

# Countering Risk and Variability Exposure

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Slides at <https://github.com/stevenokimbrough/presentations/blob/master/philosophy-dept-risk-senate-2019.pdf>

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p.m. in 402 Cohen Hall



# Thanks to

- Laurent Guy
- Max Kimbrough
- Tate Shafer

# Outline

- 1 Risk Exposure
  - Observations
  - Proposal
  - Objections
  - Next
- 2 Faculty Senate Doings
- 3 End Matter

## Speed Drill on a Speed Drill

- Risk is a thing.
- Observation #1: Often, mere exposure to risk or variability is harmful to the agent exposed.
- Observation #2: Fuel price risk attends use of fossil fuels but is absent with renewable energy.
- Fuel price risk is generally harmful.
- Proposal: Shift risk exposure from electricity customers to fossil fuel producers by taxing fuel price risk and using the revenues to subsidize renewable energy.
- The consequences of this reasoning ramify greatly.

# In the next ten minutes...

- Tell about a couple of topics I'm working on
- Hope to interest you in them
- Hope to get feedback from you in the interests of furthering my thinking

The topics:

- 1 Exposure to risk and variability
- 2 Penn Faculty Senate doings

# One job of philosophy is

- To discern under-appreciated facts and reflect on them, make something of them
- Recall Peirce: Metaphysics is an empirical science

Am working in that mode.

## In deference to speed...

- Risk  $\approx$  an *unwanted event* which may or may not occur.  
[Hansson, 2018]
- To be *exposed* to a risk  $\approx$  To be harmed if the risk materializes.
- To be exposed to variability  $\approx$  To rely on something that is unreliable, that changes
- Martha Fineman [Fineman, 2008] speaks of *vulnerability*.  
Good stuff.  
Being vulnerable  $\approx$  Exposed to risk or variability.

# Exposure to risk (and variability)

Often, mere exposure to risk and/or variability is itself harmful (to the agent in question).

- (To become vulnerable is (often) to be harmed.)
- Examples
  - Risk of fire and flood  $\leadsto$  purchasing home insurance
  - Russian roulette on someone else  $\leadsto$  trauma, discomfort
  - Recognized in the law (assault in distinction to battery, etc.), by philosophers, by common intuitions
- But I have not seen the principle explicitly stated . . .
- Why harmful? Because you have to be prepared for what might happen, for what will happen with variability.



# Exposure

Exposure to risk and variability is often costly to the target agent, who must prepare and adapt in consequence.

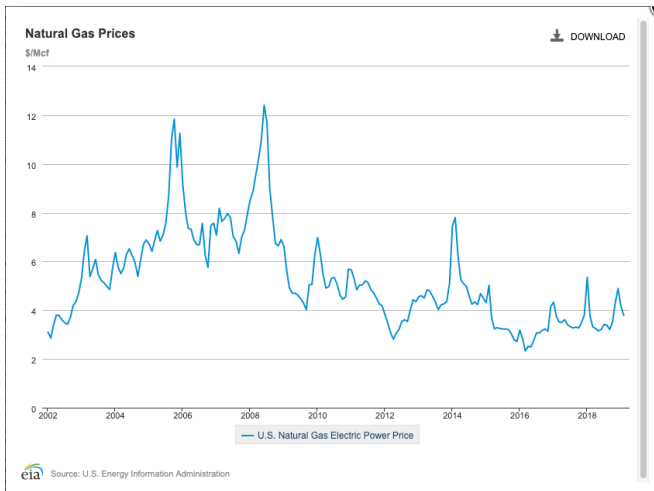
- Who gets exposed to risks (in harmful ways) is often socially conditioned or determined
- Not always from nature, e.g., with a hurricane
- Risk shifting is a major thing, e.g., from defined benefit pensions to defined contribution retirement accounts; reducing “social safety nets”; the gig economy
- Raises important issues of justice.
- What can be done?
- Well, let’s look at natural gas prices. Occasions further observations.

## Observation: Natural Gas Power Plant

What will it cost you to produce a megawatt of electricity 15–20 years from now?

- Gas plant owner: I don't know; it depends on the price of natural gas.
- Mr. Market: Hedge with futures contracts.

# What have the prices been?



2019-09-04

# Countering Risk and Variability Exposure

- └ Risk Exposure
  - └ Observations
    - └ What have the prices been?

What have the prices been?



Source: [https://www.eia.gov/energy/infrastructure/natural\\_gas\\_prices.php](https://www.eia.gov/energy/infrastructure/natural_gas_prices.php)

This is variability and this is price risk

## Observations

# What will the prices be? Thin market.




Month	Options	Charts	Last	Change	Prior Settle	Open	High	Low	Volume	HI / Low Limit	Updated
DEC 2019	OPT		2.924	+0.007	2.917	2.924	2.925	2.924	12	No Limit / No Limit	20:05:24 CT 15 May 2019
JAN 2020	OPT		3.019	+0.013	3.006	3.014	3.019	3.013	19	No Limit / No Limit	20:06:43 CT 15 May 2019
FEB 2020	OPT		-	-	2.967	-	-	-	0	No Limit / No Limit	17:55:03 CT 15 May 2019

Figure: Henry Hub futures.

## Cost of rolling hedge? Huge, a non-starter.

<https://www.cmegroup.com/trading/energy/natural-gas/natural-gas.html>

## Observation: Renewables

What will it cost you to produce a megawatt of electricity 15–20 years from now?

