Using Text to Quantify Policy Uncertainty

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Policy-Related Uncertainty

Recent and Ongoing Episodes

- **United States:** Debt ceiling fight (2011), fiscal cliff (2012), Obamacare (2010-?), 2016 election cycle
- **Europe:** Sovereign debt & banking crises in Eurozone, immigration crisis, Brexit
- **China:** Leadership transition circa 2012, stock market missteps, aggressive sovereignty claims in South China Sea
- **Russia:** Annexation of Crimea, ongoing Ukraine conflict, weak rule of law
- **Turkey:** Failed coup attempt, crackdown
- Brazil, Middle East, ...
2016 U.S. Presidential Election

Trump’s surprise win in the presidential election contest brought greater economic uncertainty in several policy areas, including:

– U.S. trade policy
– U.S. immigration policy
– Institutional independence of Fed
– U.S. security policy and support for its traditional alliances (e.g., NATO, South Korea), which undergird the global economic and security order since World War II
Politics and Economic Uncertainty

• These recent examples, drawn from many parts of the world, suggest that governments and political processes are important sources of economic uncertainty.

• Policy-related uncertainty also arises as a consequence of major economic shocks and disruptions. Example: The Global Financial Crisis of 2008–09 confronted policymakers with extraordinary and complex challenges → great uncertainty about how policymakers should and would respond to the challenges, and what would be the economic consequences.

• Unsatisfactory economic performance also seems to fuel populist political forces: Trump, Le Pen, Brexit, rise of far-right political parties in Europe. See Funke et al. (2016).
How Can High (Policy) Uncertainty Harm Economic Performance?

• By causing businesses to delay or forego investment and hiring when they are costly to reverse
• By raising the cost of debt and equity finance, thereby discouraging investment
• By causing households to behave more cautiously, cutting back on spending
• By raising asset price volatility
• By undermining confidence?
How to Make Progress in Understanding the Relationship between Politics and Uncertainty?

“The first essential step in the direction of learning any subject is to find principles of numerical reckoning and practicable methods for measuring some quality connected with it.”

Lord William Thompson Kelvin, 1883
What Do Our Policy Uncertainty Measures Seek to Capture?

All of the following:

• Uncertainty about *who* will make economic policy decisions – e.g., who will win the next election?

• Uncertainty about *what* economic policy actions decision makers will undertake, and *when*.  

• Uncertainty about the economic *effects* of policy actions – past, present and future actions  

• Economic uncertainty induced by policy inaction  

• Uncertain economic ramifications of national security and other policy matters that may not be mainly economic in character
Our Economic Policy Uncertainty Indices rely on computer-automated newspaper searches

How it works for the United States:

• For 10 major US papers, get monthly counts of articles that contain at least one word from each of three term sets:
  
  **E:** \{economic or economy\}
  
  **P:** \{regulation or deficit or “federal reserve” or congress or legislation or “white house”\}
  
  **U:** \{uncertain or or uncertainty\}

  Include “the Fed”, “regulatory” and other variants.

• Scale the EPU count for each paper and month by the count of all articles in the same paper and month

• Standardize each paper’s scaled count to unit St. Dev., then sum over the 10 papers by month to get the U.S monthly index
US Newspaper-Based EPU Index, 1985 to Aug. 2016

More Newspaper-Based EPU Indices

• Monthly EPU indices for 16 countries that account for 2/3 of global output.
  – Several more countries in the works
• Historical EPU indices back to 1900 for the US and the UK
• U.S. category-specific EPU indices
• Daily EPU indices for the US and UK
• Daily Equity Market Uncertainty index
• Immigration Fear and Policy Uncertainty indices for the US, France, Germany, UK

Downloadable and regularly updated at http://www.policyuncertainty.com
Selected category-specific EPU Indices, Quarterly

Notes: Indices reflect scaled monthly counts of articles containing the same triple as in Figure 1 and one or more terms pertaining to national security (e.g., “war”, “terrorism”, or “department of defense”) and healthcare (e.g., “healthcare”, “hospital”, or “health insurance”), respectively, for the National Security and Healthcare indices. Each series is normalized to mean 100 from 1985-2009 and based on queries run Jan 18, 2015 on Access World News Newsbank newspaper archive, which covers about 1,500 US papers.
North Korean Economic Policy Uncertainty Index

Source: www.policyuncertainty.com. Data from 0 North Korean newspapers.
EPU Index for Russia, October 1992 to August 2014

Global EPU Index, January 1997 to October 2016

Notes: Global EPU calculated as the GDP-weighted average of monthly EPU index values for the US, Canada, Brazil, UK, Germany, Italy, Spain, France, Netherlands, Russia, India, China, South Korea, Japan, Ireland, and Australia, using GDP data from the IMF's World Economic Outlook Database. National EPU index values are from www.PolicyUncertainty.com and Baker, Bloom and Davis (2016). Each national EPU Index is renormalized to a mean of 100 from 1997 to 2015 before calculating the Global EPU Index.
Evaluating Our Measurement Approach
A) Proof-of-Concept: Comparing a newspaper-based index of equity market uncertainty to the VIX.

