



**MONETARY AND  
CAPITAL MARKETS**

# **GLOBAL FINANCIAL STABILITY REPORT**

**Spring 2020, Chapter 5**

**Climate Change:**

**Physical Risk and Equity Prices**

**IIF WEBINAR**

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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)

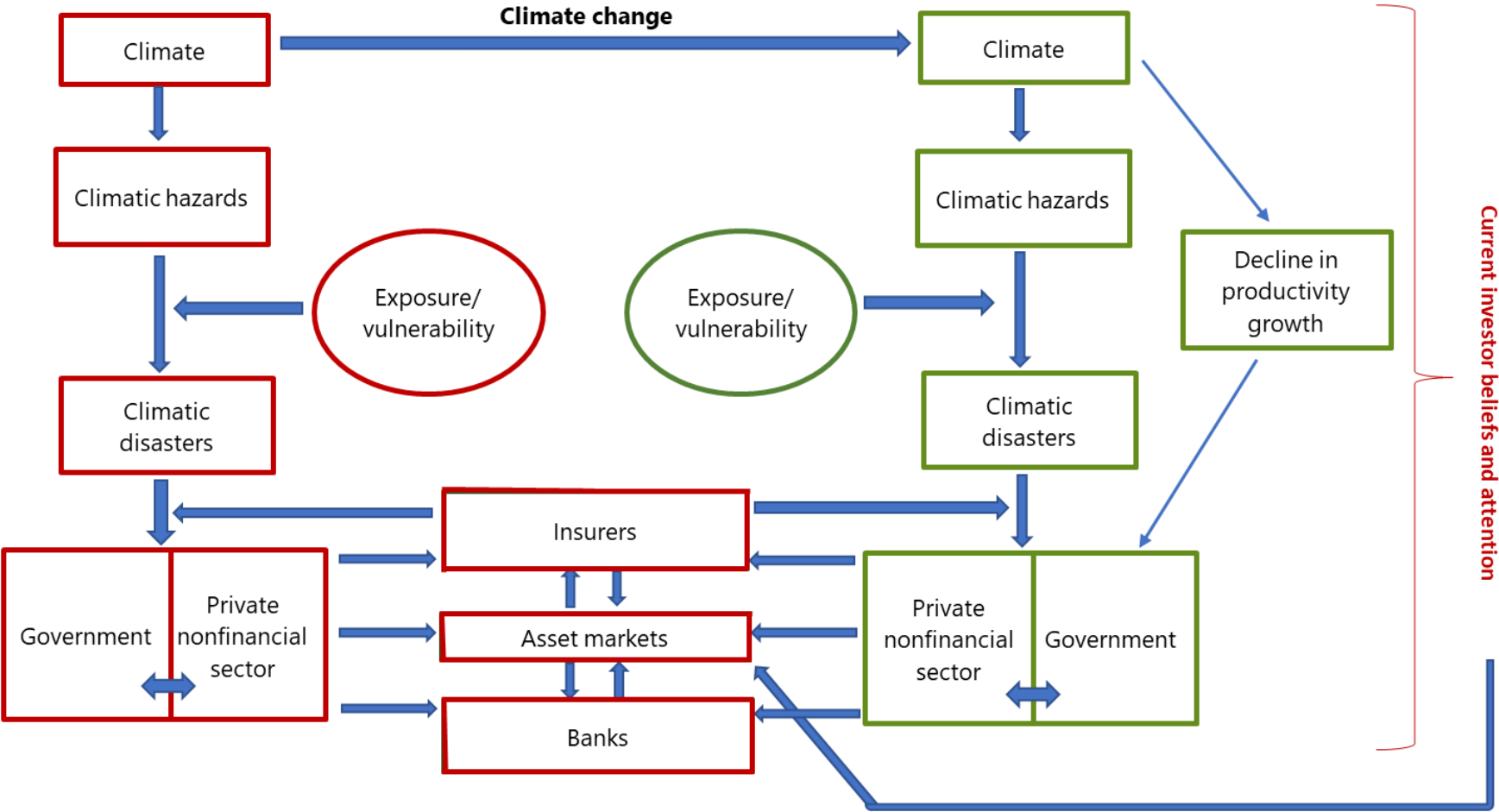
# How climate change physical risk impacts financial stability

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.

