That Sinking Feeling: The Changing Price of
Disaster Risk Following an Earthquake (PowerPoint)
Levente Timar, Arthur Grimes and Richard Fabling

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That sinking feeling: the changing price of disaster risk following an earthquake

Levente Timar
13 February 2015, AARES Conference
Research team

- Levente Timar, Arthur Grimes, Richard Fabling
- Funded by the Natural Hazard Research Platform
Canterbury earthquakes

• M 7.1 in Sept 2010, M 6.3 in Feb 2011, M 6.3 in June 2011

• Among most severe natural disasters to strike NZ

• Damage in CBD
  • Brick and mortar buildings
  • Cordoned off for 2 years

• Residential damage
  • 90% of residential buildings damaged
  • 20,000 houses seriously affected, 6,000 beyond repair
  • Mostly due to liquefaction
Liquefaction
Liquefaction

- Hazard mapped by scientists prior to earthquakes
- Largely unknown to public
- Ignored or downplayed by institutions

Sept 2010 earthquake: information shock
  - NZ Herald citations

![Graph showing citations over time]
Previous research

• Property markets internalize the perceived risks associated with natural hazards

• Discount changes with prevalence of hazard events

• Effect may only be temporary
  • Insurance take-up (Gallagher 2014)
  • Property prices (Bin & Landry 2013)
Study design

• Compare pre- and post-earthquake sales of residential properties not directly affected by the earthquakes

• Differentiate across risk types and risk potential

<table>
<thead>
<tr>
<th>Risk type</th>
<th>Seismicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dunedin City (low)</td>
</tr>
<tr>
<td>Construction (known)</td>
<td>X</td>
</tr>
<tr>
<td>Liquefaction (unknown)</td>
<td>X</td>
</tr>
</tbody>
</table>

• Permanent vs transient impact
Dunedin City

Return periods

- MM7
  350 yrs
- MM9
  13,000 yrs
Hutt City

Return periods

- MM7
  30 yrs
- MM9
  400 yrs
Models

• Hedonic model

\[
\log(P_{it}) = \bar{\alpha} + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}
\]

• Repeat sales model

\[
\log(P_{it}) = \bar{\alpha} + \alpha_i + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}
\]

• Control for all unchanging house characteristics
• Parameters on (unchanging) house attributes unidentified
• Nested models to facilitate comparison
Models

- **Hedonic model**
  
  \[
  \log(P_{it}) = \bar{\alpha} + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}
  \]

- **Repeat sales model**

  \[
  \log(P_{it}) = \bar{\alpha} + \alpha_i + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}
  \]

- Control for all unchanging house characteristics
- Parameters on (unchanging) house attributes unidentified
- Nested models to facilitate comparison

House attributes

Post-EQ indicator

Seismic risk variables

House fixed effect
Data

• Residential property sales classified by liquefaction potential zone from QVNZ

• Sample
  • house has a sale record in the post-EQ period
  • at least another sale record from before the EQ (1990-)

• Sale price, house and location attributes (size, age, structure, quality, etc.)
Estimation results
Repeat sales model, risk variables

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<thead>
<tr>
<th></th>
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<th>Hutt City</th>
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<tbody>
<tr>
<td>Quarter</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>House fixed effect</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Construction x Post EQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brick</td>
<td>-0.0267</td>
<td>0.0045</td>
</tr>
<tr>
<td>Other</td>
<td>-0.0163</td>
<td>0.0061</td>
</tr>
<tr>
<td>Weatherboard</td>
<td>(base)</td>
<td>(base)</td>
</tr>
<tr>
<td>Liquefaction x Post EQ</td>
<td>0.0430</td>
<td>-0.0138**</td>
</tr>
<tr>
<td>Observations</td>
<td>5,009</td>
<td>12,688</td>
</tr>
<tr>
<td>Houses</td>
<td>1,392</td>
<td>4,076</td>
</tr>
</tbody>
</table>

** significant at 5%
Time-varying liquefaction risk premium
Hutt City

- Estimated marginal impact & 90% CI
- Average magnitude of 1.4%
- Around 2% for about 2 years
- Fully dissipates within three years
Conclusion

• Consistent with hypotheses

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• Consistent with previous research on effects of uncertain and infrequently observed events
Conclusion

• Why does the risk premium disappear?
  • Cognitive dissonance
  • Rational response (expectations around insurance)

• Policy implications
  • Greater prominence for risk advice in risky areas
  • Risk-differentiated insurance premia

• Ignorance is bliss?