



The Takeaway

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Does Price Volatility Information Affect Consumer Choice?



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Most electricity consumers in the United States purchase electricity through a fixed-rate plan. This leads to inefficiencies and overuse because there are no monetary incentives for consumers to limit usage during peak times when electricity generation is very expensive. The reliance on fixed-rate plans makes electricity generation inefficient and has negative environmental implications. Neither utilities nor policy makers have been able to figure out how to successfully introduce dynamic-rate pricing plans on a large scale. Our research suggests ways electric utilities can help consumers make more efficient choices.

RISK AVERSION OR LACK OF INFORMATION?

Consumers in most deregulated retail markets for electricity can choose to sign up for a variable-rate plan, but most choose not to do so,¹ even though variable rates can be cheap-

WHAT'S THE TAKEAWAY?

Fixed-rate electricity plans lead to inefficient energy usage.

Dynamic rate plans offer monetary incentives to limit usage during peak times, but risk averse consumers tend not to choose them.

Our study suggests that the way price volatility information is presented may help transition more consumers to variable rate plans and make electricity generation more efficient and environmentally friendly.

er. This suggests that consumers are risk averse and do not want to be exposed to the potential for higher electricity prices. However, preference for fixed-rate contracts could also be a consequence of consumers not having enough information to effectively compare fixed and variable-rate plans. Currently, the only information that individuals shopping for an electricity plan are provided is the average expected price, in cents per kilowatt-hour (kWh), for a given usage level. No information is readily available about the level of price volatility that one may experience by signing up for a variable-rate plan.

Having the ability to choose a retail electricity plan was only introduced in the late 1990s.² The online platforms on which consumers shop for a retail electricity provider appear to be designed with the assumption that consumers only care about the average price and do not respond to changes in marginal prices.³ We wanted to investigate whether providing consumers with the additional information about expected price volatility would lead them to make different choices. Specifically, we are interested in whether consumers respond to price volatility information, and if their response differs depending on how the information is presented.

Previous studies have shown that consumers often make mistakes when choosing from a menu of options, especially when they face varying prices. In some markets, the process of choosing can be complex and costly,⁴ and, on average, consumers tend not to exhibit the “extraordinary degree of sophistication and effort” required to make an optimal consumption decision when prices

vary.⁵ Thus, sometimes having to make a choice can actually make consumers worse off, even if the choice process is reasonably simple.⁶

A DISCRETE CHOICE EXPERIMENT

In context of electricity markets, Borenstein (2007) suggests that consumers worry about the volatility of their monthly bills, rather than hourly prices.⁷ The hypothesis is that the way that volatility information is processed depends on the way it is presented. We test this hypothesis empirically by implementing a discrete choice experiment, in which we present individuals with fixed and variable-rate electricity plans that differ in average price, price volatility, and other attributes, including the share of renewable energy offered and the customer satisfaction rating of the provider. In our discrete choice experiment, we present participants with different combinations of electricity plans (choice sets) that have various combinations of attributes and ask them to choose which plan they prefer in each choice set.

We conduct the experiment online using the Prolific database, targeting homeowners as respondents. We randomly assign participants to two treatment groups, which differ in the price volatility information they see. The first treatment group is given price volatility as a percentage of hourly price (e.g., +/-10%). The second treatment group is given a variation in the monthly bill (e.g., \$90-\$120). Our main question of interest is whether consumers react differently to price volatility information in these two treatments.

Our results⁸ reveal that consumers dislike price volatility when presented with hourly

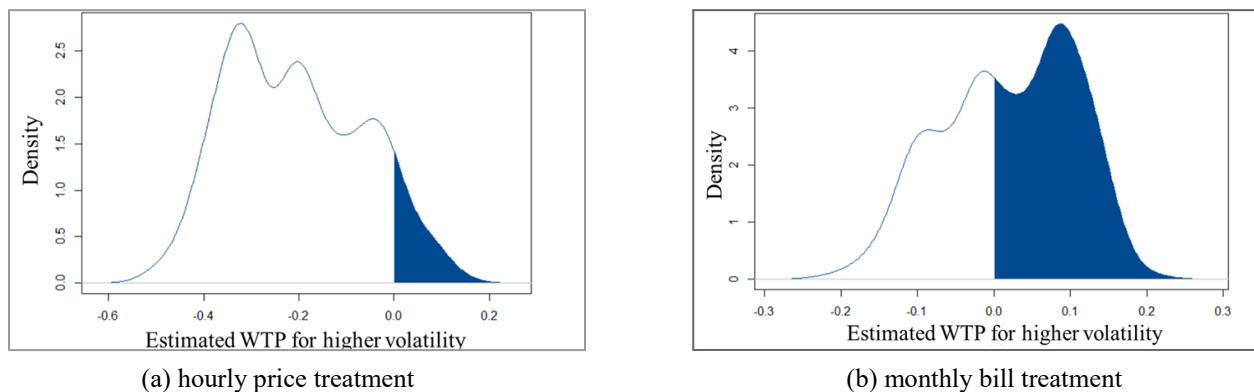
price variation, but not when presented with a monthly bill range. A ten percent increase in hourly price volatility is associated with a reduction of four cents/kWh in willingness to pay (WTP) for the plan. A ten percent increase in monthly bill volatility, however, is associated with an increase in willingness to pay of 0.2 cents/kWh. More importantly, the distribution of the estimated willingness to pay measures looks very different across the two treatment groups.