### Channel 1: Current Climatic Disasters

### Channel 2: Future Climatic Disasters



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,



**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.

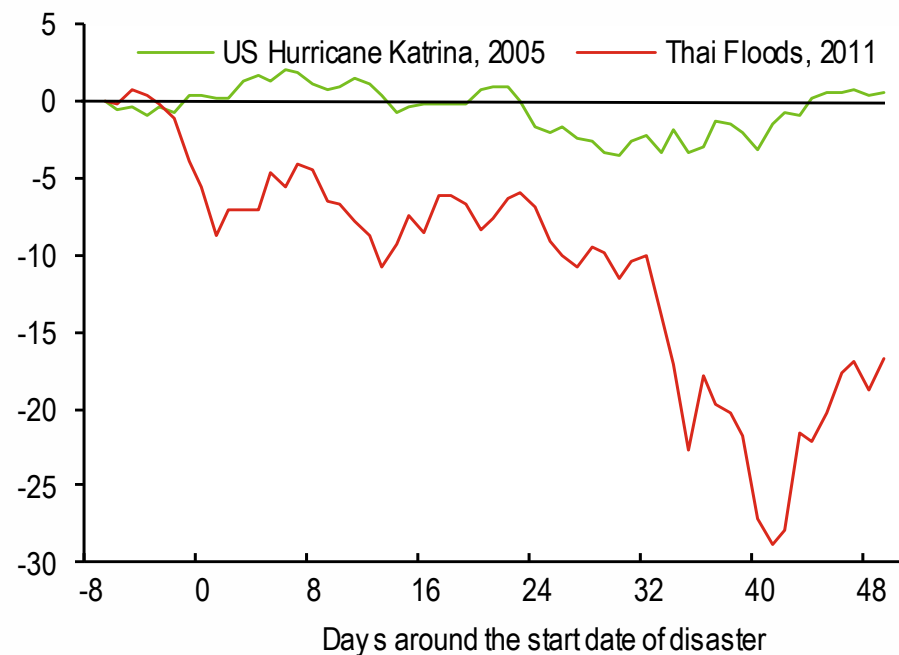
**Event window:** Cumulative average abnormal returns (CAARs) are relative to 21 trading days before the start day to incorporate any potential anticipation effects of disasters.

# Equity market impact

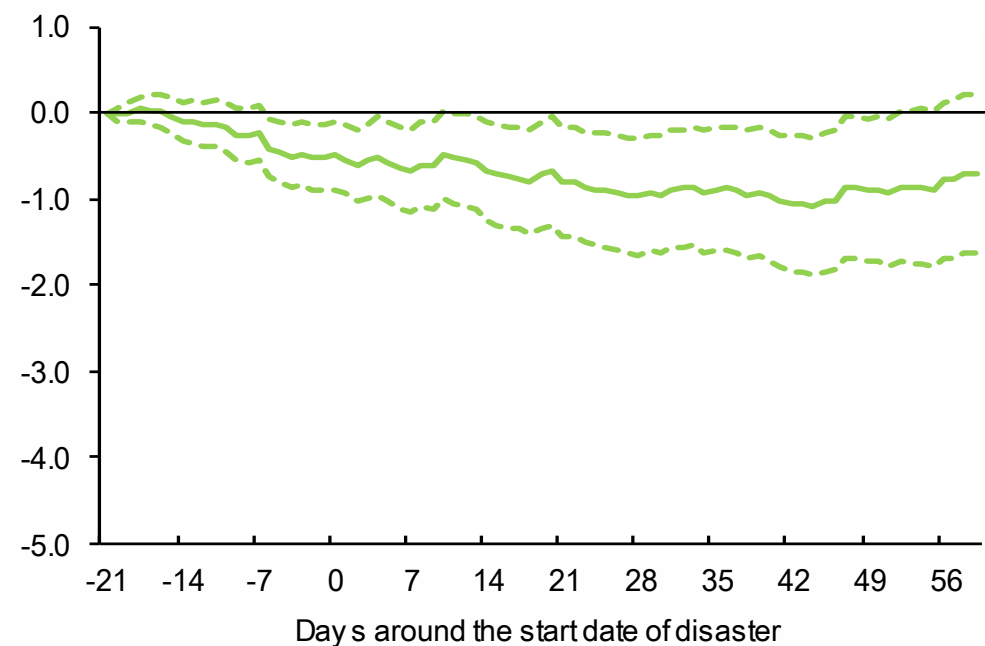
*Large disasters can have a significant impact on equity markets ...*

