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# Shocks to Transition Risk

Christoph Meinerding

Yves Schuler

Philipp Zhang

Deutsche Bundesbank & University of Zurich

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The views expressed in this paper are those of the authors and do not necessarily coincide with the views of the Deutsche Bundesbank or the Eurosystem.

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## **Climate change increases economic risks:**

For instance,...

- Physical risk: More frequent extreme weather events,
- Transition risk: Process of adjusting to lower carbon economy.

**Why transition risk?** We know much less about it...

- A precise definition is missing.
- Measurement is challenging (in contrast to physical risks).

**1. We propose a method to measure shocks to transition risk:**

- Instances with significant new information on possible transition paths
  
- **To qualify as shock to transition risk:**
  - ① Impact valuation of green and brown firms differently  
AND
  - ② Relate to economic news on climate change

**2. We analyse their impact within a macro-financial VAR**

# 1. Identification of shocks to transition risks

## Overview

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**Goal:** Find months with with significant new information on possible transition paths

→ **Combination** of two popular approaches

### 1. Portfolio sorts

- Long-short portfolios
- based on firms' carbon footprints
- see In, Park, Monk (2019), Wilkens et al. (2019)
- Sign of return is informative

### 2. Textual analysis

- # of newspaper articles mentioning climate change AND economics
- Different from Engle et al. (2019) WSJ climate uncertainty index.
- Account for “relevance”

## Justification for our approach

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### Either of the two steps lacks robustness:

- **Only portfolio sorts:**

- Data quality on firms' carbon footprints is still low.
- Stock market returns are noisy, driven by many other factors → false positives

- **Only textual analysis:** Not clear if news

- relevant (related to transition risk?) or
- anticipated (timing of the shock?).

### Combination addresses these concerns. On top of that:

- Narrative-based labelling of shocks (addressing endogeneity concerns),
- (Some sort of) distinction between physical and risk-neutral expectations.

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## Step 1: Portfolio sort

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### Construction of ESG-sorted equity portfolios:

- Merge equity returns from CRSP-Compustat with ESG data from Eikon.
- Sort firms on (i) carbon (equivalent) emissions or (ii) energy usage.
- Form value-weighted decile portfolios (annual rebalancing).
- Compute Fama-French three factor residuals of portfolio returns.
- Compute monthly long-short portfolio returns (one for carbon, one for energy).
- Brown-minus-green (BMG) portfolio from Gorgen et al. (2020) included as third long-short portfolio.

### Observations

- 1 FF3 residuals exhibit little heteroskedasticity.
- 2 Portfolio sorts offer (too) many degrees of freedom → be restrictive
- 3 Data coverage very weak, in particular before 2010



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## Step 2: News index

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### Construction of monthly climate news index:

- Datasource: Factiva (ten major U.S. newspapers).
- Key search phrase (*climate change*) AND (*economic or economy*).
- Standardize article counts with number of articles about (*economic or economy*).
- Focus on climate news at business cycle frequencies  
→ raw index is HP-filtered with smoothing parameter  $\lambda = 129600$ .

### Observations:

- 1 Positive time trend in unfiltered news index.
- 2 News index more volatile in second half of sample.
- 3 News index very robust to more sophisticated dictionaries.
- 4 Standardization turns out to be very important.

### Extension towards G7 countries: work in progress

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**Step 3: Combination**

**Coexceedance approach:** Shocks to transition risks as months where...

- filtered news index is more than 1 std. above mean.
- (abs.) long-short portfolio return 1 std. above mean (for at least one portfolio).

**Type of shock (positive/negative):** Sign of relevant portfolio return [▶ Details](#)

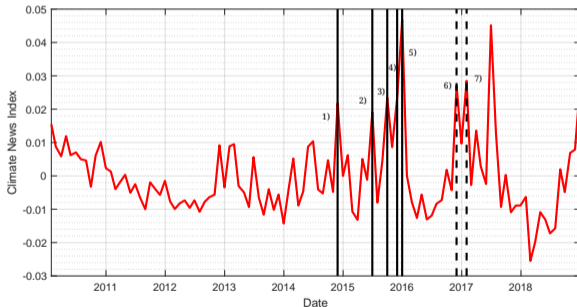


Figure: Shocks to transition risk: Solid vertical line = pos.; Dashed vertical line = neg.

## 2. Impact of shocks to transition risk

## Bayesian VAR, mimicking local projections

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### Bayesian VAR, following Waggoner and Zha (2003):

- Assumption 1: shock is exogenous
- Assumption 2: may affect macro-financial variables contemporaneously or with lag

