GLOBAL FINANCIAL STABILITY REPORT

Spring 2020, Chapter 5
Climate Change: Physical Risk and Equity Prices

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Climate change and financial stability

- The projected increase in the frequency and severity of disasters due to climatic hazards is a potential threat to financial stability.
  ➔ Focus on climate change physical risk
  ➔ Focus on equity markets
  ➔ Sample of 68 economies representing 95 percent of world GDP

- The chapter looks backward (past disasters), then forward (future disasters/physical risk)
How climate change physical risk impacts financial stability

The financial sector is exposed to climatic disasters through two channels: First, current climatic disasters affect credit, underwriting, market, operational, and liquidity risks.

Second, the shifts in expectations and attention about future climatic disasters can affect asset values today.

Source: IMF staff.
Looking back: Measuring the equity market impact of large disasters

For each climatic disaster in the sample, we calculate the cumulative average abnormal returns (CAARs) around the event date.

Specifically,

\[
\text{Event window: Cumulative average abnormal returns (CAARs) are relative to 21 trading days before the start day to incorporate any potential anticipation effects of disasters.}
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\[
\text{Estimation window: Expected returns are computed based on estimates from a one-factor model (global factor) using data in the one-year period before the event window.}
\]
Large disasters can have a significant impact on equity markets … … but on average their impact has been modest

Cumulative Market Returns in the United States around Hurricane Katrina (2005) and in Thailand around the 2011 Thai Floods (Percent)

Cumulative Average Abnormal Market Returns around Large Disasters, 90 Percent Confidence Interval (Percent)
Impact on banks’ and insurers’ equity prices

**Negative impact of large disasters on banking sector in AEs and EMDEs**

Banking Sector: Cumulative Average Abnormal Returns around Large Disasters, 90 Percent Confidence Interval

**Negative impact of large disasters on non-life insurance sector in AEs**

Advanced Economies, Non-Life Insurance Sector: Cumulative Average Abnormal Returns around Large Disasters, 90 Percent Confidence Interval
The effect of insurance penetration and sovereign financial strength

Greater insurance penetration and sovereign financial strength cushion the negative impact of large disasters on the market and banks, especially when the impact is large.

1. Mitigating Factor: Nonlife Insurance Penetration (Percent)

2. Mitigating Factor: Sovereign Rating (Percent)
Looking ahead: equity pricing of future climate change physical risk

Although the severity of climatic hazards is projected to increase, large uncertainty remains.

Latest Projected Changes in Extreme Weather Events, Relative to 1985–2005 (Various horizons)
Investors face a daunting informational challenge

- To price climate change physical risk into equity portfolios investors need to form views on:
  - the likelihood of various climate scenarios and their implications for physical risk
  - the future location of production sites, supply chains, and distribution of customers
- Moreover, the time horizon over which climate change physical risk unfolds may be longer than investors’ investment horizon.
Is climate change physical risk reflected in equity prices?

Three analytical approaches:

▪ Cross-sectional asset pricing tests
▪ Equity investor attention to temperature
▪ Asset pricing model with climate change (Online Box 2)
Climate change physical risk does not appear to be reflected in global equity valuations

There is no association between predicted changes in climatic hazard occurrence and equity valuations ... even when controlling for fundamentals.

Sign of Coefficients from Regressions of Price-to-Earnings Ratio on Indicators of Predicted Changes in Climatic Hazard Occurrence

- Advanced economies
- Emerging market and developing economies

<table>
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<th>Change Indicator</th>
<th>RCP 2.6</th>
<th>RCP 4.5</th>
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<td>Δ Extreme Heat Exposure</td>
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<td>+</td>
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<tr>
<td>Δ Extreme Precipitations</td>
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<tr>
<td>Climate Change Hazard Index</td>
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In most of the countries, stocks with the highest sensitivity to temperature earn lower returns than others.

Stocks with the highest sensitivity to temperature earn lower returns than the others, after controlling for standard risk factors, suggesting mispricing.
Main conclusions

- The average impact of large climatic disasters on equity prices has been modest in the past.
- Climate change physical risk does not appear to be reflected in global equity valuations.
- Beyond climate change mitigation and adaptation, sovereign financial strength and higher insurance penetration helps to preserve financial stability.
Policy recommendations

- Enhance insurance penetration and strengthen sovereign financial health
- Granular, firm-specific disclosure on current and future exposure and vulnerability to climate change physical risk
- For financial firms, stress testing can play an important role

Of course, climate change mitigation and adaptation policies are of first order importance even beyond the realm of financial stability