

Data Visualization: Grouping Acronyms as Heuristic Devices in Sovereign Bond Markets

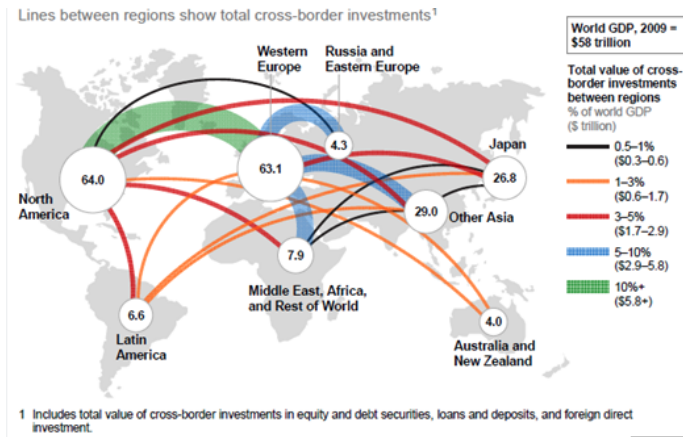
Nicola Nones

University of Toronto

January 13, 2025

Reputation and Global Capital Flows

Access to international capital \Rightarrow Economic development + Buffer to exogenous shocks.

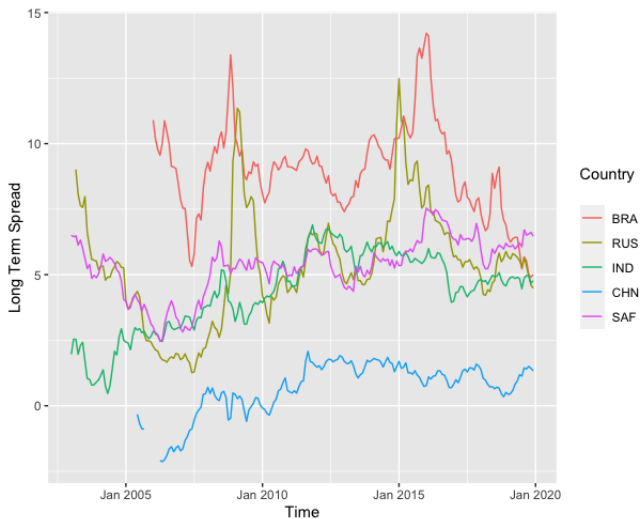


The complex environment of international finance



Investments' riskiness reputation, and interest rates

Higher risk \Rightarrow Higher interest rates



Research Question

Investors' beliefs about a country's reputation matter for governments' ability to access capital. How do financial investors assess a country's default risk? What role do the media play in this assessment, if any?

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"First there was BRICs. Then came CIVETS. Then we were presented with BASIC, CRIM, BRICK, CEMENT, BEM, N11 and the 7% Club. Now barely a week goes by before someone tries to float another 'useful' investment acronym." (Global Dashboard, Jules Evans, December 6th, 2010)

Investors, sovereign borrowing, and heuristics: Rational Models

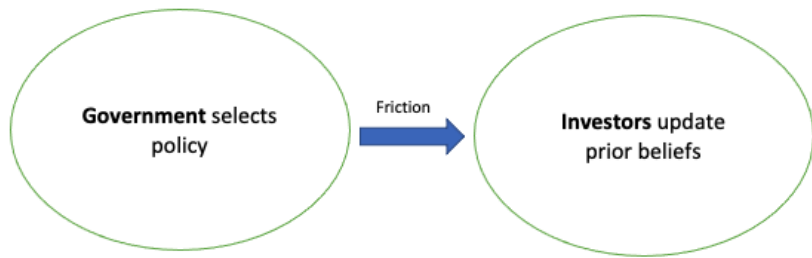
- Standard rational models and fully Bayesian agents (Bernhard and Leblang, 2006).

Investors, sovereign borrowing, and heuristics: Rational Models

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- The passive role of the media.

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The company states share in investors' mind

- Behavioral models and boundedly rational investors. The role of heuristics (Fourcade, 2013; Brooks et al., 2015).

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- "Reputational transfers" via heuristics: IO membership, geography, level of development, credit ratings (Gray, 2009, 2013; Brazys and Hardiman, 2015).

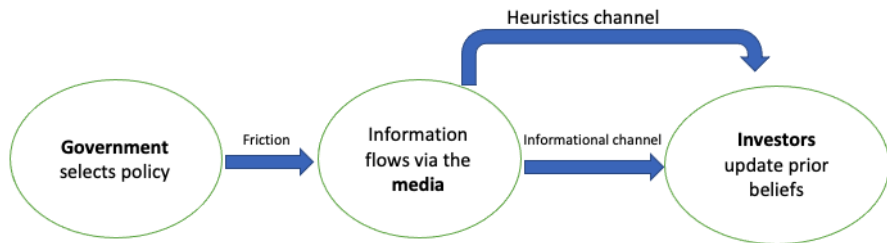
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- "Reputational transfers" via heuristics: IO membership, geography, level of development, credit ratings (Gray, 2009, 2013; Brazys and Hardiman, 2015).
- My contribution: the role of the media.

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- "Reputational transfers" via heuristics: IO membership, geography, level of development, credit ratings (Gray, 2009, 2013; Brazys and Hardiman, 2015).
- My contribution: the role of the media.
- Investors rely on "the company a state keeps" in grouping acronyms disseminated by the media as a way to infer a country's creditworthiness.

