Measuring Geopolitical Risk

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Geopolitical risks often cited by policy-makers, investors, and media as key determinants of economic decisions.

- 2017 Gallup Survey: 75% of investors worried about geopolitical risk for business environment.
- Geopolitical Risk part of ‘uncertainty trinity’ that could have significant adverse economic effects. Carney (2016)
...but their Consequences are Unclear

Little research devoted to quantify the macroeconomic and financial impact of geopolitical risks.
What We Do

1. **Construct an indicator of geopolitical risk**—GPR Index—measuring frequency of articles in leading newspapers discussing rising geopolitical tensions.
   - Focus on risks associated with wars, terrorism, tensions between states;

2. High GPR induces:
   - adverse effects on US employment, IP, and trade;
   - drop in US stock market: heterogeneous response across industries;
   - decline in real activity and stock prices in advanced economies;
   - capital outflows from emerging economies to safe havens.

3. **Economic impact** of GPR mostly driven by threat of adverse geopolitical events rather than their realization.
Why We Do It

- Existing indicators not amenable to empirical analysis:
  - No definition or unclear definition of geopolitical risk;
  - Constructed judgmentally with unknown criteria;
  - Little variation or short sample availability;
  - Constructed as combinations of outcome variables (gold, VIX, dollar, oil prices).

- Complement research on effects of wars and terrorist attacks.
  Blomberg & al (2004); Tavares (2004); Glick & Taylor (2010)

- Relationship to proxies for macroeconomic uncertainty:
  - Exogeneity of GPR index;
    Ludvigson & al (2015); Caldara & al (2016)
  - Control for effects of realization of events.
Plan of the Talk

- Construction of the GPR Index
- Understanding the GPR Index
- Domestic and International Effects of Higher GPR
- Robustness
- Conclusions
CONSTRUCTION OF THE INDEX
Definition: Geopolitics and Geopolitical Risk

- Geopolitics is a word that encompasses multiple definitions.
- We define Geopolitical Risk as the “risk associated with wars, terrorist acts, and tensions between states that affect the normal and peaceful course of international relations.”
- Geopolitical risk captures both risk that these events materialize and new risks associated with escalation of existing events.
- Definition excludes some “geopolitical” phenomena:
  - Major economic crisis (e.g. GFC, Eurozone debt crisis)
  - Major democratic political events (e.g. Brexit)
  - Climate change, civil right movements...
Measurement: Newspaper Searches

- Our methodology mimics what Baker, Bloom, Davis (2016) do for EPU Index.

- The geopolitical risk (GPR) index measures the frequency of articles in 11 newspapers mentioning rising geopolitical tensions.

- Benchmark index (from 1985):
  - **United States**: Boston Globe; Chicago Tribune; Los Angeles Times; NYT; WSJ; WaPo.
  - **United Kingdom**: Daily Telegraph; FT; Guardian; Times.
  - **Canada**: The Globe and Mail.

- Historical index (from 1899): NYT, Chicago Tribune, and WaPo

- Risks as covered/perceived by the English-speaking press.

- More weight to events with U.S. involvement.
Not as Simple as Searching for 'Geopolitical' AND 'Risks’

- **Language** has changed:
  - Term ”Geopolitical risk” popular after 9/11
  - ”War risks” used to be ”War perils”
  - ”Terror Threats” used to be ”Terrorist Menaces”

- **News articles content** has changed:
  - Focus shifted from ’chronicles’ to ’opinions’.

- **Nature of risks** has changed:
  - From wars to nuclear threats to terrorism.
Measurement: Selection of Search Terms

- We define 6 search groups based on pilot audit of articles likely mentioning geopolitical risks.

- Audit set of articles ($\mathcal{E}$) containing Geopolitics or War or Military or Terrorism/t – most RECURRING WORDS in geopolitics books.

- In 2,500 articles in $\mathcal{E}$, about 50% discuss high geopolitical risk ($\mathcal{E}^1$).

- Most articles in $\mathcal{E}^1$ contain additional words related to risks or threats, tensions between states, beginning of wars.

- Construct search categories based on content of articles in $\mathcal{E}^1$.

