' direction this means what? (Btw: who defines what right is - which is precisely one of Hayek's major points).

It locally moves up a gradient (hill), so it might end up (get stuck) on any 'local' optimum (hilltop). What would happen in a landscape of troughs and hills that is wobbling and shifting on different scales?

Here you'll find some background information and summary of Hayek's development of thought (and links to the writings of Hayek).

<http://hayekcenter.org/?p=1678>

In his 1936/1937 'Economics of Knowledge' Hayek uses the equilibrium concept for the anticipations / plans of a \*single\* actor \*as long as\* his anticipations 'hold'. New information = new anticipations = new plans = new \*individual\* equilibrium, no other equilibrium.

[see more](#)

o 1 Reply 



**Jason** → Carl Henning Reschke  
9 years ago



The phrase "right direction" is actually a direct quote from Hayek in 'The Use of Knowledge in Society':

"The marvel is that in a case like that of a scarcity of one raw material, without an order being issued, without more than perhaps a handful of people knowing the cause, tens of thousands of people whose identity could not be ascertained by months of investigation,

It is clear that Hayek means the "right direction" is towards an optimum (i.e. using a scarce commodity more sparingly).

And again, the intertemporal equilibrium (involving expectations) in "Economics and Knowledge" is a somewhat different (but not entirely unrelated) concept than the price mechanism. There are two problems: the economic calculation problem and the coordination of future plans problem. The price mechanism is a heuristic solution to the former, but Hayek was just among the first to formulate the latter. See Glasner's piece and his follow up:

<https://uneasymoney.com/201...>

1 o Reply 

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**Carl Henning Reschke** → Jason

9 years ago edited

I know its from Hayek. That's why I asked the question.

1) Still here is the question who or what defines 'right'?

In a simple machine learning algo world the algorithm would climb up any hill ('gradient') where it starts, and where the hill is defined by the problem the algorithm is to solve. To move this to Hayek's world you would have to have several algorithms competing against each other and they would have to be adaptable as in evolutionary strategies.

So Hayek would answer: nobody or all actors through their interactions define what is right - it ('right') emerges iteratively based on the interactions of the actors (or their plans) in an evolutionary way without conscious design, as Hayek indeed says (and you would concur, I assume).

2) There's a problem here: What are the institutions ('regulations', rules) that govern this process (if any) and where does the process

[see more](#)

1 o Reply 



**Guilherme** → Jason

9 years ago edited

Seriously, man? You're saying Hayek assumes market optimality, you're saying that he doesn't consider fallibility or limitations of knowledge. But it's exactly the opposite of Hayek's thinking. My harsh criticism is just because Hayek is one of the most known thinkers to be against the idea of market optimality, one of that who most emphasized human fallibility and the limitation of knowledge.

2 1 Reply 



**Jason** → Guilherme

9 years ago

Limitations of knowledge and fallibility are not directly related to optimality. A system where agents make mistakes can still have an optimum -- a best case. In fact, Gary Becker showed that random "irrational" agents can still show optimal behavior in a market ("Irrational Behavior and Economic Theory", 1962).

'perfect". As Hayek says: "tens of thousands of people ... move in the right direction".

In a system with noise, error, etc, saying that agents or prices move in the right direction is an optimality claim. It assumes markets work as a kind of information pump with bad information being pumped out and good information being kept in. The information theory approach tells us that this is not guaranteed:

<http://informationtransfere...>

1 o Reply [🔗](#)



**ViperRum**

9 years ago edited

From the article,

"This picture also gets rid of the dimensionality problem: the distribution of demand can be as complex and multidimensional (i.e. depend on as many variables) as the distribution of supply. The single dimension represented by the price now only measures the single dimension of information flow."

Derp. Didn't you just get done saying this was a bad thing with regards to prices?