*... 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)**



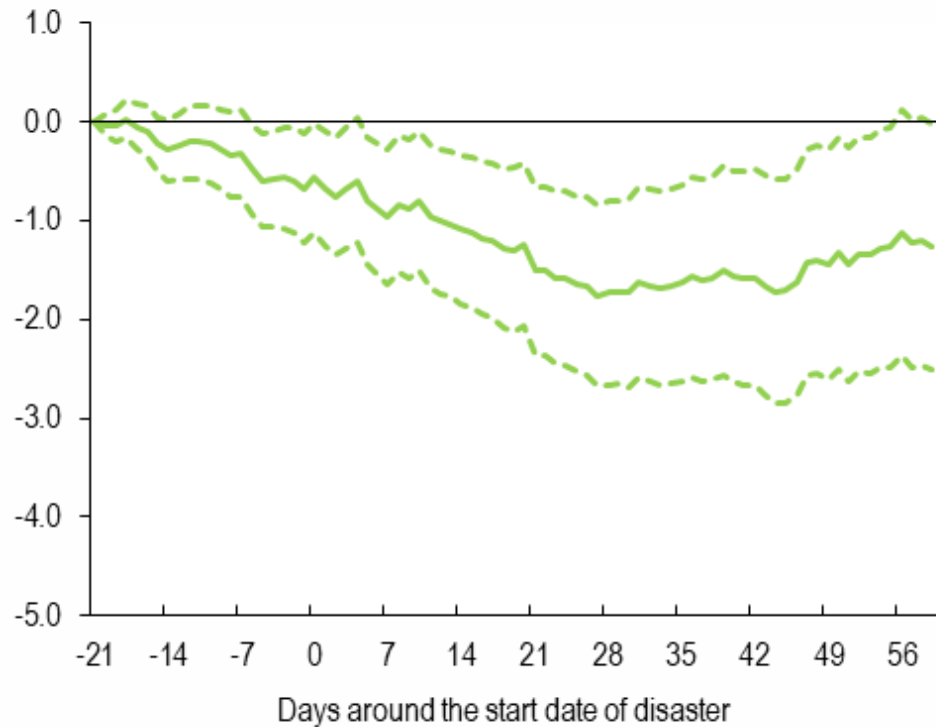
**Cumulative Average Abnormal Market Returns around Large Disasters, 90 Percent Confidence Interval (Percent)**