- Exclude from searches phrases overwhelmingly associated with false positives ($\mathcal{E}^0$):
  - E.g. movies, anniversaries, obituaries, end of the war.
## Measurement: The Search Terms

<table>
<thead>
<tr>
<th>Search Category</th>
<th>Words</th>
</tr>
</thead>
</table>
| 1. Geopolitical Threats | Geopolitical AND (risk* OR concern* OR tension* OR uncertaint*)  
"United States" AND tensions AND (military OR war OR geopolitical OR coup OR guerrilla OR warfare) AND ("Latin America" OR "Central America" OR "South America" OR Europe OR Africa OR "Middle East" OR "Far East" OR Asia) |
| 2. Nuclear Threats | ("nuclear war" OR "atomic war" OR "nuclear conflict" OR "atomic conflict" OR "nuclear missile") AND (fear* OR threat* OR risk* OR peril* OR menace*) |
| 3. War Threats    | "war risk" OR "risk* of war" OR "fear of war" OR "war fear" OR "military threat" OR "war threat" OR "threat of war"  
("military action" OR "military operation" OR "military force") AND (risk* OR threat*) |
| 4. Terrorist Threats | "terrorist threat" OR "terrorist threats" OR "menace of terrorism" OR "terrorism menace" OR "threat of terrorism" OR "terrorist risk" OR "terror risk" OR "risk of terrorism" OR "terror threat" OR "terror threats" |
| 5. War Acts       | (beginning OR outbreak OR onset OR escalation OR start) "of the war"  
(war OR military) AND ("air strike" OR "heavy casualties") |
| 6. Terrorist Acts | "terrorist act" OR "terrorist acts" |
The Benchmark Geopolitical Risk Index

GPR Benchmark Index (GPR)

GPR Index updated monthly and available at
https://www2.bc.edu/matteo-iacoviello/gpr.htm
Geopolitical Threats vs. Geopolitical Acts

- GPR index captures a convolution of shocks to first and higher order moments of the distribution of geopolitical events.
  - Spikes in risk often coincide with realization of big events.

- We organize searches to separate threats that do not immediately materialize from acts that reveal an underlying threat.
  - Geopolitical Threats (GPT): Search categories 1 to 4;
**Geopolitical Threats vs Geopolitical Acts**

Correlation coefficient: 0.60

**GPR THREATS AND ACTS**

- TWA Hijacking
- US bombs
- Libya
- Kuwait Invasion
- US Invasion of Panama
- Gulf War
- Iraq Disarmament Crisis 1998
- 9/11
- IPCC
- Madrid bombings
- London bombings
- Arab Spring
- Iran/Nuclear Tensions
- Russian annexation of Crimea
- Syrian Civil War Escalation
- Syria & Libyan War
- ISIS Escalation
- Paris attacks

Index (2000-2009 = 100)
Geopolitical Threats vs Acts in 1991 and 2003

Gulf War

Iraq Invasion

GPR Threats
GPR Acts
The Historical Geopolitical Risk Index

GPR Historical

- WWI Begins
- 1900
- 1910
- 1920
- 1930
- 1940
- 1950
- 1960
- 1970
- 1980
- 1990
- 2000
- 2010

- Second Boer War and Boxer Rebellion
- Beginning of Russian-Japanese War
- First Balkan War Begins
- Japan attacks Shanghai and Nanking
- Italian Invasion of Ethiopia
- Hitler threatens Czechoslovakia
- Beginning of WWII
- Attack on Pearl Harbor
- Escalation of Korean War
- Suez Crisis
- Second Taiwan Strait Crisis
- Soviet Union Resumes Nuclear Tests
- Middle East Tensions pre-6 Day War
- Vietnam War: First Battle of Quang Tri
- Yom Kippur War
- Grain Embargo against USSR
- Falklands War Begins
- Able Archer 83
- US Bombing of Libya
- Gulf War
- US Bombing of Iraq
- 9/11 Iraq Invasion
- Russia annexes Crimea

Index (2000-2009 = 100)
Audit: Reading and Manually Coding Articles

- **Pilot Audit**: Sample 2,500 articles from set $\mathcal{E}$ consisting of articles containing: geopolitics, war, military, terrorism/t.
  - Goals: inform and refine search terms; understand true $\mathcal{E}^1$ and false $\mathcal{E}^0$ positives; build audit guide

- **Full scale Audit**: Sample of 6,125 articles (50 per quarter) from $\mathcal{E}$.
  - Goal: construction of “human GPR” = $\mathcal{E}^1 / \mathcal{U}$;
  - Correlation between GPR index and “Human GPR”: 84%.