- Solar farm owner: Would you like to buy a power purchase agreement?
- Wind farm owner: Would you like to buy a power purchase agreement?

Low price risk. Production risk engineered at inception with a PPA (power purchase agreement).

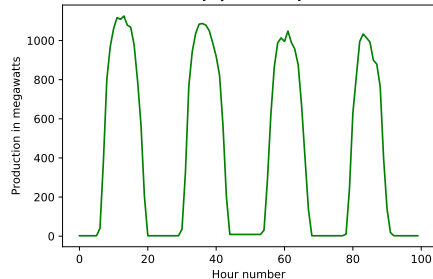
# The Idea

- Tax fuel price risk and use the revenues to subsidize substitution of VRE for gas in existing power plants.
  - Transfers risk from customers to producers.
  - A risk or volatility tax. Compare with a carbon tax, a health tax.
  - Like a “fee and dividend” carbon tax, but the benefits accrue mostly to the customers.

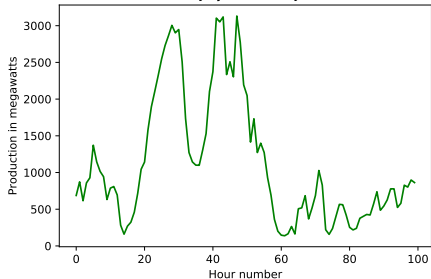
Objections

# But renewables are highly variable too!

100 hours of solar, July 2019, in PJM load area AECO



100 hours of wind, July 2019, in PJM load area AECO



- Yes, but. . .
- The proposal assumes an operating natural gas generator and encourages substitution of VRE (variable renewable energy) when it is available and nets out cheaper.
- (Load following costs for gas plants are under \$1/mWh. Cheap.)



# We've all lived with fuel price risk, what's the problem?

- How do you set the tax rate? What if the tax is higher than the benefit because people don't much care about fuel price risk?
- Natural gas is only slightly more expensive than VRE. All of the revenues go to increasing VRE. The net cost increase is very small.
- Happy to have a public debate and democratic decision making.
- Reduction of fuel price risk is a building block, one of many pluses of VRE.

# What next?

- If we accept the principle that exposure to risk and volatility is often harmful, we can extend its application well beyond the current case.
- GHG emitters are forcing a costly need to adapt to a warming world . . . They are adding risk. Make them pay for adaptation to the risks of climate change.

# Inviting, encouraging participation

- Scholarly communications  
And in particular: open access publishing, and stance towards Elsevier and other publishers.  
open access (pay to publish) vs subscription (pay to read) publishing. Justice? Morality?
- Climate change
  - mitigation
  - adaptation
  - transition

Culture, norms for a flourishing, just society under climate change? Transition especially engages the entire university (and more).



Fineman, M. A. (2008).

The Vulnerable Subject: Anchoring Equality in the Human Condition.

*Yale Journal of Law and Feminism*, 24(1):1–23.



Hansson, S. O. (2018).

Risk.

In Zalta, E. N., editor, *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University, fall 2018 edition.

# Additional slides

A simple formula governs whether substitution by solar PV (and indeed any VRE generation) will be cheaper than the gas saved. This will occur when

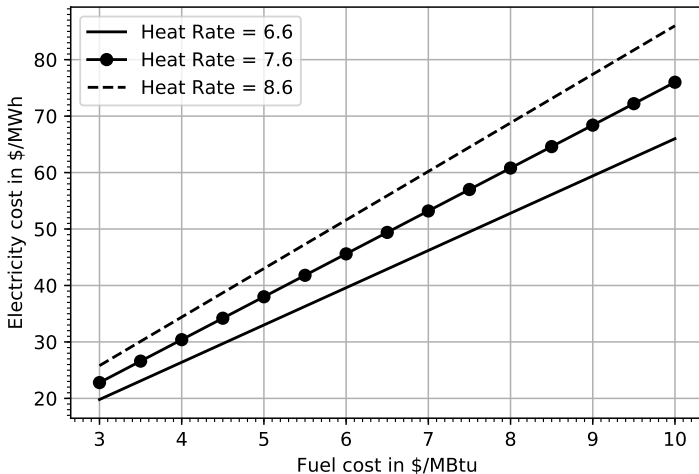
$$C_R < R_H \times C_F \quad (1)$$

where  $C_R$  is the cost of renewable energy, measured in dollars per megawatt hour,  $R_H$  is the heat rate of the thermal (e.g., CCGT) plant, measured in millions of BTU per megawatt hour, and  $C_F$  is the fuel cost, measured in dollars per million BTU. Alternatively, this occurs when

$$LCOE_{VRE} < HeatRate \times FuelCost \quad (2)$$

Note the dimensional characteristics:  $LCOE_{VRE}$  (LCOE, levelized cost of energy) is in \$/MWh,  $HeatRate$  is in MBtu/MWh, and  $FuelCost$  is in \$/MBtu. Suppressing subscripts we arrive at a simple formula. VRE is a cheaper substitute for gas if:

$$\frac{LCOE}{FuelCost} < HeatRate \quad (3)$$



**Figure:** Electricity cost of fuel as a function of gas price at three different heat rates for CCGT plants. Roughly, 6.6 is a very efficient

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