The company states share in investors' mind - My Model



The argument I

- External actors define heuristic categories.

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- External actors define heuristic categories.
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- Investors rely on such heuristics and update their priors on a country's reputation.

The argument II

- Boundedly rational investors assess how much that country fits in a stereotypical “good” or “bad” class.

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- Grouping acronyms as a *signaling mechanism* about the stereotypical class.
- Acronym’s evaluative association determines the class, “good” (e.g. BRICS) or “bad” (e.g. PIIGS).

The argument II

- Boundedly rational investors assess how much that country fits in a stereotypical “good” or “bad” class.
- Grouping acronyms as a *signaling mechanism* about the stereotypical class.
- Acronym’s evaluative association determines the class, “good” (e.g. BRICS) or “bad” (e.g. PIIGS).
- Boundedly rational investors update their priors about one class member even if they receive new information about only the other class members (and vice versa).

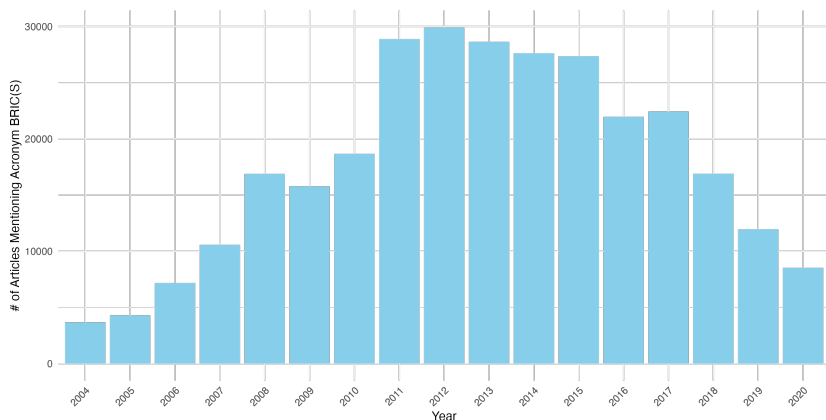
Hypothesis 1: An increase in the implicit association to the positive (negative) BRICS (PIIGS) label will lead to a decrease (increase) in the country's perceived riskiness.

Question for You 1

How would you visualize the use of acronyms in the media over time?
Discuss.

The BRICS in the Media

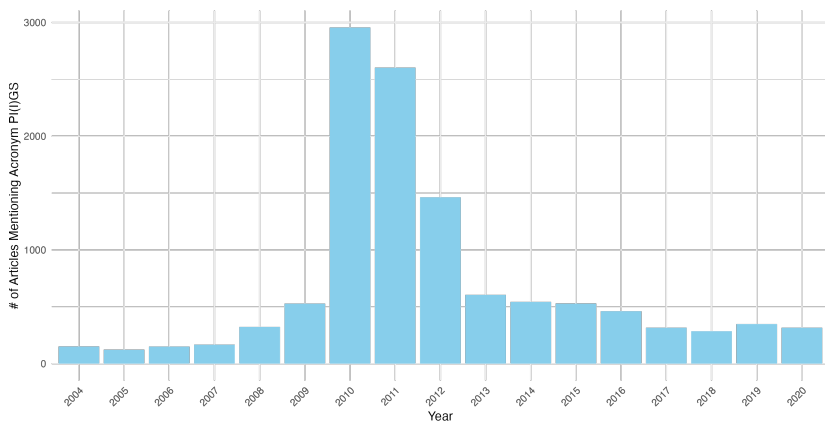
Figure: Mentions of BRIC(S) in Newspapers (2004-2020)



Source: Factiva. *Keyword search:* BRIC or BRICS not brac and (Brazil or India or Russia or China or South Africa)

The PIIGS in the Media

Figure: Mentions of PI(I)GS in Newspapers (2004-2020)



Source: Factiva. *Keyword search:* PIIGS or PIGS and (Italy or Ireland or Greece or Spain or Portugal) and *econom** not *meat** not *farm**

Figure: Mentions of PI(I)GS in Newspapers (2004-2020)

```
> df
# A tibble: 17 × 2
  count year
  <dbl> <dbl>
1    151 2004
2    123 2005
3    150 2006
4    167 2007
5    323 2008
6    528 2009
7   2956 2010
8   2603 2011
9   1463 2012
10   605 2013
11   543 2014
12   529 2015
13   461 2016
14   316 2017
15   285 2018
16   348 2019
17   316 2020
```

Source Code for PIIGS Graph

```
# Create the plot
# Use factor to treat year as a categorical variable
p1 <- ggplot(df, aes(x = factor(year), y = count)) +
  geom_bar(stat = "identity", fill = "skyblue") +
  # Change Y and X-axis labels
  labs(x = "Year", y = "# of Articles Mentioning Acronym PI(
      I)GS") +
  # background color white
  theme_minimal() +
  # Set limits to display years from 2004 to 2020
  scale_x_discrete(limits = as.character(2004:2020)) +
  # Rotate x-axis labels for better readability
  theme(axis.text.x = element_text(angle = 45, hjust = 1),
        # Remove the title
        plot.title = element_blank())
```