# Impact on banks' and insurers' equity prices

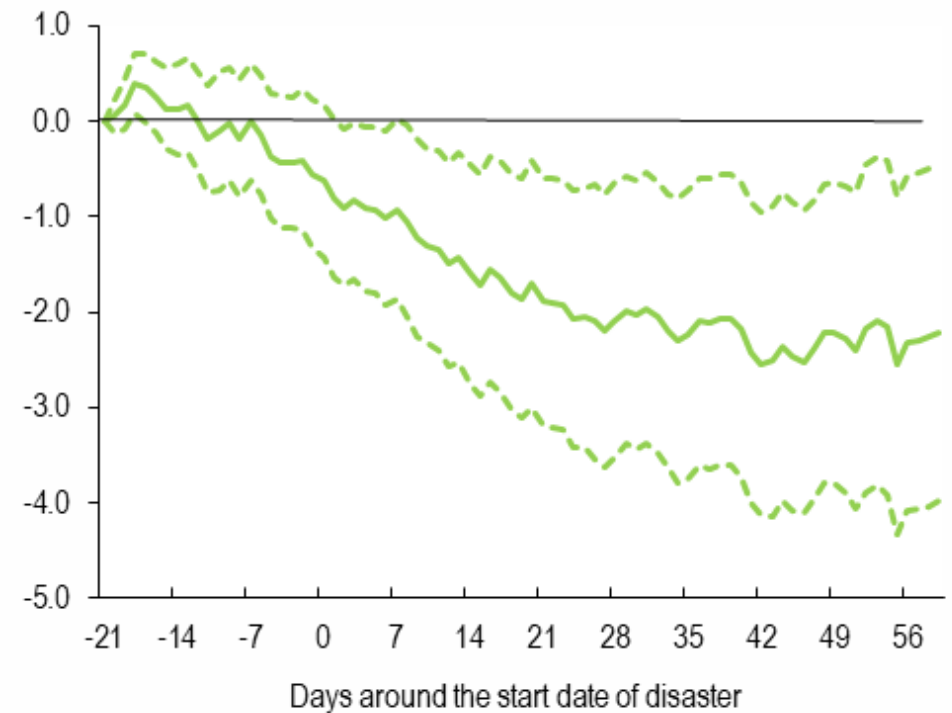
## Negative impact of large disasters on banking sector in AEs and EMDEs

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

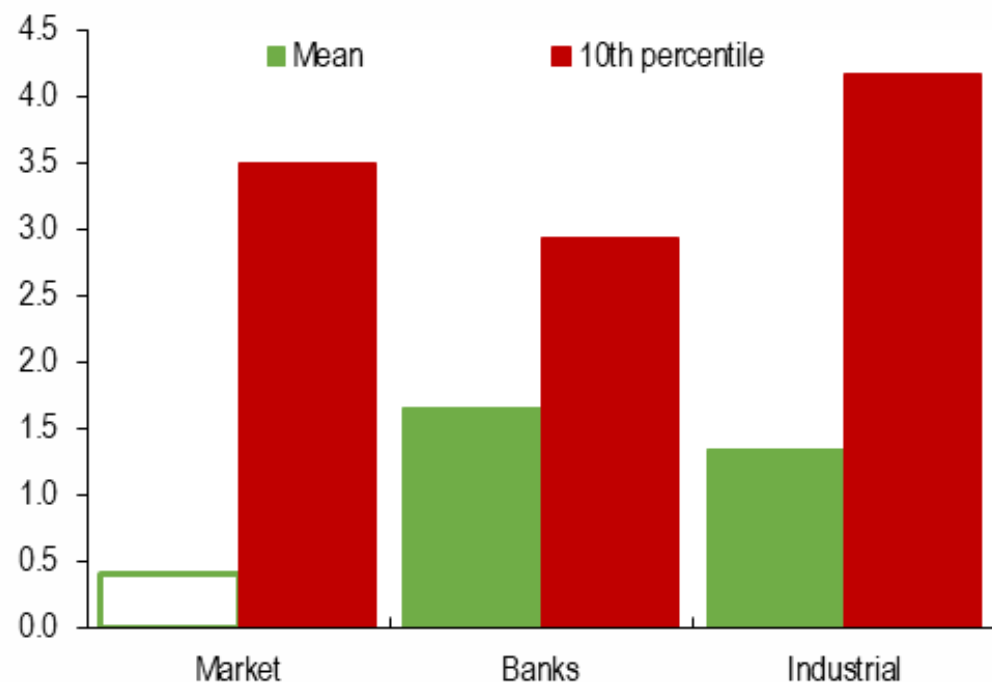
Advanced Economies, Non-Life Insurance Sector: Cumulative Average Abnormal Returns around Large Disasters, 90 Percent Confidence Interval