The newspaper-based index of Equity Market Uncertainty uses our E and U term sets but replaces the P set with “stock price”, “equity price”, and “stock market”.

Notes: The news-based index of equity market uncertainty is based on the count of articles that reference ‘economy’ or ‘economic’, and ‘uncertain’ or ‘uncertainty” and one of ‘stock price’, ‘equity price’, or ‘stock market’ in 10 major U.S. newspapers, scaled by the number of articles in each month and paper. The news-based index and the VIX are normalized to a mean of 100 over the period.
B) Large-Scale Human Audit Study

Teams of RAs read 12,000 randomly selected newspaper articles to code them as to “economic uncertainty”, “economic policy uncertainty” and more according to a 65-page audit guide.

Economic Policy Uncertainty

Newspaper Articles from 1985-2012

Audit Methodology: Main Steps

1. Download all NY Times, LA Times, and SF Chronicle articles from 1985 to 2012 that pass our Economic Uncertainty filter.
   - The NY Times online archive
   - The LA Times online archive

2. Draw 1,000 articles from this pool.
3. Assign 84 of the sampled articles for each paper to Kyle and 84 to Sophie. Call these subsamples Sub(Name,Paper).
4. Review the articles and get ready to score.
5. In sum, the audit guide contains 65 pages. Review the audit guide.
6. Lastly, review the articles.

August 30 Sampling Details

1. Download all NY Times, LA Times, and SF Chronicle articles from 1985 to 2012.
2. Assign 84 of the sampled articles for each paper to Kyle and 84 to Sophie.
3. Call these subsamples Sub(Name,Paper).

 Auditing the Sampled Articles

1. If yes to 2, then identify the policy category (checking all that apply):
   - Monetary policy
   - Fiscal policy
   - Taxes
   - Labor regulations
   - Legal policy
   - Competition policy
   - Government spending
   - Health care programs and regulations
   - National security and terrorism
   - Trade policy
   - Energy & environmental regulation
   - Natural resources and commodities
   - Entitlement programs, social safety net, welfare programs
   - Financial regulation (including banking and equity markets)
   - Political conflict and leadership changes
   - Sovereign debt, exchange rate policy, foreign reserves
   - Other policy matters (specify)

2. Code other aspects of policy uncertainty treated in the article: direction of change, nature of policy uncertainty (is it about who, actions, or effects?), and whether it discusses policy concerns in the United States or foreign countries.

FAQ

1. Given that the outcome of government policy is always uncertain, at some level, does any mention of a new or proposed policy constitute EPU = 1?

2. No. An article is scored as EPU = 1 if it mentions the policy, mentions a specific proposal, etc... For example, if an article mentions the policy, then the policy is coded as EPU = 1.

3. True Positive 2

   “Our Love Affair With Malls Is On the Rocks”
   Code as EPU = 1, because the article discusses uncertainty as...

4. False Positive 5

   “Canada Is Expected to Join U.S.-Mexico Trade Talks”
   Code as EPU = 0, because the article does not mention any aspects of uncertainty.

5. False Negative 4

   “Canada quickly expressed interest in having a role in the new talks, but its status was left unclear amid uncertainty about how its inclusion might affect the United States-Mexican talks, which were considered a high priority by both countries.”
   Code as EPU = 1, because the article mentions uncertainty over the trade policy in North America. The automated search incorrectly codes the article as EPU = 0, because it never mentions any of the terms in the ‘policy’ part of our search filter.
C) Political Slant? Compare 5 most Republican and 5 most Democratic papers – they look very similar.

Papers sorted into 5 most ‘Republican’ and 5 most ‘Democratic’ groups using the media slant measure from Gentzkow and Shapiro (2010).
D) Policy Uncertainty Measures Based on Textual Analysis of the Fed’s Beige Books and Section 1A (Risk Factors) of Firms’ 10K Filings

Notes: The left scale shows frequency counts per Beige Book (normalized by word count) of “uncertainty” and references to policy uncertainty. The right scale reports the percentage of sentences in Section 1A (Risk Factors) of annual 10-K filings that contain one or more of the policy terms listed in Appendix C. The correlation between the Beige Book Normalized Policy Uncertainty Count and the EPU index is 0.54.
E) Market-Use Test

Market use underscores the information value of our data:

I) Many policy organizations and financial institutions use our data including Goldman Sachs, Citibank, JP Morgan, Wells Fargo, IMF, central banks, and more. (see www.policyuncertainty.com).

