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Assessing climate risk for investment portfolios

An overview for (Dutch) pension funds

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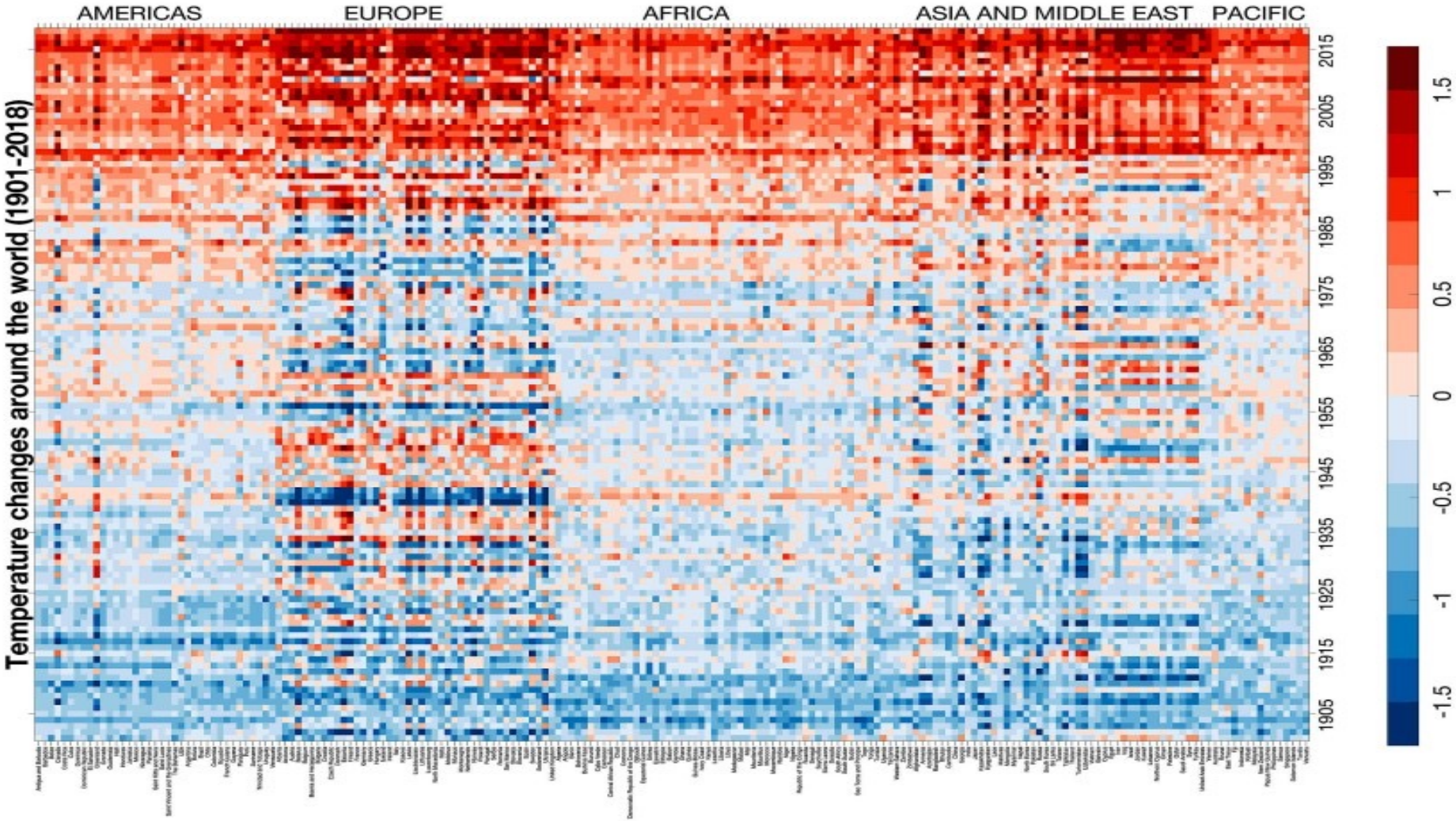
Climate change: “Warming stripes”



Source: Ed Hawkins. °C. Difference from annual mean, 1901-2018

Climate risk

Effects of climate change constitute a potentially important source of risk for investors:

- **Physical risk**: damage or loss of assets (e.g., floods, droughts, storms, wildfires) and/or impact on supply chain
- **Transition risk**: impact on firms of transition to low-carbon economy – including policy risk (e.g, carbon tax), technological risk, legal/reputation risk; possibly leading to 'stranded assets'

Measuring climate risk

- Climate risk is an important source of **financial risk**
  - Krüger, Sautner & Starks (2019): 50% of global institutional investors say that regulatory risks have already begun to materialize
- **Long-term, systematic** risk (hard to diversify / hedge)
- **Difficult to measure**:
  - 'New' type of risk, huge uncertainty ('Knightian uncertainty')
  - Historical data are of little use
  - Physical and transition risk could interact in a myriad of ways
- **Pension funds required to measure climate risk**
  - European regulations: IORP II
    - Pension funds need to include climate risk in their 'own-risk assessment'

Approaches to assess climate risk

1. Top-down ('macro') approaches
2. Sector ('meso') approaches
3. Bottom-up ('micro') approaches
4. Factor models

- *Dealing with uncertainty? Often through scenario analysis, similar to ALM studies*

1. Top-down ('macro') approaches

- **Approach**: incorporate climate change scenarios into macro-econometric model ⇒ predictions for economic growth, inflation, interest rates ⇒ translation into impact climate risk on investment portfolios (often by sector / country; sometimes ALM; physical and/or transition risk)
- **Pros**: broad analysis of impact on global economy & entire investment portfolio; feedback effects
- **Cons**: 'black box' approach (complex, intractable); in ALM studies, interest rate prediction is dominant; Lucas critique

2. Sector ('meso') approaches

- **Approach**: analysis of impact of (in particular) transition risk on specific sectors; economic reasoning rather than econometric model; no macro predictions
- **Pros**: broader analysis than individual firms without complex model; tractable; facilitates 'informed discussion'
- **Cons**: no macro analysis; 3 important assumptions (sector classification, 'pass-through', 'abatement'); extensions needed (distinction regions + physical risk)

3. Bottom-up ('micro') approaches

- **Approach**: analysis of impact climate risk on individual firms; *physical risk*: geographic location (e.g., floods, droughts); *transition risk*: impact of firm on climate (e.g., carbon footprint) & firm's climate policies; often aggregated to entire investment portfolio
- **Pros**: detailed firm-level analysis; no automatic aggregation by sector or region; tractable
- **Cons**: no broader analysis; data quality crucial; often limitations of large data exercise

4. Factor models

- **Approach**: academic 'asset pricing' approach says investment risk can be measured by exposure to risk factors (e.g., CAPM beta); climate risk could potentially be captured by one or more new risk factors (temperature, droughts, brown minus green)
- **Pros**: capturing climate risk in risk factors is appealing and (at least in theory) easy to implement
- **Cons**: no consensus on risk factors; based on historical data

Sustainability measures: 3 issues

1. Limited coverage & data quality:
   - Often only publicly listed companies; extrapolation
   - Self-reported, no (international) standard
2. Disagreement across data providers
   - Berg, Koelbel & Rigobon (2019) document correlation of 0.60 across 5 different ESG data providers
3. What to measure
   - *Physical risk*: geographic location of firms measures direct exposure, but not their ability to adjust & supply chain effects
   - *Transition risk*: carbon footprint and other ESG measures (a) capture only one dimension of transition risk, (2) are not forward-looking, and (3) disregard differences across firms in their ability to adjust

Recommendations (1)

- **Approaches to measure climate risk**
  - Bottom-up approaches (micro) seem almost inevitable, but depend on data quality, are limited in scope, and may result in large data-driven exercises that may not be very insightful
  - Thus: recommend to complement bottom-up with sector approaches (meso) to examine broader effects in a tractable way
  - Top-down approaches (macro) and factor models not very insightful in my view
  - Crucial to remain critical / skeptical: measuring climate risk is a huge challenge and all models / approaches have serious limitations!

Recommendations (2)

- **Sustainability measures**
  - Major limitations; no easy fix
  - Physical risk: geographic data on firms and on climate change
  - Transition risk: where possible, combination of quantitative data (e.g., carbon footprint) with more qualitative assessment (based on firm's policies, strategy, ability to adjust)
  - Return of fundamental analysis?

The End

- Many thanks for your attention
- Questions/discussion welcome