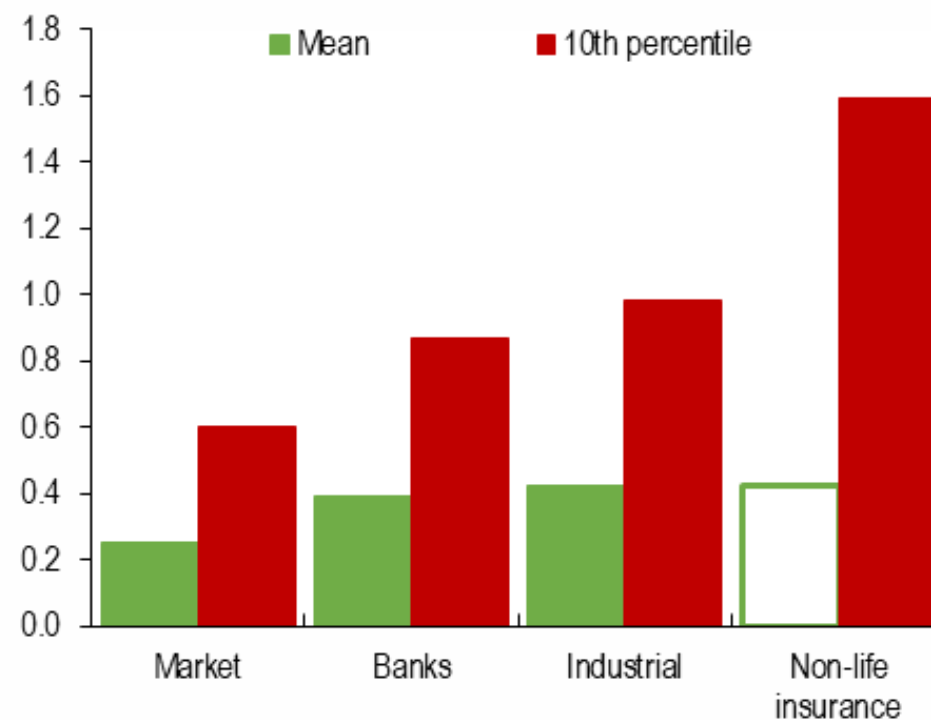
# The effect of insurance penetration and sovereign financial strength

*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)