I) Blackrock has its own in-house team that has picked up on our work and adopted methods similar to ours.

I) Bloomberg, FRED, Reuters and Haver stream our data for their business clients and other users.
National Elections and Economic Policy Uncertainty
Patterns in the Data

1. U.S. EPU was high in the months surrounding the first elections of Bill Clinton, George W. Bush, …

2. Looking at 62 national elections in 11 countries, my research with Baker and Bloom finds statistically significant evidence of elevated EPU around national leadership elections more generally.

3. But the estimated effect of elections on EPU is modest – roughly a 20 percent increase on average, and a bit more for close elections.

4. Why such a modest effect for national leadership elections? Perhaps because the policy stakes are also modest – in most cases.
The 2016 U.S. Presidential Election

1. Trump and Clinton were far apart on many major policy issues: immigration, trade, taxes, foreign policy, etc. Not Tweedledee vs. Tweedledum.

2. Trump is a wild card – no track record as a policy maker; little in the way of a consistent, coherent set of policy principles; and a history of intemperate remarks. He also seems to regard unpredictability as an attractive philosophy of leadership and governing.
Unsmoothed Index Values:
November 7: 81
November 8: 103
November 9: 323
November 10: 355
November 11: 213
Why was US EPU subdued in advance of the presidential election? Four reasons:

1. The smart(?!?) money said Clinton would win with high probability.
2. Clinton is a known quantity – she’s been on the national policy scene for 25+ years.
3. She’s also a status quo candidate who was seen as unlikely to implement large, abrupt departures from Obama’s policies.
4. The Republicans were seen as likely to retain control of the House, Senate or both, preserving the recent pattern of divided government and curtailing the scope for major policy shifts.
Going forward after the election...

Higher EPU and the prospect of harmful policies could exert a drag on trade, investment, hiring and growth. But the election outcome also improved prospects for tax reform, fiscal stimulus, and a lessening of regulatory burdens.

Major areas of concern include:

- **Demise of US-led global trade order**: Threats to WTO and existing trade treaties, potential US shift to a crude mercantilist trade policy, risk of retaliatory policy shifts by trading partners.
  - What happens when Trump’s “understanding” of the facts clashes with reality? Example: his claim that China has been depreciating the Yuan vs. the Dollar? (See Charles Calomiris in Forbes on 25 August 2015.)
• **Immigration policy:** If the U.S. becomes a less attractive or viable destination for talented, motivated immigrants, it will diminish the U.S. capacity for innovation and growth.

• **International security:** Trump seems willing to downgrade U.S. commitment to NATO and to coddle foreign tyrants who say nice things about Trump. Thus far, he has shown little appreciation for the dangers of nuclear proliferation.
  – He has raised doubts in Japan, South Korea and Europe about U.S. willingness to honor treaty security obligations
  – What’s the evidence that the international order is stable and prosperous when the US turns inward?
Assessing the Economic Effects of Policy Uncertainty

• National time-series evidence
• Firm-level evidence
National Time-Series Evidence

- Include Monthly EPU Indices in Vector Autoregressive (VAR) statistical models of the sort that macroeconomists routinely use to characterize dynamic co-movements in aggregate data.
- Fit to monthly and quarterly data for the United States and to a dozen countries in a panel VAR.
- Examine Impulse Response Functions to EPU shocks (i.e., Cholesky innovations).
- **Main Question:** What do EPU shocks portend for future movements in output growth, investment rates, employment growth, etc.?
Notes: The baseline case involves the same sample period, VAR specification and identification as in Figure 8. The other cases depart from the baseline as indicated. We place EU and VIX after EPU in the ordering. For the “1920-1984” response function, we use monthly data from 1920 to 1984 on log industrial production and EPU in a bivariate VAR with EPU ordered first.
Summary of National Time-Series Evidence

• Positive EPU shocks foreshadow deteriorations in macroeconomic performance, as reflected by investment, employment and output measures.

• The dynamic responses are material, but moderate, in size.