Figure 1 shows the distribution of WTP for an increase in price volatility under the two different treatments. The x-axis shows an estimated willingness to pay for a plan with higher price volatility, with positive values indicating that consumers are willing to pay more for the plan and negative values indicating that consumers require a price discount to select the plan. In the hourly price treatment, few respondents are willing to pay more for higher price volatility (the area under the curve that is shaded) and the average WTP is negative. By contrast, a significant share of respondents in the monthly bill treatment show willingness to pay more for

a larger range in the monthly bill, with the average WTP being positive.

This supports Borenstein’s argument that consumers think about monthly bills differently than they do about hourly prices, but it also suggests that consumers’ preferences for volatility may be affected by the type of volatility information they see. The different volatility preferences that we observe in our two treatment groups could be driven by anchoring bias.⁹ In our experimental setup, both treatment groups are presented with the same expected hourly price, and it is possible that the hourly price serves as an anchoring point for respondents in the hourly price treatment. These respondents then consider volatility in relation to the given hourly price. Respondents in the monthly bill treatment, however, need to make a simple calculation (average price x 1000) to get their anchoring point. To respondents who did not make this calculation, the low end of the bill range could prove to be a sufficiently strong focus, leading more respondents to choose an electricity plan with a greater range of potential outcomes (i.e., lowest monthly bill).

Figure 1: Distribution of willingness to pay (WTP) for an increase in price volatility



Source: The author’s study on price volatility information and consumer choices in electricity markets.

Not surprisingly, both treatment groups display a lower preference for volatility at higher average electricity prices. At low prices, consumers are better able to afford negative price shocks, and so are more likely to tolerate the potential for such shocks. Respondents who report a higher preference for financial risk¹⁰ are more likely to select electricity plans with higher price volatility, but only in the hourly price volatility treatment. Males are more likely to select electricity plans with higher price volatility in both treatment groups.

CONCLUSION

These results suggest that the way in which price volatility information is presented is at least as important as the information itself. Highlighting the potential upside of variable rates can incentivize consumers to choose a variable rate plan. Some utilities routinely advertise these potential upsides (free nights and weekends!). Our study suggests that a broader effort to include price volatility information in consumer choice platforms may help transition more consumers to variable rates and make electricity generation a little more efficient and environmentally friendly.

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Notes:

¹ In a recent paper, Burger et al. (2019) calculate that as of 2016, less than 0.25 percent of residential customers in the U.S. faced real-time electricity prices. See Burger, S.P., Knittel, C.R., Pérez-Arriaga, I.J., Schneider, I., & vom Scheidt, F. (2020). The efficiency and distributional effects of alternative residential electricity rate designs. *The Energy Journal*, 41(1). DOI: [10.5547/01956574.41.1.sbur](https://doi.org/10.5547/01956574.41.1.sbur)

² Borenstein, S. & Bushnell, J. (2015). The US Electricity Industry after 20 years of restructuring. *Annual Review of Economics*, 7, 437-63. DOI: [10.1146/annurev-economics-080614-115630](https://doi.org/10.1146/annurev-economics-080614-115630)

³ Ito, K. (2014). Do consumers respond to marginal or average price? Evidence from nonlinear electricity pricing. *American Economic Review*, 104(2), 537-63. DOI: [10.1257/aer.104.2.537](https://doi.org/10.1257/aer.104.2.537)

⁴ Brennan, T.J. (2007). Consumer preference not to choose: Methodological and policy implications. *Energy Policy*, 35(3), 1616-27. DOI: [10.1016/j.enpol.2006.04.023](https://doi.org/10.1016/j.enpol.2006.04.023)

⁵ Bushnell, J.B. & Mansur, E.T. (2005). Consumption under noisy price signals: A study of electricity retail rate deregulation in San Diego. *The Journal of Industrial Economics*, LIII(4), 493-513. DOI: [10.1111/j.1467-6451.2005.00267.x](https://doi.org/10.1111/j.1467-6451.2005.00267.x)

⁶ Wilson, C.M. & Price, C.W. (2010). Do consumers switch to the best supplier? *Oxford Economic Papers*, 62(4), 647-68. <https://www.jstor.org/stable/40856525>

⁷ Borenstein, S. (2007). Customer risk from real-time retail electricity pricing: Bill volatility and hedgability. *The Energy Journal*, 28(2), 111-30. DOI: [10.5547/ISSN0195-6574-EJ-Vol28-No2-5](https://doi.org/10.5547/ISSN0195-6574-EJ-Vol28-No2-5)

⁸ Shcherbakova, A., Nayga, R., Palma, M., & Yang, W. (2022). Price volatility information and consumer choice in electricity markets. Working paper that can be requested from the authors.

⁹ For a detailed overview of the anchoring effect, see Furnham, A. & Boo, H.C. (2011). A literature review of the anchoring effect. *The Journal of Socio-Economics*, 40(1), 35-42. DOI: [10.1016/j.socec.2010.10.008](https://doi.org/10.1016/j.socec.2010.10.008)

¹⁰ We measured risk preferences using the revised Domain-Specific Risk-Taking (DOSPERT) scale, which has been estimated to be more accurate than direct self-reported measures of risk preferences.

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