Going Solar: Economics of Decision-Making

Benjamin Sigrin
Masters Student in EER and Public Affairs
Energy Systems Transformation Group
www.ESTresearch.com

Advisor
Dr. Varun Rai

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How Consumers Value Energy Investments

• **Classic approach** is to consider discount rate used to value future costs and benefits

• **Social factors** such as peer influence and networking effects are also important

• **Ultimately consumers are unreliable as ‘rational investors’**
Data & Methodology

• **Data:** 211 PV installers in Dallas area
  - Applications to claim utility rebate for installed residential system
  - Conducted survey to determine investment decision, demographics, and income.

• **Method:** Built a financial model to calculate expected revenues and costs associated with system ownership
# Summary of Model Parameters

<table>
<thead>
<tr>
<th></th>
<th>Buyers</th>
<th>Leasers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size (n)</td>
<td>142</td>
<td>69</td>
</tr>
<tr>
<td>Cost after rebates ($/W)</td>
<td>$1.7 – $3.6 / W</td>
<td>$0.57 - $0.82 /W</td>
</tr>
<tr>
<td>System life</td>
<td>25 years</td>
<td>15 years</td>
</tr>
<tr>
<td>Annual Electricity Consumption</td>
<td>750 – 2750 kWh/month</td>
<td>similar</td>
</tr>
<tr>
<td>Cost of Electricity</td>
<td>12¢ - 14¢ /kWh</td>
<td>similar</td>
</tr>
<tr>
<td>System Size</td>
<td>3.5 – 9.0 DC-kW</td>
<td>similar</td>
</tr>
<tr>
<td>Escalation in cost of electricity</td>
<td>0% - 5% per year</td>
<td>same</td>
</tr>
</tbody>
</table>
Buying A PV System Is Less Profitable Than Leasing And Often A Loss

**Buyers:**
Mean: -$490/kW
SD: $1,370/kW

**Leasers:**
Mean: $935/kW
SD: $595/kW
Expectations of System Payback

- Model Calculated Payback Period (years)
- Consumer’s Reported Payback Period (years)

- Too Optimistic
- Too Pessimistic

- Bought
- Leased

Graph showing the comparison between model-calculated and consumer-reported payback periods, with data points indicating optimistic and pessimistic scenarios for those who bought versus leased.
Finding Implied Net Present Value

2. How much do you agree or disagree with each of these statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would not have installed the PV system if it had cost me $1000 more</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I would not have installed the PV system if it had cost me $2000 more</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I would not have installed the PV system if it had cost me $3000 more</td>
<td></td>
<td></td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would not have installed the PV system if it had cost me $4000 more</td>
<td></td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would not have installed the PV system if it had cost me $5000 more</td>
<td></td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This consumer is indifferent to paying $3000 more for his system— the implied NPV!
Implied Discount Rates For Income And Ownership

**Implied Discount Rates For Income And Ownership**

- **$0 - $59,999**
- **$60,000 - $84,999**
- **$85,000 - $114,999**
- **$115,000 - $149,000**
- **$150,000 - $249,999**
- **$250,000+**

**Annual Household Income**

- Scenario 3 Buy
- Scenario 3 Lease
Conclusions

• Buyers are optimistic/unprofitable and leasers are realistic/profitable in assessing the true benefits and costs

• Leasers imply a 18%-22% annual discount rate whereas buyers imply 4%-9%

• All of these results have strong policy and marketing implications.