• The right interpretation of these statistical results is unclear. Two possibilities (not the only two):
  – Higher EPU causes the negative statistical effects
  – EPU shocks coincide with other negative developments that are not (fully) captured by the other variables in our statistical model, and the other developments cause the deterioration.
Firm-Level Evidence

• Micro data offer more scope to control for confounding factors and to identify causal effects.
• We use firm-level micro data to investigate the effects of EPU on firm-level stock-price volatility, investment rates and employment growth rates.
• Our approach exploits large differences across firms in exposure to policy factors (government spending and regulations).
• We investigate whether firms with greater exposure to policy risks see larger responses to movements in our EPU index.
Exploiting differences across firms in share of revenues from sales to the federal government.


- Guided Missiles and Space Vehicles: 78%
- Health Services: 44%
- Ordnance and Accessories: 39%
- Search, Detection, Navigation,… Aeronautical Systems: 27%
- Engineering Services: 21%
- Aircrafts and Parts: 20%
- Ship and Boat Building and Repairs: 15%
- Books, Loose Leaf Binders, and Bookbinding: 10%
- Heavy Construction: 9%

Direct sales to federal government account for a small share of revenues in most other industries.
Measuring Firm-Level Policy Exposure Intensity

Main Approach: First, compute revenue share of government purchases at SIC3 level from 2000-2013. Second, compute firm-level exposure as revenue-weighted mean of its industry exposures using Compustat line of business data. Time-averaged measures, constant at the firm level.

Supplemental and Alternative Approaches:
2. Measure exposure by slope coefficient in regression of firm’s daily stock returns on daily EPU index from 1985-1995, which pre-dates the regression sample period.
3. Quantify policy risk exposure using textual analysis of 10-K filings. Specifically, compute each firm’s 2006-2013 average share of sentences in Section 1A (Risk Factors) that reference policy matters.
How Large Are the Estimated Effects of EPU on the Cross Section of Stock-Price Volatility?

Example: Overall U.S. EPU rose by 86 log points from 2006 to 2012, and Financial Regulation and Healthcare EPU indices rose by even larger amounts.

Estimated effects on option-implied firm-level stock price volatility in selected industries:

- Ordnance: +4.6 log points
- Heavy Construction: +0.6
- Engineering Serv.: +3.3 points
- Healthcare: +13.9
- Aircraft, Parts: +3.3
- Finance: +23.8

- Contrast to episode of July-Aug. 2001 to Sep.-Oct 2001 (before and after 9-11)
Summary of Firm-Level Regression Results

- High EPU raises firm-level stock-price volatility in sectors with heavy reliance on government spending (e.g., healthcare, defense-related industries, infrastructure investments) and high exposure to regulation (e.g., healthcare, financial services).
- Rising EPU lowers firm-level investment rate and employment growth in sectors with heavy reliance on government spending and high exposure to regulation.
- These effects on firm-level stock-price volatility, investment rates, and employment growth rates are sizable in sectors with high exposure to policy.
Our Data Are Online at www.PolicyUncertainty.com

- Monthly EPU indices for 16 countries, including all G10 economies, with more countries in the works. Regular updates in the first few days of each month.
- Historical EPU indices back to 1900 for the United States and United Kingdom
- Daily EPU indices for the US and UK, with daily updates
- Many category-specific EPU indices back to 1985 for the United States
- Special U.S. tabulations for “government shutdown” and “debt ceiling”
- Special U.K. tabulations for Brexit-related EPU.
- Daily newspaper-based index of equity market uncertainty back to 1985
- Migration-related Fear and Policy Uncertainty Indices for France, Germany, the U.K., and the U.S.
References

Additional Slides – Not for Prepared Remarks
Financial Regulation Uncertainty Index, Quarterly

Notes: The index reflects the frequency of newspaper articles about economic policy uncertainty and financial regulatory matters, as indicated by terms like “bank(ing) supervision,” “Glass-Steagall,” and “Dodd-Frank.” Data are from Baker, Bloom and Davis (2015) and are available and updated monthly at www.PolicyUncertainty.com. Normalized to a mean of 100 from 1985 to 2009.
The Brexit Uncertainty Shock

• A surprise referendum outcome
• It triggered a huge spike in UK EPU
• Global EPU reverberations
• But concerns about Brexit-related uncertainty have abated rapidly
The Brexit Shock and Its Immediate Wake, Daily Data

A Big Surprise!!

The Brexit Shock and Its Immediate Wake, Daily Data

Massive Surge In UK EPU!!

A Big Surprise!!