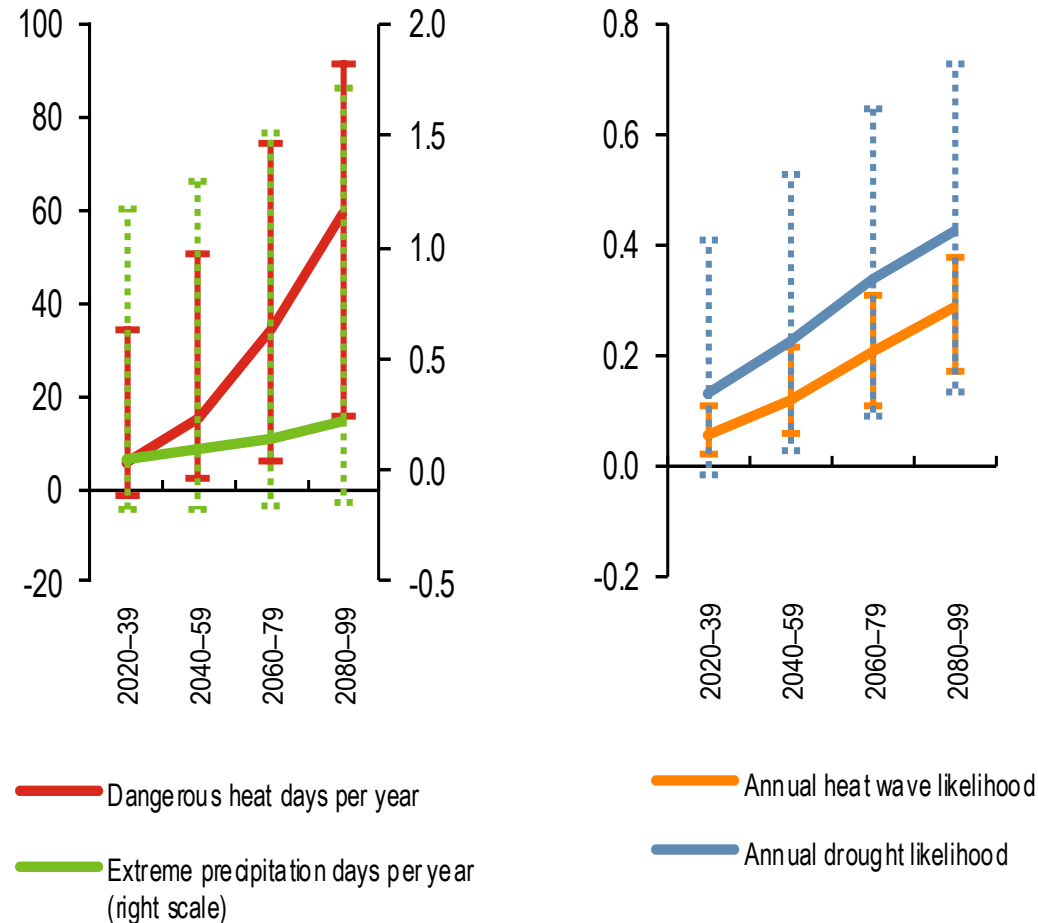
2. Mitigating Factor: Sovereign Rating (Percent)



# 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:

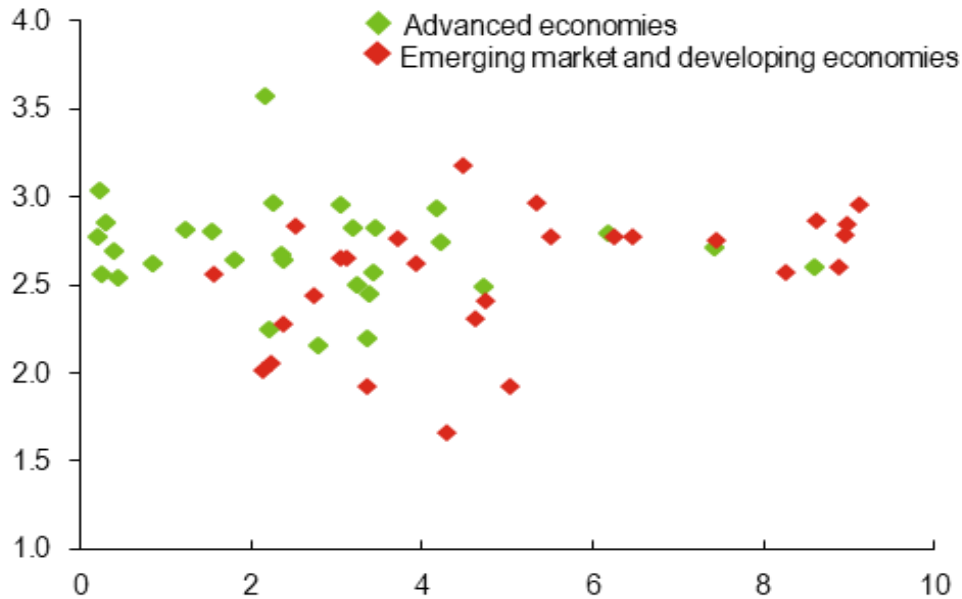
- Cross-sectional asset pricing tests
- Equity investor attention to temperature
- Asset pricing model with climate change (Online Box 2)