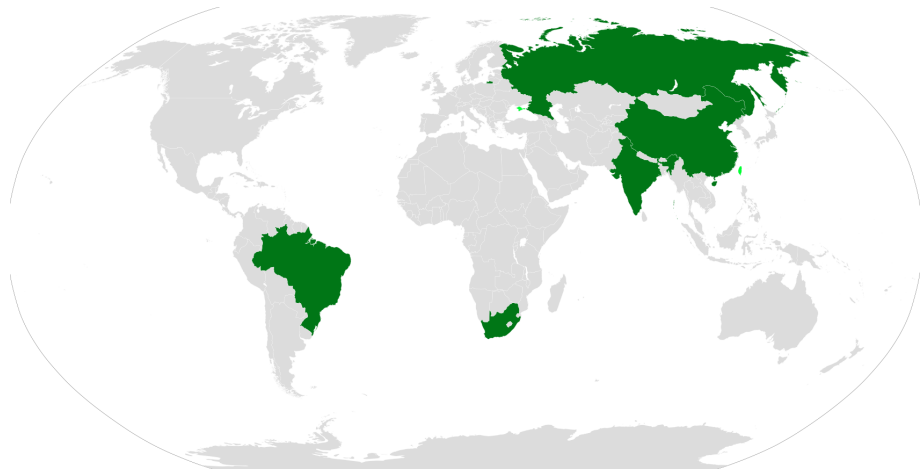
My main claim

The countries grouped together are somehow similar, but not similar enough to warrant treating them as the same.

Question for You 2

How would you go about defending my claim above? Discuss.

BRICS 1: Geography



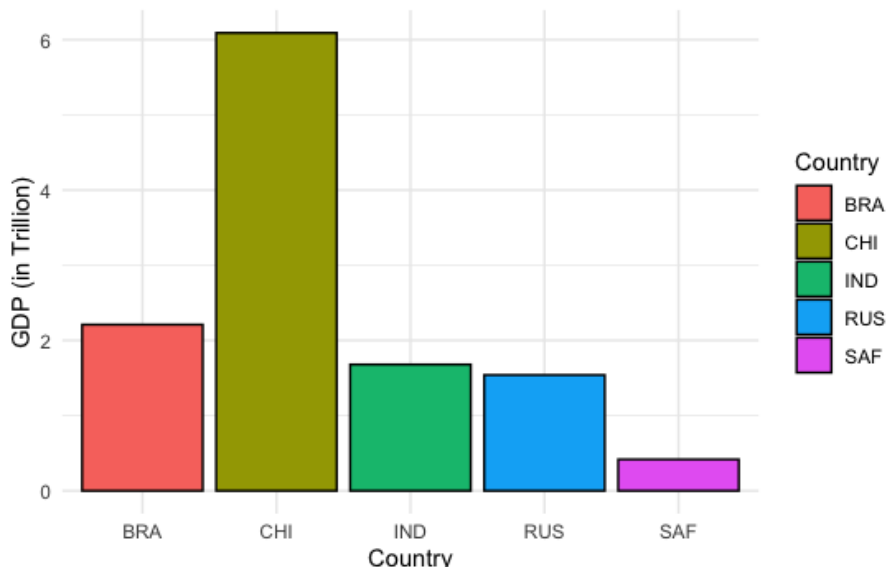
BRICS 2: Economy and Politics in Table

Table: 1 BRICS Comparison (2010)

	BRA	RUS	IND	CHI	SAF
GDP (in trillion)	2.21	1.54	1.68	6.09	0.417
GDP per capita (PPP)	14,254	20,490	4,215	9,254	12,771
Exports (as % GDP)	10.9	29.2	22.4	27.2	25.8
Capital Account (Chinn-Ito)	0.48	0.54	0.16	0.16	0.16
Polity Score (-10, 10)	8	4	9	-7	9

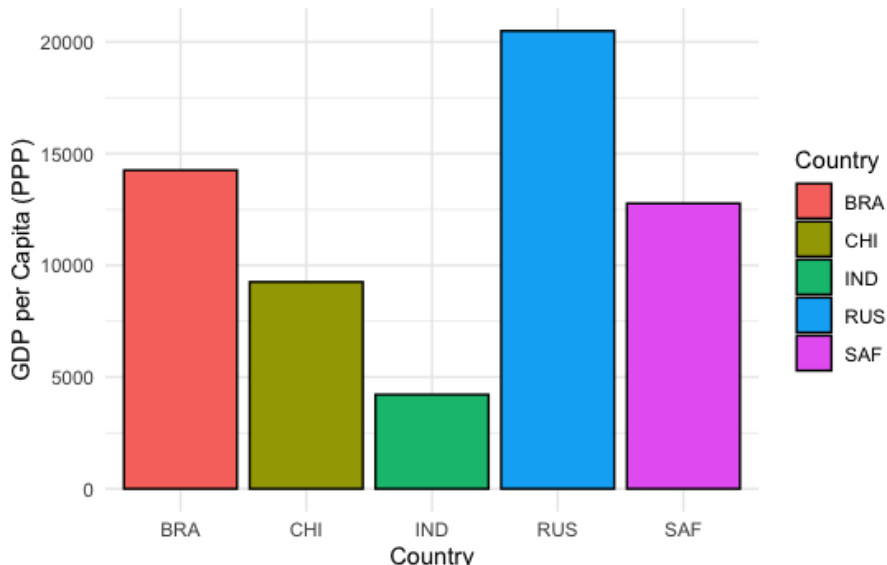
BRICS 3: Economy and Politics in Figure 1

GDP Distribution Across BRICS (2010)