Not only that you appear to basically be agreeing with Hayek, that prices convey information and what you are trying to do is put it into precise mathematical terms...so what? You can attempt to control it? You seem to have basically redone neoclassical economics (hint Hayek was NOT a neoclassical economist, that is why he was part of the Austrian school) but using the framework of information theory. Okay...maybe interesting, but I see nothing new here. At all. So where exactly did Hayek fail? If anything his article the Use of Knowledge in Society was way, way ahead of its time according to your article.

Further, you seem to have failed to grasp a key observation of Hayek, the information necessary to use the neoclassical framework or even your information theory is so vast and huge it cannot

[see more](#)

2 1 Reply [🔗](#)



**Jason**

→ ViperRum

9 years ago

"Didin't you just get done saying this was a bad thing with regards to prices?"

Nope. I said it was a bad thing to say that single-dimensional prices reflected the multidimensional distributions of supply or demand. Single dimensional prices can fully reflect the single dimensional distribution of information flow between supply and demand.

" ... suggesting that via this new 'realistic' interpretation it can be used to control the economy"

I am explicitly \*not\* suggesting this "solves" the calculation problem (I cite a reference that says it is impossible with modern computational resources).

1 o Reply [🔗](#)



**the9trances**

→ ViperRum

9 years ago

#rekt

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**Carl Henning Reschke**

9 years ago edited

The problem with Hayek is probably less the (really) subjective, psychological Hungarian-Austrian Hayek, but the (authors' and too many others') interpretation of Hayek in a culture and worldview of utilitarian economic maximisation and 'optimality' that was and is quite strong in a (still living) Victorian 'business' culture.

2 o Reply **Roger Koppl**

9 years ago edited

 Carl Henning Reschke

Sorry, but that's too cryptic for me. Honestly, I have no idea what your comment means, Carl.

o o Reply **ViperRum**

9 years ago

 Roger Koppl

Hayek was not a "neoclassical economist" in the sense of Jevons, Walras and those who followed them. Austrians are strongly subjectivists in terms of value. When something has value to me, it is my subjective preferences that determine that value. To early neoclassical economists they felt that utils--i.e. units of utility--could eventually be measured. Austrians said, "Nope." and went with a subjective value system. Hayek also was not a fan of the utility/profit maximization approach either. The problem is that how do you know when you are maximizing utility or profits. Armen Alchian also made this point. Profits are important, but a firm will never know if the profits it obtains are indeed truly maximal profits. In other words, Jason Smith set up a straw man and kicked the crap out of it. Amusing in some regards I guess, but in the end a pointless exercise.

7 o Reply **Roger Koppl**

9 years ago

 ViperRum

ViperRum: Okay, if that's what Carl meant, cool. I really couldn't make it out. As a footnote, Hayek didn't reject profit maximization. On the contrary, he somewhere endorsed Milton Friedman's claim that the proper "social function" of business is to maximize profit. (If we were being super strict, I guess we'd talk about maximizing the \*wealth\* of shareholders.) I'm not even sure we should say H. exactly \*rejected\* utility maximization. I think he just kept it in bounds, so to speak.

2 o Reply **Carl Henning Reschke**

9 years ago

 Roger Koppl

ViperRum explained it quite well, and I was rather cryptic, sorry and thank you! Added in brackets some terms that make it hopefully easier to understand.

I would just add that the Austrian economists are a subset of larger group of 'subjective' philosophers and scientists who had concentrated in the Austro-Hungarian empire, as described e.g. by W. M. Johnston in 'The Austrian Mind'.

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9 years ago

Yes to the "Austrian Mind" point. Right on.

1 o Reply **ViperRum** → Roger Koppl

9 years ago

How about Hayek was not a \*big\* fan of the neoclassical paradigm, that it left a lot to be desired (or included)? It can have its uses, but let us not take it too far.

2 o Reply **Roger Koppl** → ViperRum

9 years ago

Yeah, I think something like that is true.

o o Reply **Dylan Brewer**

9 years ago

I found the characterization of Hayek's arguments to be wrong. Hayek's works definitely do not underestimate the complexity of the system—he finds the market system to be so complex that he recommends avoiding attempts to intervene in it for fear of unintended consequences.

