Fires, Floods and Financial Meltdowns
Black Swan Events and Property Asset Management

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Property Research

Can decision makers adapt to a world of “Black Swans” the seemingly improbable but highly consequential surprises that turn our familiar way of thinking upside down.  

Source: Posner 2010

Modelling the Economic Environment

Types and Form

Natural and Man Made Disasters

Supercycles / K Wave
Technical Innovation
- Digital Age: 1985 >

Economic Cycles
Demand, Supply and Capital Market Drivers

Core Economic Activity

Structural Changes and Transformation Forces

Unexpected Events (Black Swan Theory)

Short Term Effect

Long Term Effect

Underlying Economic Effect

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Mispricing of Real Estate

Importantly, property pricing models depend on the quality of information available and the information processing undertaken.

For comparison evidence-based valuation techniques, this is particularly difficult for major commercial properties (for example, regional shopping centres etc) as transactions can be limited and there is scarce details covered by limited disclosure requirements.

Deconstructing the pooled risks can be difficult and new information can often polarise opinions.

In behavioral theory, there is a tendency to overestimate the probability of events vivid in our minds, than those as a distinct memory.

Source: Glaeser and Sunstein 2013

Black Swan Theory

The term “Black Swan Event” was developed by Taleb (2007). It describes an event which is a surprise (to the observer) and has a major impact.

These events have the following three key attributes:

- Outlier, being outside the realm of regular expectations
- Carries an extreme impact
- Explanations for the occurrence are concocted after the fact, making it explainable and predictable.

Source: Taleb 2009
Black Swan Events: Types and Forms

<table>
<thead>
<tr>
<th>Type</th>
<th>Form</th>
<th>Recent Examples</th>
<th>Impact</th>
<th>Category of Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volcanic Activity</td>
<td>SA</td>
<td>Iceland (2010)</td>
<td>Local, Global (ash)</td>
<td>Environmental</td>
</tr>
<tr>
<td>Earthquake</td>
<td>SA</td>
<td>Christchurch, NZ (2011)</td>
<td>Local</td>
<td>Human / Physical</td>
</tr>
<tr>
<td>*</td>
<td>SA</td>
<td>Japanese Tsunami (2011)</td>
<td>Local</td>
<td>Human / Physical</td>
</tr>
<tr>
<td>Hurricane/ Cyclone</td>
<td>WR</td>
<td>Katrina, New Orleans (2005)</td>
<td>Local</td>
<td>Human / Physical</td>
</tr>
<tr>
<td>Famine</td>
<td>WR</td>
<td>Sudan and Ethiopia Famine (1998 +)</td>
<td>Local to National</td>
<td>Human</td>
</tr>
<tr>
<td>Floods</td>
<td>WR</td>
<td>Pakistan (2010)</td>
<td>Local to National</td>
<td>Human</td>
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<tr>
<td>Pandemic</td>
<td>IV</td>
<td>Haiti Cholera Outbreak (2010)</td>
<td>Local</td>
<td>Human</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>AIDS (1981+)</td>
<td>Global</td>
<td>Human</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>Bird Flu , Asia (2008+)</td>
<td>National to Global</td>
<td>Human</td>
</tr>
<tr>
<td></td>
<td>IV</td>
<td>SARS, Hong Kong (2002)</td>
<td>National to Global</td>
<td>Human</td>
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</table>

Key
- SA= Seismic Activity
- WR= Weather Related
- IV= Infectious Virus
- MM= Man Made Disaster

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<tr>
<td>Political</td>
<td>MM</td>
<td>Arab Spring Uprising (2010)</td>
<td>National</td>
<td>Human</td>
</tr>
<tr>
<td>Technical</td>
<td>MM</td>
<td>Gulf of Mexico, Oil Rig Failure, BP (2010)</td>
<td>Local</td>
<td>Human / Environmental</td>
</tr>
<tr>
<td>Technical</td>
<td>MM</td>
<td>Chernobyl, Nuclear Disaster (1986)</td>
<td>Local to National</td>
<td>Human / Environmental</td>
</tr>
<tr>
<td>Technology</td>
<td>MM</td>
<td>Internet Bubble (2000-03)</td>
<td>Global</td>
<td>Financial</td>
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Black Swan Events Framework

In defining Black Swan categories:

**Known Known events**
- relevant information can be sourced for decision making purposes

**Unknown Unknown events**
- difficult to even identify and therefore quantify

**Known Unknown events**
- where there is known information although there needs to be a development of probability theory as past events may be random and vary in magnitude

Source: Evans 2012

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Adapted: Casti 2011, Makridakis et al 2009
Black Swan Events: Known/Unknown

For Property Asset Managers, the impact of Black Swan Events can be twofold:

- specific location (for example, earthquakes, hurricanes) which can damage the physical building
- economic loss for the space occupier, as operational risk (for example, global financial crisis, cyber attacks) may spread across several unrelated locations at different timelines

The unpredictability of these Black Swan Events can have major ongoing implications and on the classical Gaussian bell curve produce the concerning “fat tail” distribution, where outlier risks - extreme events occur.

Source: Posner 2010, Tableb 2009

Black Swan Predictions

In mapping locational risks, primary data for each type of Black Swan Event can be sourced and modelled, although this would be expensive and impracticable for specific research.


Based on EM-DAT data, the index is focused on:
- Drought
- Earthquakes
- Tropical cyclones
- Floods

As 75% of the world’s population lives in areas that have been affected by at least one of those events, which account for 94% of reported casualties for the 1980-2006 period.
Black Swan Predictions

Model Construction

In linking location risk to human loss, UNDP (2004) defines the risk of human loss as a function of three components: hazard, elements at risk and vulnerability. This can be described in a simplified equation as:

\[ R = H_{fr} \cdot Pop \cdot Vul \]

where:
- \( R \) = No. of expected human impacts
- \( H_{fr} \) = Frequency of a given hazard
- \( Pop \) = Population living in a given exposed area
- \( Vul \) = Vulnerability depending on socio/political/economical context of the population (non-dimensional number between 0-1)

Disaster Risk Index: Global Map
Next Step

- Measuring Property Risk by Location
  Linking in with Macquarie University research on the pricing of natural hazard risks for the insurance industry.

- Property and Extreme Financial Risk
  Measuring extreme risk which is beyond traditional (standard deviation) risk management practices, being too narrow and constraining a definition.

- Quality of Forecasts During Periods of Uncertainty
  Examine the accuracy of economic forecasts during different market conditions.