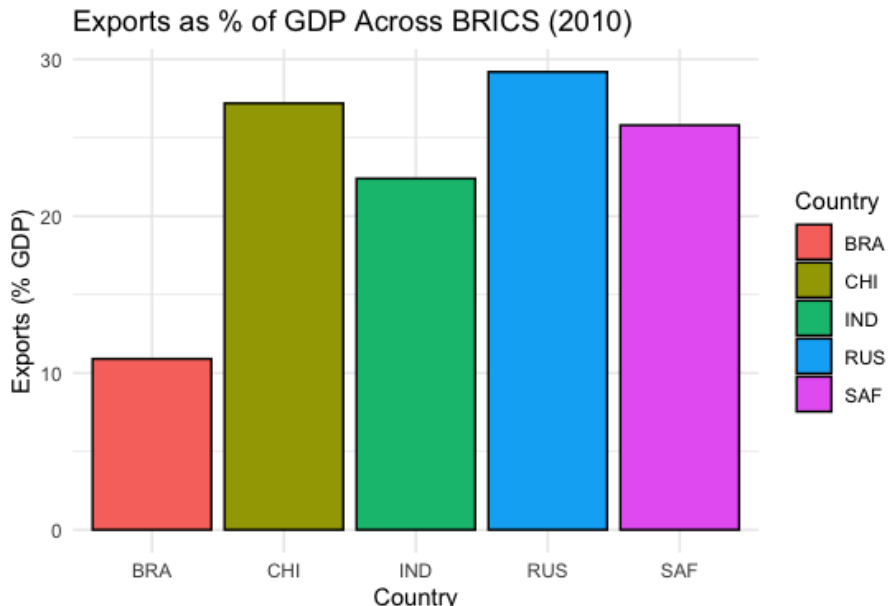


BRICS 4: Economy and Politics in Figure 2

GDP per Capita (PPP) Across BRICS (2010)

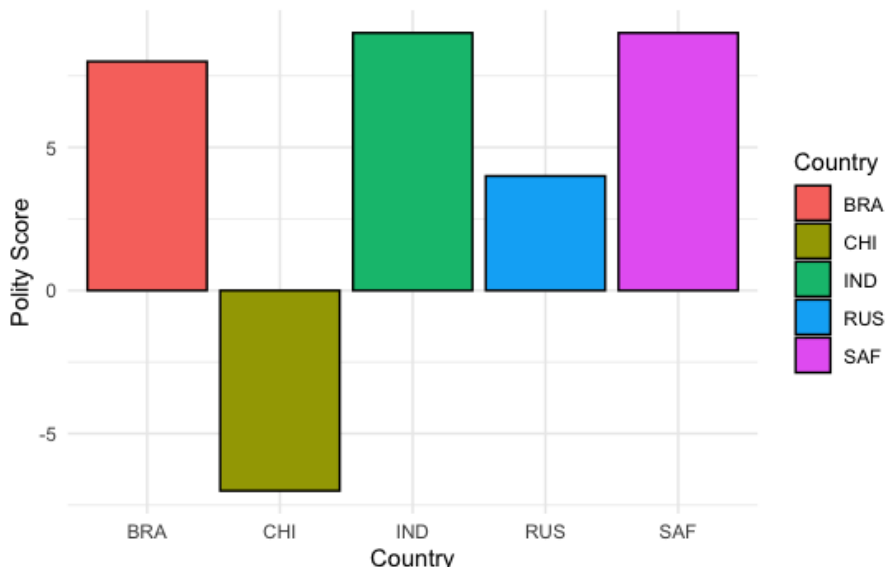


BRICS 5: Economy and Politics in Figure 3



BRICS 6: Economy and Politics in Figure 4

Polity Score Distribution Across BRICS (2010)