- **Ex post Evaluation**: Sample of 2,500 articles only from set selected by automated searches.
  - 87% mention high or rising geopolitical tensions.
  - 4% mention low or decreasing geopolitical tensions.
  - Correlation between GPR and audited-GPR is 0.98
UNDERSTANDING THE GPR INDEX
Risks Captured by our Index

- Our index captures geopolitical risks as perceived and chronicled by the press in English-speaking countries, particularly in the United States.

- The behavior of the index over time shows how different events move the balance of risks over long horizons and at daily frequencies.

- The index by definition captures media attention towards geopolitical risks, but appears exogenous to major newsworthy events of non-geopolitical nature.
The Historical Geopolitical Risk Index: Components

Words in the Historical Index

- Geopolitical Threats
- Nuclear Threats
- War Threats
- War Acts
- Terrorist Threats
- Terrorist Acts
Daily GPR Index

(a) January 7, 1991

(b) January 17, 1991

(c) September 12, 2001

(d) October 3, 2001

(e) August 10, 2017

(f) August 23, 2017
GPR Index is not correlated with changes in media coverage of unpredictable newsworthy events. → No difference between objective geopolitical risks and media attention towards them.
GPR Index is not correlated with changes in media coverage of predictable newsworthy events.
GPR and Newspaper Slant

GPR Index does not reflect newspaper political slant.
GPR displays more high-frequency variation, allowing to establish the importance of GPR for stock returns over relatively short samples.
GPR and War Deaths

[Graph showing GPR Index, Total Deaths due to war and terror, and Civilian Deaths due to terrorism, US & Europe over years 1985 to 2015.]
GPR and EPU

- US bombs Libya
- Kuwait Invasion
- Black Monday
- Gulf War
- Russian Crisis/LTCM
- Clinton Election
- Bush Election
- 9/11
- Madrid bombings
- London bombings
- Transatlantic aircraft plot
- Lehman Failure and TARPI
- Stimulus Debate
- Euro Crisis
- Debt Ceiling Debate
- Iraq invasion
- Lehman Failure
- Euro Crisis
- Lehma failure and TARP
- Debt ceiling Debate
- Fiscal Cliff
- Govt Shutdown
- Russia annexes Crimea
- Ukraine and ISIS
- Paris attacks

1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017

0 100 200 300 400 500

GPR vs EPU

GPR vs VIX
GPR and VIX

GPR vs VIX

VIX

GPR

1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017

- Black Monday
- Kuwait Invasion
- Asian Financial Crisis
- LTCM
- 9/11
- Iraq Invasion
- Lehman
- Euro Crisis

0 100 200 300 400 500 600

0 10 20 30 40 50 60 70 80 90

0 100 200 300 400 500 600 700 800 900
EFFECTS OF HIGHER GPR
Economic Effects of GPR

- How could GPR matter?

1. Standard Uncertainty/Macro Channels.
2. Effects on Stock Returns.
Effects of Higher GPR: A VAR Analysis

- Sample: 1985M1 to 2016M12.

- US benchmark VAR:
  1. **GPR Index**;
  2. Economic Policy Uncertainty (EPU);
  3. Consumer sentiment;
  4. US industrial production;
  5. Private payroll employment;
  6. US Imports + Exports;
  7. Value-weighted S&P 500 Index;
  8. Oil price;
  9. Yield on 2-Year Treasury.


- **Identification**: GPR Index ordered 1st in Cholesky ordering.

- Shock sized to match typical increase in GPR after major events.
The Macroeconomic Impact of Increased GPR

GPR Index

EPU Index

Consumer Sentiment

Industrial Production

Employment

Gross Trade

S&P500

Real Oil Price

2-Year Treas. Yield
Increased Geopolitical Risk and Stock Returns

Cumulative Excess Return Over S&P 500 - Selected Industries
Effects of Higher GPR: Acts vs Threats

- Modify VAR used to study effects of GPR on US economy.

- Replace GPR with GPA and GPT.

  - **Identification:** GPA ordered 1st and GPT 2nd in Cholesky ordering.
    - GPA shocks move GPT on impact.
    - GPT shocks do not move GPA on impact.