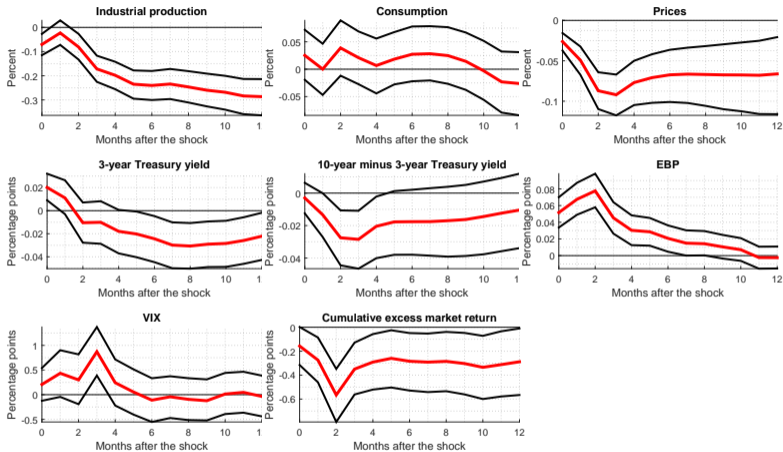
### Shock to transition risk:

Value of news index at month of shock (positive vs. negative)

### Small model of US economy:

- Industrial production
- Consumption
- PCE deflator
- 3-year Treasury yields
- 10 minus 3 year Treasury yields
- Gilchrist-Zakrajsek excess bond premium (EBP)
- VIX
- CRSP value-weighted excess return

## Aggregate results: Increase in transition risk under TR1



- Lowers IP
- Increases financial stress, credit risk premia

## Aggregate results

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### Additional results:

- Shocks explain between 20 – 30% of variation in IP and EBP
- Asymmetry between positive and negative shocks
- Energy materials IP: production goes down and stocks become more volatile
- NFCI: credit conditions tighten after positive TR shock

⇒ More detailed results in our paper! [▶ Details](#)



## Next steps and work in progress

- Repeat the analysis for G7 countries
  - News indices based on Factiva: **done**
  - Portfolio sorts based on ISS data: **done, but inconclusive results**
  - VAR analysis: **data has been collected, analysis yet to come**
- Generally: robustify the approach (show that it produces “better” results than simpler approaches, justify complexity) [▶ Details](#)

## **News-Based Identification of Shocks to Transition Risks.**

### **Combination of**

- textual analysis
- portfolio sorts

supposed to **reduce degrees of freedom.**

### **We find:**

- Shocks to transition risk have aggregate + sectoral impact, affect financial stability.
- Pronounced asymmetry of positive and negative shocks.

**Comments welcome!**

# Appendix

**Shocks increasing transition risk:**

- 1) Climate deal between US and China about carbon emission reduction (Nov 14)
- 2) Announcement of new emission rules in US;  
Commitment by G7 to zero carbon emissions until 2100 (Jun 15)
- 3) UN Sustainable Development Goals set by UN General Assembly;  
Governor Carney (BoE) on mitigation of climate change (Sep 15)
- 4) Run-up to Paris climate summit (Nov 15)
- 5) Paris climate summit with Paris agreement (Dec 15)

**Shocks decreasing transition risk:**

- 6) Election of president Trump (Nov 16)
- 7) Inauguration of Trump; Scott Pruitt (E.P.A. nominee) takes first actions (Jan 17)

**Important non-events:** E.g. US withdrawal from Paris Agreement (Jul 17)

[◀ Return](#)

## Aggregate results: Importance of shocks to transition risk (FEVD, in percent)

Variable	Increase		Decrease	
	TR1	TR2	TR1	TR2
Industrial production	21.5	9.4	1.1	1.4
Consumption	0.9	0.5	1.1	0.7
Prices	13.4	6.6	0.3	0.9
3-year Treasury yield	4.5	3.7	3.5	1.3
10-year minus 3-year Treasury yield	3.6	5.2	2.4	1.4
EBP	29.2	12.5	13.2	1.3
VIX	3.1	2.0	1.8	0.8
Cumulative excess market return	7.7	4.7	4.6	0.4

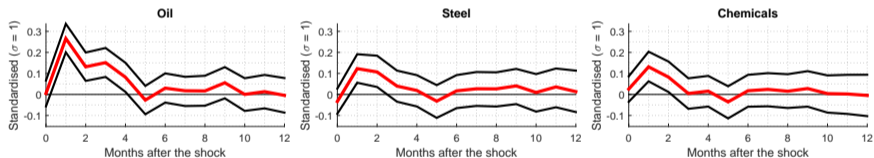
- Explains up to 22% of variation in IP (on average over the first year).
- Explains up to 29% of variation in EBP.
- Sectoral results
  - Lowers production of energy materials, industrial equipment and transit equipment
  - Explains up to 27% (18.4%) [15.8%] of variation in production of energy materials (industrial equipment) [transit equipment].

## Impact on industry portfolio return variances and NFCI subindices (TR1)

## Data:

- Industry portfolio return variances
  - Sum of squared daily returns from 17 Fama-French industry portfolios + banks, insurance, real estate, financial trading
- NFCI subindices (credit, leverage, non-financial leverage, risk)

## Results:



- Increases equity volatility, especially in oil, steel, and chemicals sector
- Increases equity volatility in the banking sector, but not insurance sector
- Increases NFCI: Credit (credit conditions tighten), but not risk or leverage

[Return](#)

**Robustness:**

- Different news indices.
- Different portfolio sorts.
- Shocks: Leave one out.
- Shocks: No contemporaneous impact.

**Challenges:**

- Portfolio sorts: too many degrees of freedom
- **No formal definition of transition risk** → how to validate our measurement?

[← Return](#)