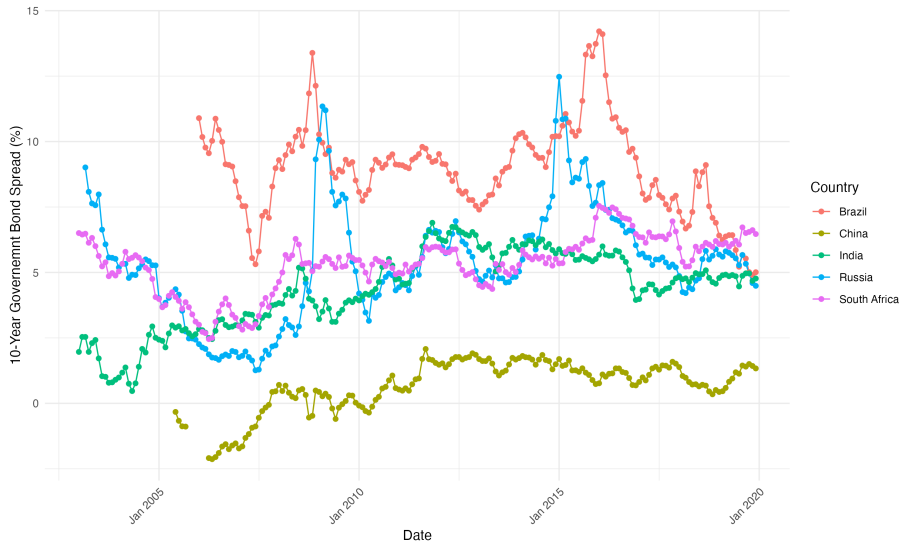


Source Code for the Polity (Democracy scores) graph

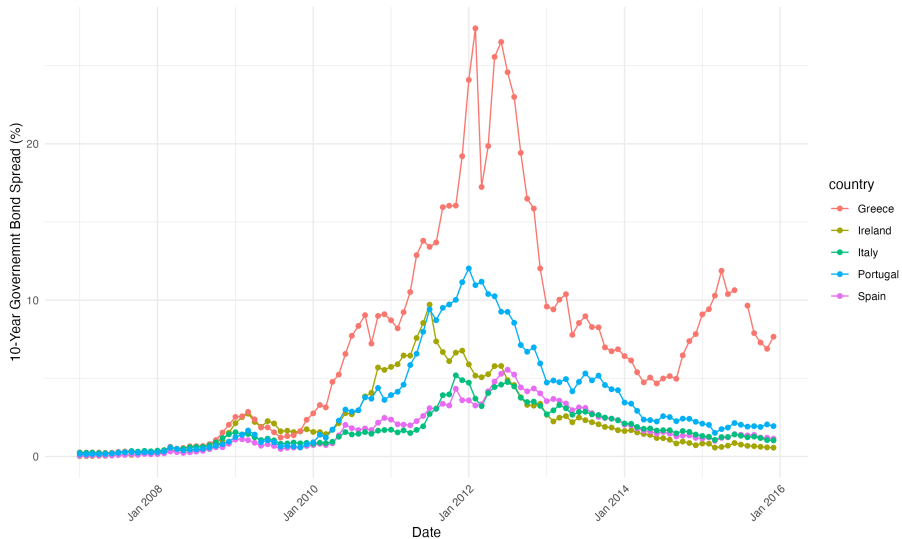
```
# Create the plot
ggplot(brics_data, aes(x = Country, y = Polity_Score, fill =
  Country)) +
# Identity = use the actual values (not transformed). Black
  is for the bars containing the rectangles.
geom_bar(stat = "identity", color = "black") +
labs(title = "Polity Score Distribution Across BRICS
  (2010)",
  x = "Country", y = "Polity Score") +
theme_minimal()
```

The above figures are good for a presentation but may be too much in a paper (for this reason, I present them in a table). Nevertheless, I would like to show some graphs in the paper. I decided to focus on one financial variable, the long-term spreads of the interest rates of sovereign bonds. This choice has an added benefit: it introduces the concepts of sovereign bond spreads (country interest rate - US interest rate) and sovereign bond markets. The spread will be the dependent variable in my models.

BRICS: Reputation in Financial Markets



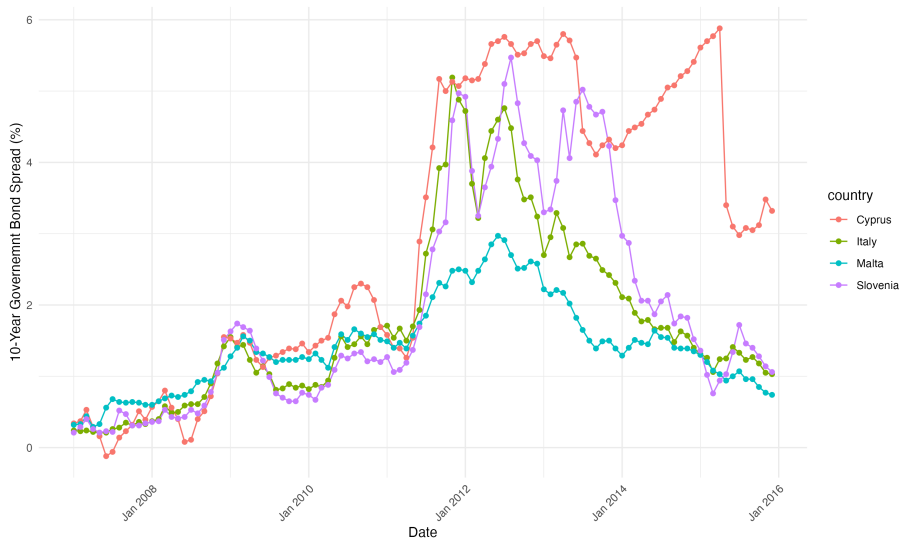
PIIGS: Reputation in Financial Markets



Problem?

PROBLEM: Wait, are we sure that the PIIGS figure conveys the message that Portugal, Ireland, Italy, Spain, and Greece are different one from another?!?

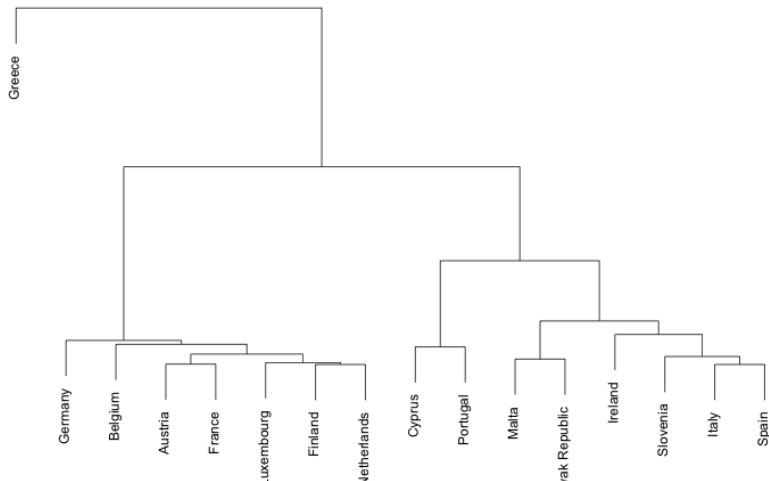
PIIGS: Reputation in Financial Markets 2