# 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.*

Price-to-Earnings Ratio (y-axis, on a log scale) and Climate Change Hazard Index (x-axis)



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

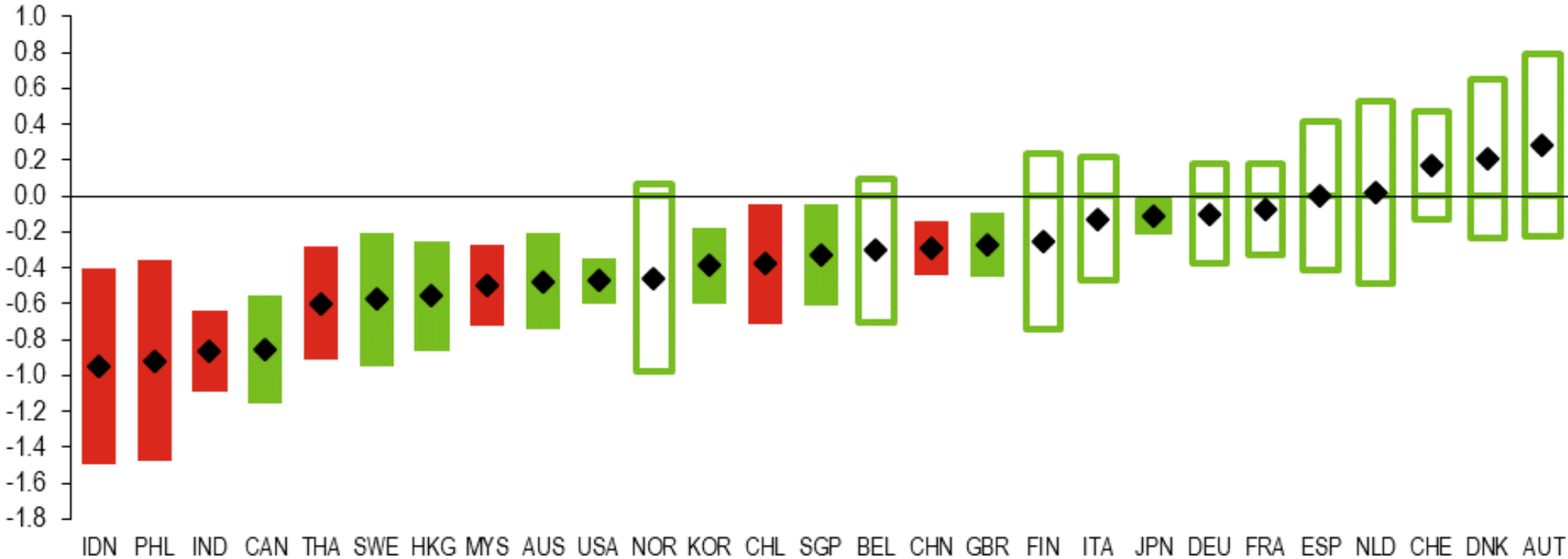
■ Sign consistent with the pricing of climate change physical risk but the coefficient is not statistically significant

	RCP 2.6	RCP 4.5	RCP 6.0	RCP 8.5
$\Delta$ Extreme Heat Exposure	+	+	+	+
$\Delta$ Extreme Precipitations	+	+	+	+
$\Delta$ Drought Likelihood	-	-	-	-
$\Delta$ Heat Wave Likelihood	+	+	+	+
Sea Level Rise Index				+
Climate Change Hazard Index				+

# 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*

Abnormal Equity Returns of Firms with the Highest Sensitivity to Temperature  
(Percent, 1998–2018)



## **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