- GPA shocks convolution of shocks to first and higher moments of geopolitical events distribution.

- GPT shocks primarily shocks to uncertainty and risk.
The Impact of Increased GPR: Acts
Selected Variables from US VAR
The Impact of Increased GPR: Threats

Selected Variables from US VAR
The Impact of Increased GPR: Acts
Cumulative Excess Return Over S&P 500
The Impact of Increased GPR: Threats
Cumulative Excess Return Over S&P 500
International Effects of Higher GPR

Three models chosen depending on data availability and timing of effects.

1. International Macro Impact: VARs (dynamic effects):
   - GPR Index;
   - EPU;
   - Country/Region 'X' industrial production.

2. Stock Returns: Univariate regressions

\[
r_{i,t} = \mu_i + \alpha_i GPRSHOCK_t + \epsilon_{i,t},
\]

(monthly data from pre-WWII)

3. Capital Flows \( y \): Panel regressions

\[
y_{i,t} = \alpha_i + \rho_1 y_{i,t-1} + \beta GPR_t + \Gamma X_t + u_{i,t},
\]
1. The International Impact of Increased GPR

Industrial Production for Selected Countries and Regions
# 2. Geopolitical Risk and Stock Returns

Table 2: GPR and World Stock Market Returns

<table>
<thead>
<tr>
<th>Country</th>
<th>GPR Historical</th>
<th>GPR Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>GPR</td>
<td>-0.45</td>
<td>-0.74</td>
</tr>
<tr>
<td></td>
<td>(0.27)</td>
<td>(0.35)</td>
</tr>
<tr>
<td>Crisis Index</td>
<td>-0.16</td>
<td>-0.16</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.15)</td>
</tr>
<tr>
<td>GPA</td>
<td>-0.10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.30)</td>
<td></td>
</tr>
<tr>
<td>GPT</td>
<td>-0.31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Estimation of the effect of geopolitical risk on world stock market returns between 1919 and 2016. We standardize the GPR, GPA and GPT indexes so that the coefficient measures the percent change in stock returns to a 1 standard deviation innovation in a given index. The variable crisis is the total number of crises in a month, normalized by 2.41, the average number of active crisis in our sample. Standard errors reported in parentheses are corrected for autocorrelation using the Newey-West method. See Section 5.2 for additional details. Source: Global Financial Data and International Crisis Database.
## 2. Geopolitical Risk and Stock Returns: Countries

Table 3: GPR and Country Stock Market Returns

<table>
<thead>
<tr>
<th>Country</th>
<th>GPR Historical</th>
<th>GPR Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Coefficient</td>
<td>(2) Std. Errors</td>
</tr>
<tr>
<td>Australia</td>
<td>-0.30</td>
<td>(0.22)</td>
</tr>
<tr>
<td>Belgium</td>
<td>-0.70</td>
<td>(0.31)</td>
</tr>
<tr>
<td>Canada</td>
<td>-0.62</td>
<td>(0.23)</td>
</tr>
<tr>
<td>Finland</td>
<td>-0.20</td>
<td>(0.36)</td>
</tr>
<tr>
<td>France</td>
<td>-0.59</td>
<td>(0.33)</td>
</tr>
<tr>
<td>Germany</td>
<td>-0.09</td>
<td>(0.62)</td>
</tr>
<tr>
<td>India</td>
<td>-0.49</td>
<td>(0.50)</td>
</tr>
<tr>
<td>Italy</td>
<td>-0.90</td>
<td>(0.38)</td>
</tr>
<tr>
<td>Japan</td>
<td>0.07</td>
<td>(0.32)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>-0.30</td>
<td>(0.37)</td>
</tr>
<tr>
<td>Peru</td>
<td>-0.59</td>
<td>(0.71)</td>
</tr>
<tr>
<td>Portugal</td>
<td>-0.27</td>
<td>(0.52)</td>
</tr>
<tr>
<td>Spain</td>
<td>-0.27</td>
<td>(0.32)</td>
</tr>
<tr>
<td>South Africa</td>
<td>-0.84</td>
<td>(0.23)</td>
</tr>
<tr>
<td>Sweden</td>
<td>-0.40</td>
<td>(0.28)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-0.56</td>
<td>(0.23)</td>
</tr>
<tr>
<td>United States</td>
<td>-0.43</td>
<td>(0.29)</td>
</tr>
</tbody>
</table>

**Note:** Estimation of the effect of geopolitical risk on individual countries’ stock market returns. We standardize the GPR index so that the coefficient measures the percent change in stock returns to a 1 standard deviation innovation in a given index. Column (3) reports the year in which the monthly data on stock returns are available for each country, while the sample ends in 2016 for all countries. Standard errors reported in parenthesis are corrected for autocorrelation using the Newey-West method. See Section 5.2 for additional details. Source: Global Financial Data.