Source Code for the Polity (Democracy scores) graph

```
# Create the ggplot
eurozone_VS_ita <- ggplot(df_selected, aes(x = date, y =
  spread, color = country)) +
  geom_line() + # Line plot
  geom_point() + # Points on the line
  labs(
    #title = "Value Over Time for Selected Countries",
    x = "Date",
    y = "10-Year Governemnt Bond Spread (%)",
    color = "Country"
  ) +
  theme_minimal() + # Minimal theme
  scale_x_date(date_labels = "%b %Y") + # Formatting the x-
    axis date labels
  theme(
    axis.text.x = element_text(angle = 45, hjust = 1) #
      Rotate x-axis labels
  )
)
```

PIIGS: Reputation in Financial Markets 3: Hierarchical Clustering



Which country would lose or gain the most from being associated with the other country via the acronyms PIIGS/BRICS? The logic of the argument suggests that it depends on the country's prior reputation. The worse the reputation, the greater the benefits from being associated with a positive investment group (BRICS). The better the reputation, the greater the losses from being associated with a negative investment group (PIIGS).

Country heterogeneity: BRICS Table

Table: Country by Country Fiscal Capacity (2004-2020 Average), Number of Defaults and Credit Rating Scores (prior to 2004 or 2010)

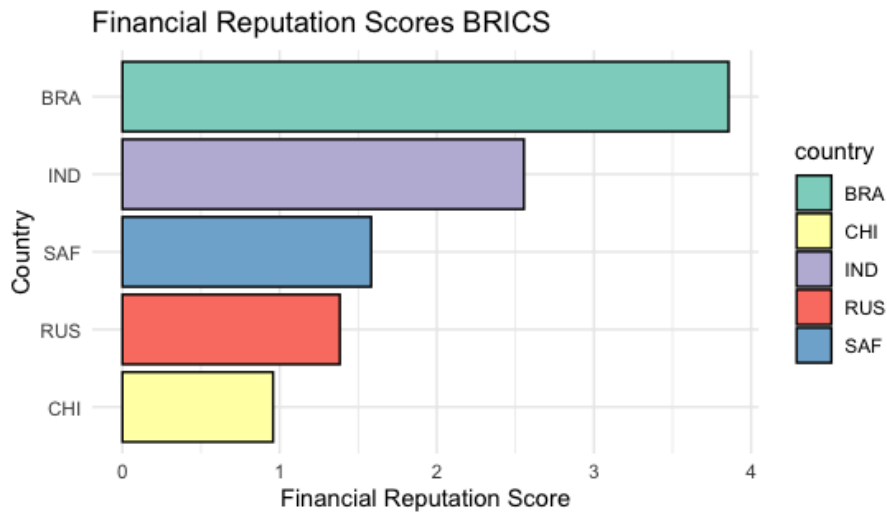
	BRA	RUS	IND	CHI	SAF
Debt-to-GDP Ratio	62.67	12.29	71.11	39.26	45.00
Budget-to-GDP Ratio	-5.14	0.84	-4.63	-2.15	-3.91
Defaults	5	4	0	0	1
Fitch Credit Rating Score	7.25	10.48	10.04	15	14.75

Country heterogeneity: PIIGS Table

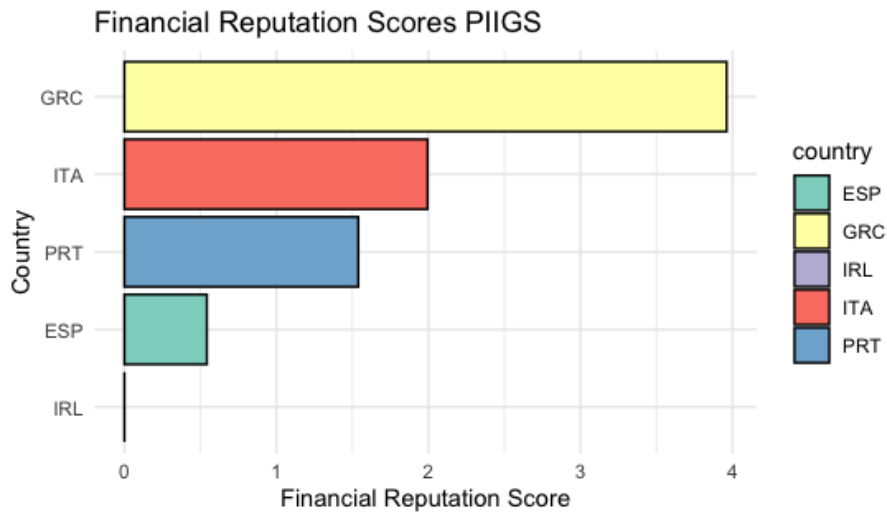
Table: Country by Country Fiscal Capacity (pre-2009 Average), Spread and Credit Rating Scores (prior to 2002)

	PRT	ITA	IRL	GRC	ESP
Debt-to-GDP Ratio	65.0	108.0	31.0	105.0	46.7
Budget-to-GDP Ratio	-4.61	-3.05	-0.04	-7.14	-0.09
10 Year gov Spread	1.68	2.02	0.65	6.32	1.64
Fitch Credit Rating Score	18.5	18.1	20.4	13.4	19.3

Country heterogeneity: BRICS Figure



Country heterogeneity: PIIGS Figure



Measuring reputational transfer via *negative* search strategy

The goal: no direct informational content about the target country, while allowing for *implicit association* with other countries via the acronym.

