

# Energy Affordability Indices: Overview

The University of Michigan Energy Survey uses a psychological framework to gauge how consumers view energy costs in the context of their own needs. We express this aspect of the survey's findings as index numbers, which are metrics defined on a relative scale designed to consistently compare results over time. To create affordability indices for home energy and motor fuel costs, we probe consumers' perceptions of what is affordable to them and their families. This approach to understanding affordability takes into account consumers' views as to how their household energy costs affect their everyday lives.

These affordability indices are advantageous for understanding a) current consumer attitudes on energy costs, b) patterns of change in how consumers view their energy costs, and c) consumer expectations regarding energy-related personal behaviors. Moreover, these indices can be of value for modeling consumers' energy affordability thresholds and a variety of personal behaviors (e.g., saving money, environmental action).

To assess the perceived affordability of energy, we ask consumers to state the price at which they feel that home energy bills and motor fuel costs would become unaffordable. We compare consumers' responses regarding their personal thresholds of unaffordability to their current energy expenses (a baseline) to measure energy affordability as perceived by consumers.

## Gasoline Affordability Index

To obtain a baseline, or current price of gasoline per gallon that consumers are paying, we utilize data from the U.S. Energy Information Administration (EIA). Specifically, we obtain the national average retail price for all grades and all formulations of gasoline over the weeks corresponding to the month-long data collection period for the Energy Survey in a given quarter. We then use that four-week average gasoline price as the baseline.

To understand consumers' threshold of affordability for gasoline, we ask:

At what price per gallon would gasoline get so high that it comes unaffordable to you (and your family)? By unaffordable we mean that you (and your family) would be forced to make significant changes in the way you get around.

The gasoline affordability index is created by first dividing the response price (Pr), at which a consumer believes gasoline would become unaffordable, by the national all-grade average price per gallon at time of survey (P0). We subtract one from this ratio and then multiply by 100, as shown by the formula:

$$\left( \left( \frac{P_r}{P_0} \right) - 1 \right) \times 100$$

Thus, the resulting index value can be interpreted as a percent increase relative to baseline given by the price of gasoline at the time the survey was taken.

## Home Energy Affordability Index

To obtain a baseline of current monthly home energy costs, we ask consumers:

Now thinking about the last time you (or someone else in your household) paid a household energy bill of any kind, how much did that bill cost you?

Respondents are asked to not include their water bill and, if needed, the different types of energy costs (e.g., electricity, natural gas) are explained by the interviewers.

We ask a question similar to that for probing gasoline affordability to assess consumers' affordability of home energy costs:

At what dollar amount would that home energy bill become unaffordable to you (and your family)? By unaffordable we mean that you (and your family) would be forced to make significant changes in the way you live your life.

Importantly for the survey design, we ask this question at a different point in the questionnaire than the probes about gasoline costs. The home energy affordability index is also created by dividing the bill amount respondents say would become unaffordable (Pr) and consumers' self-reported most recent home energy bill (P0), then subtracting by 1 and multiplying by 100 (see equation for gasoline affordability).

## Additional Information about the Indices

We compute both affordability indices individually for each respondent and analyze the indices overall as well as by our various classification variables (e.g., income, region, home tenure). In the case of gasoline, the baseline (P0) remains constant for a given quarter. For home energy, the baseline (P0) is dependent on each individual consumer's self-reported most recent home energy bill (i.e., the baseline differs from person to person, unlike the uniform baseline price gasoline used as P0 for all consumers).

For each quarterly sample, we trim the affordability indices at the 90th percentile. Values above the 90th percentile score (for a given index) are recoded using the value of the 90th percentile. For the gasoline affordability index each quarter, less than 4% of the responses are typically recoded. For the home energy affordability index, less than 10% of the responses are typically recoded each quarter.

Both index values and corresponding information (e.g., dollar amount for monthly home energy expenses) are weighted to reflect the composition of the U.S. adult population.