Table 4: GPR and Capital Flows

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1) Inflows/GDP Emerging Economies</th>
<th>(2) Inflows/GDP Advanced Economies</th>
<th>(3) Inflows/GDP United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagged Inflows</td>
<td>0.30 (0.06)</td>
<td>0.16 (0.06)</td>
<td>0.51 (0.08)</td>
</tr>
<tr>
<td>GPR Index, standardized</td>
<td>-0.23 (0.12)</td>
<td>1.00 (0.32)</td>
<td>0.44 (0.36)</td>
</tr>
<tr>
<td>VIX, standardized</td>
<td>-1.09 (0.18)</td>
<td>-1.54 (0.59)</td>
<td>-0.88 (0.37)</td>
</tr>
<tr>
<td>Lagged GDP Growth</td>
<td>0.29 (0.09)</td>
<td>1.61 (0.36)</td>
<td>0.01 (0.62)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,932</td>
<td>2,305</td>
<td>119</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.170</td>
<td>0.047</td>
<td>0.329</td>
</tr>
<tr>
<td>Number of countries</td>
<td>23</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Country Fixed Effects</td>
<td>YES</td>
<td>YES</td>
<td>—</td>
</tr>
<tr>
<td>Clustered Standard Errors</td>
<td>YES</td>
<td>YES</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: Estimation of effects of geopolitical risk on gross capital inflows. We standardize both the GPR index and the VIX, so that the coefficients report the response of the ratio of inflows to gdp (in percentage points) to a 1 standard deviation innovation in GPR and the VIX. Robust standard errors reported in parenthesis. See Section 5.3 for additional details. Source: IMF’s Balance of Payments Statistics database.
ROBUSTNESS
Robustness Analysis

- Investigate the following modifications to the baseline VAR specification:
  1. Censored GPR index: Keep only 9 largest peaks.
  2. Dummy for 9/11.
  3. Alternative Cholesky ordering
  4. Replace EPU with the VIX.

- Alternative specifications of GPR index:
  1. Broader and narrower list of search terms;
  2. Exclude articles mentioning economic consequences of GPR.
Censoring + 9/11 Dummy

- GPR Index
- EPU Index
- Consumer Sentiment
- Industrial Production
- Employment
- Gross Trade
- S&P500
- Real Oil Price
- 2-Year Treas. Yield
Ordering GPR Last

GPR Index

EPU Index

Consumer Sentiment

Industrial Production

Employment

Gross Trade

S&P500

Real Oil Price

2-Year Treas. Yield
Replacing EPU with the VIX

GPR Index

VIX

Consumer Sentiment

Industrial Production

Employment

Gross Trade

S&P500

Real Oil Price

2-Year Treas. Yield
Conclusions

- We construct a quantitative measure of geopolitical risk.

- For many countries, the GPR index is perhaps more ”exogenous” to economic conditions than other uncertainty measures.

- Geopolitical risk has adverse effects on real activity and stock returns in advanced economies.

- The effect on US stock returns varies across industries.

- Adverse effects of geopolitical risk are mostly driven by the threat of adverse geopolitical events.

- We are currently working on constructing country-specific GPR indexes.
Available Indices 1: Doomsday Clock
Available Indices 2: Geopolitical Heat Maps
Most Frequent Words in Geopolitics Textbook
Content of Articles in Pilot Auditing

Scatter plot of the 4 principal components from analysis of the top 50 bigrams from 2,500 newspaper abstracts classified as $E^1$. 
Frequent Unigrams in Flint’s Geopolitics Textbook

- geopolit
- state
- world
- war
- nation
- terror
- polit
- countri
- global
- conflict
- power
- boundari
- code
- leader
- unit
Increased Geopolitical Risk and Investment

Nonresidential Investment and Consumer Durables

Estimation of quarterly VAR from 1985 to 2016.