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atleast2 "BRICS/PIIGS" or atleast2 "BRIC" +

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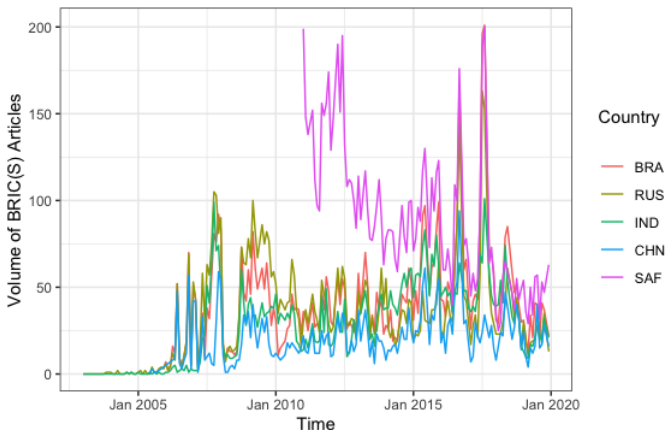
atleast2 "BRICS/PIIGS" or atleast2 "BRIC" +
not "Target Country Noun" **not** "Target Country Adjective" **not** "Target Country Population" +

Measuring reputational transfer via *negative* search strategy

The goal: no direct informational content about the target country, while allowing for *implicit association* with other countries via the acronym.

atleast2 "BRICS/PIIGS" or atleast2 "BRIC" +
not "Target Country Noun" **not** "Target Country Adjective" **not** "Target Country Population" +
and ("Other Country 1" or "Other Country 2" or "Other Country 3" or "Other Country 4")

Figure: 2 The BRICS Articles Series from the 'Negative' Search Strategy



Not important but happy to talk about it.

Dependent variable: 10-year Sovereign bond spreads.

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Independent variable: Volume of articles as defined above.

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Dependent variable: 10-year Sovereign bond spreads.

Independent variable: Volume of articles as defined above.

Control variables: a bunch.

Dependent variable: IMF, OECD, Eurostat

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Independent variable: Factiva and Lexis Nexis

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Independent variable: Factiva and Lexis Nexis

Control variables: Database of Political Institutions; World Bank; IMF.

Figure: Linear Fixed Effects Models - Coefficient Plot (BRICS)

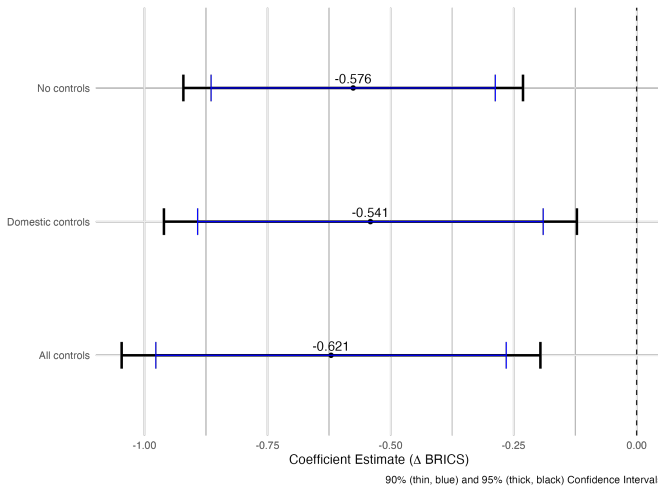
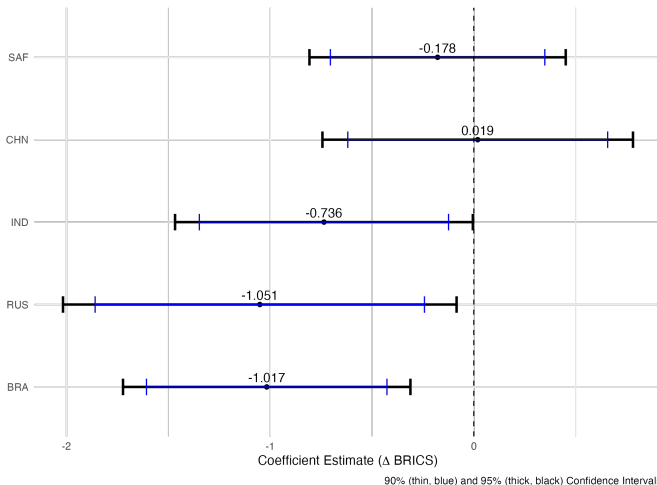


Figure: Individual BRICS - Coefficient Plot



Source Code for the Individual BRICS Coefficient Plot (c'ed)

```
# Create a data frame based on your LaTeX table data
coef_data <- data.frame(
  model = factor(c("BRA", "RUS", "IND", "CHN", "SAF"),
    levels = c("BRA", "RUS", "IND", "CHN", "SAF")),
  estimate = c(-1.017, -1.051, -0.736, 0.019, -0.178),
  std_error = c(0.360, 0.493, 0.373, 0.389, 0.321)
)
# Calculate 90% and 95% confidence intervals
coef_data <- coef_data %>%
  mutate(lower_90 = estimate - 1.64 * std_error,
    upper_90 = estimate + 1.64 * std_error,
    lower_95 = estimate - 1.96 * std_error,
    upper_95 = estimate + 1.96 * std_error)
```