The Brexit Shock and Its Immediate Wake, Daily Data

But EPU Surge Largely Reverses within 2 Weeks

The Brexit Shock and Its Immediate Wake, Daily Data

Fast Recovery in Equity Markets

The Brexit Shock and Its Immediate Wake, Daily Data

The Daily US EPU Index draws on hundreds of newspapers and is less noisy than the Daily UK EPU Index.

Smaller response for US EPU, but same pattern: Large impact effect of surprise referendum outcome, followed by rapid dissipation. No apparent EPU effect beyond the first three or four weeks.
Brexit Summary

1. Brexit referendum outcome was a big surprise and a massive shock to UK EPU, with global reverberations.
2. But (concerns about) Brexit-related uncertainty dissipated very rapidly, according to our EPU indices.
3. The British Pound fell more than 10% against the US Dollar in wake of Brexit referendum, and it remains down.
4. Equity markets, however, rebounded within a few weeks.
5. Quantifying the likely near-term output effects of Brexit is really, really hard – at least for us.
6. For industrial production, our VAR models suggest a peak negative effect of Brexit uncertainty shock of about minus 2 log points 6-12 months later.
7. Best guess for peak GDP response is about -1 log point, after considering less volatile nature of GDP, muting effect of Pound depreciation and aggressive BOE response.
More Detail on the Human Audit
Audit Process Overview

1. The authors first read and discussed a few hundred randomly selected “EU” articles to develop a coding template, training process, and draft audit guide.

2. Pilot study of 2,000 EU articles by authors and RAs to improve training process, refine coding template, expand and improve audit guide, and refine sampling methods.

3. Main audit study of EU articles (basis for analysis):
   - Training and review process for all auditors
   - 65-page audit guide (available on the web)
   - Audit team meetings every week or two over 18 months to address questions, review “hard calls,” maintain esprit de corps, and monitor performance
   - Auditors read and coded 12,000+ articles
   - We randomized article selection, order of presentation to auditors, assignment of articles to multiple auditors
How We Use the Audit Study Results

1. Identify candidate “P” terms:
   - When auditor codes EPU=1, he or she also records policy terms that appear in article’s discussion of EPU.
   - Candidates: 15 frequently appearing P terms

2. Consider ~32,000 term-set permutations involving 4 or more candidate P terms. Choose the P term set that minimizes the sum of false positive and false negative error rates relative to the human EPU classifications.
   - This optimization yields our baseline P term set.
   - We do not use time-series variation to select P term set.
   - To our surprise, we were unable to develop simple compound text filters (e.g., {government AND tax}) that improve on our baseline term set.

3. Time-series comparisons of humans and computers (next 2 slides) and additional empirical results (following slide)
Economic Policy Uncertainty Index

Year

Notes: Index comparison from 1985 Q1 to 2012 Q1 based on 3,723 articles (4,388 audits) in the Chicago Tribune, Dallas Morning News, LA Times, Miami Herald, NY Times, San Francisco Chronicle, Washington Post and Wall Street Journal. Series are plotted quarterly to reduce sampling variability, with an average of 33 articles per quarter. Each series is normalized to 100 from 1985-2009. See text for additional discussion of the audit process and this comparison.
Human and Computer EPU Indices, 1900-2010, Annual

Notes: Index comparison from 1900 to 2010 based on 11,841 articles (15,156 audits) in the Chicago Tribune, Dallas Morning News, LA Times, Miami Herald, NY Times, San Francisco Chronicle, Washington Post and Wall Street Journal. Series plotted yearly to reduce sampling variability, with an average of 107 articles per year. Each series normalized to 100 from 1900 to 2010.

Correlation = 0.93
Other Selected Results from the Audit Study

• Only 5% of articles with $EPU^H = 1$ mainly discuss actual or prospective declines in policy uncertainty.

• 10% of $EPU^H = 1$ articles discuss uncertainty about who will make economic policy decisions, 68% discuss uncertainty about what policies will be undertaken or when, and 47% discuss uncertainty about the effects of past, present or future policy actions.

• The who share of $EPU^H = 1$ triples in presidential election years as compared to other years → the nature of policy uncertainty shifts substantially over the election cycle.

• 32% of $EPU^H = 1$ articles mention policy matters in other countries, often alongside domestic policy concerns.
**US VAR for Impact on GDP and Investment (quarterly)**

**Notes:** VAR-estimated impulse response functions for GDP and Gross Fixed Investment to an EPU innovation equal to the increase in the EPU index from its 2005-2006 to its 2011-2012 average value, with 90 percent confidence bands. Identification based on three lags and a Cholesky decomposition with the following ordering: EPU index, log(S&P 500 index), federal reserve funds rate, log gross investment, log gross domestic product). Fit to data from 195 to 2014.