Furthermore, stating "Hayek dreams of compressing a complex multidimensional space of possibilities that includes the state of the world and the states of mind of thousands or millions of agents into a single dimension (i.e. price), inevitably losing a great deal of information in the process" misrepresents Hayek completely. There is no loss of information. Prices reflect a lot of information at \*low cost.\* An economic agent may be able to gain more specific information about various supply or demand conditions in a different geographic space or time, but this information acquisition is costly. Prices inexpensively coordinate behavior.

With regards to information theory, the major flaw (in this presentation at least--I am assuming it gets more complex) is that it assumes away human decision making. The analysis attempts to describe the outcomes of a system of humans without modelling actual human behavior. Neoclassical economics has gone to great lengths in the last century to "micro-found" its models. I would recommend reading some of Mas-Collel, Whinston, and Green's "Microeconomic Theory" textbook to see how economists have mathematically micro-founded their models.

[see more](#)10 1 Reply **Jason** → Dylan Brewer

9 years ago

Dylan,

When you say:

"With regards to information theory, the major flaw (in this presentation at least--I am assuming it gets more complex) is that it assumes away human decision making"

this is close, but not completely accurate. The information theory approach makes no assumptions \*about\* human behavior. Ideal information transfer is effectively an assumption that agents explore the available state space largely uncorrelated. Functioning markets in this framework require this assumption, and therefore represent a bigger assumption about human behavior than the general (non-ideal)

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1 o Reply **econfinjunkie** → Dylan Brewer

9 years ago

I had to reread the part about Hayek understating the complexity of the system several times to make sure I had read it right. I started wondering if the books I had read with Hayek's name on the cover containing statements with the exact opposite import had been someone else's book with Hayek's name photoshopped on the cover or something. Your next words, "he finds the market system to be so complex..." were exactly my understanding of Hayek. But then I thought, "But this guy's got a PhD in physics, seems like a smart guy who would be careful about getting details right," and I started to doubt myself. I'm glad someone else confirmed my doubts about the basis of the arguments in this article, meaning the article shows a deep misunderstanding of Hayek.

2 o Reply 

This comment was marked as spam.

**econfinjunkie** → Mankind Global Media

9 years ago

This person's representation of the Austrian school isn't as deep as one might think. Look at the comments section and you'll see some knowledgeable people, even at least one of the modern Austrian economists the author criticizes, pointing out some of the flaws in the author's assumptions. They are not ad hominem attacks, either, just pointing out that the author's understanding of Austrian economics is not as solid as he thinks it is.

2 1 Reply **Mankind Global Media** → econfinjunkie

9 years ago

Ummm... Jason's replying to them. And taking them to the cleaners.

o o Reply **Carl Henning Reschke** → Mankind Global Media

9 years ago

Not really. Rather, the point is: the flaws in neoliberal economics Jason wants to point out are also inherent in Hayek's view of economic interaction. The formalized process of economic interaction Jason describes is (intentionally) a rendition of Hayek's view.

The difference between 'left' and 'right' occurs in the interpretation of and conclusion from the Hayekian economic process. This relates to the following quote from Jason:

"necessarily, requiring assumptions like rational agents and perfect foresight. Ideas that were posited as articles of faith or created through incomplete arguments by Hayek are not even close to the whole story, and leave you with no knowledge of the ways the price mechanism, marginalism, or supply and demand can go wrong. Those arguments assume and (hence) conclude market optimality."

*What has Hayek really said and what is ascribed to him?*

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JASON SMITH



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Jason is a physicist who theory. He graduated from the University of Texas at Austin with **DONATING = CHANGING ECONOMICS. AND CHANGING THE WORLD.**

Washington in theoretical physics. **Twitter is a labor of love**, it's free and it's ad-free. We spend hundreds of hours and thousands of dollars spreading the word about The New Evolution of Economics.

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