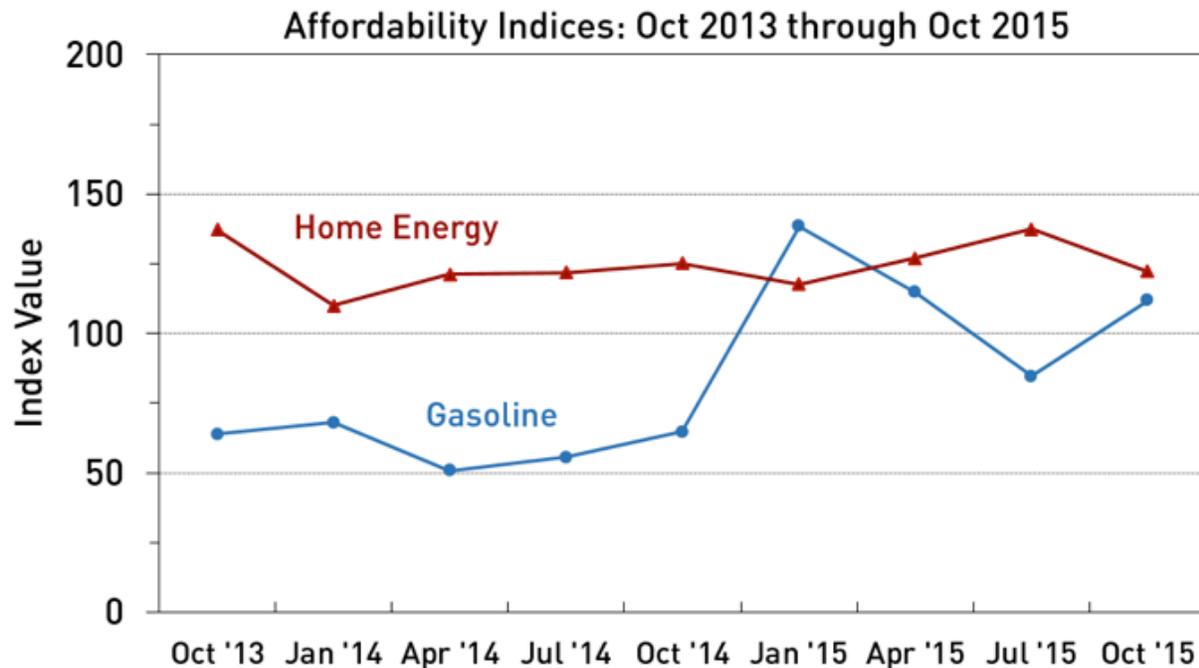
We first administered the Energy Survey in October 2013 and it is an ongoing study. Each quarter, a nationally representative sample of approximately 500 people in the U.S. are interviewed by telephone as part of the University of Michigan's Surveys of Consumers. We provide updates on the home energy and gasoline affordability indices on a quarterly basis.

### Interpreting the Indices

Both affordability indices are defined as the percent increase implied by the energy cost consumers said they would find unaffordable relative to the cost they experienced at the time of the survey. Each index is anchored near zero, which can be interpreted as indicating that the energy cost is already believed to be unaffordable. A small minority of consumers state a cost they consider unaffordable that is lower than their recent home energy bill or current gasoline price, which results in a negative value for the index. We count such responses as representing the portion of the population who believe that energy is already unaffordable.

Figure 1 shows the average affordability indices for home energy (red) and gasoline (blue) across nine quarters of data, from October 2013 to October 2015. An index value of 100 reflects a consumer belief that the cost of energy would have to double (i.e., increase by a factor of two) before it is viewed as unaffordable. As shown in Figure 1, in January 2014, the index value for home energy affordability was near 100 (specifically, 110). Thus, consumers, on average, believed that they could afford slightly over a doubling in the amount of their home energy bills in January 2014.

Likewise, an index of 150 reflects a consumer belief that the cost of energy would have to increase by a factor of 2.5 before it is viewed as unaffordable. As also seen in Figure 1, the average gasoline affordability index value was 138 in January 2015, indicating that consumers then believed that the price of gasoline would have to go up by a factor of 2.4 before they would view it as costly enough to induce them to make changes in their lives.



**Figure 1. Average index values for home energy and gasoline affordability by survey quarter**