Source Code for the Individual BRICS Coefficient Plot

```
# Plotting the coefficient estimates with both 90% and 95%
  confidence intervals
ggplot(coef_data, aes(x = estimate, y = model)) +
  geom_point() +
  # 95% CI with thicker line
  geom_errorbarh(aes(xmin = lower_95, xmax = upper_95),
    height = 0.2, size = 1) +
  # 90% CI with thinner line and color
  geom_errorbarh(aes(xmin = lower_90, xmax = upper_90),
    height = 0.2, size = 0.5, color = "blue") +
  # Adds dashed vertical line at x = 0
  geom_vline(xintercept = 0, linetype = "dashed", color = "
    black") +
  geom_text(aes(label = round(estimate, 3)), vjust = -0.5) +
```


Source Code for the Individual BRICS Coefficient Plot

```
# Plotting the coefficient estimates with both 90% and 95%
  confidence intervals
# Last line previous slide
geom_text(aes(label = round(estimate, 3)), vjust = -0.5) +
  # Adds coefficient values above the points
  labs(
    x = expression("Coefficient Estimate (" * Delta * "
      BRICS)"),
    y = "",
    title = "",
    caption = "90% (thin, blue) and 95% (thick, black)
      Confidence Intervals"
  ) +
  theme_minimal()
```

Figure: Orthogonalized Impulse response Function (All PIIGS)

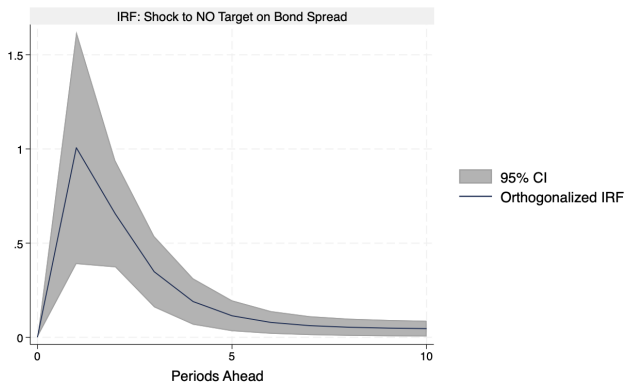
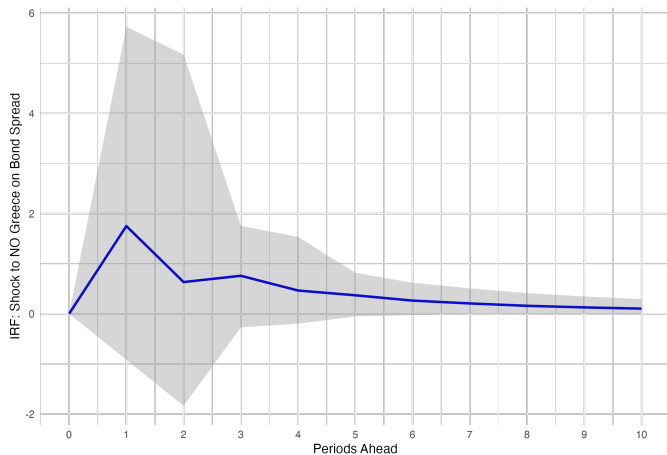
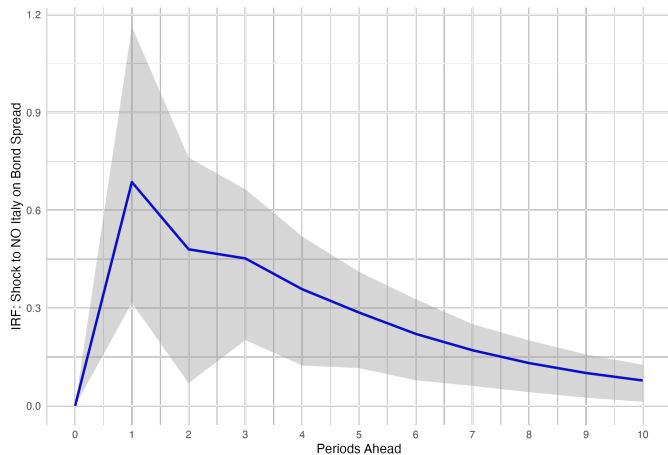


Figure: Orthogonalized Impulse response Function (Greece)



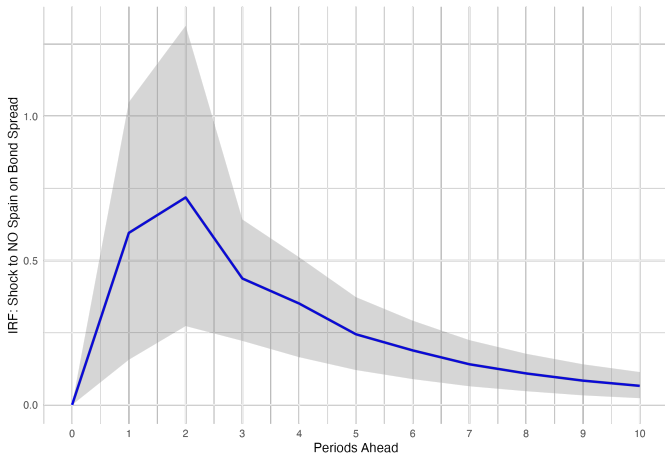
Note: 95% Bootstrap CI, 1000 runs.

Figure: Orthogonalized Impulse response Function (Italy)



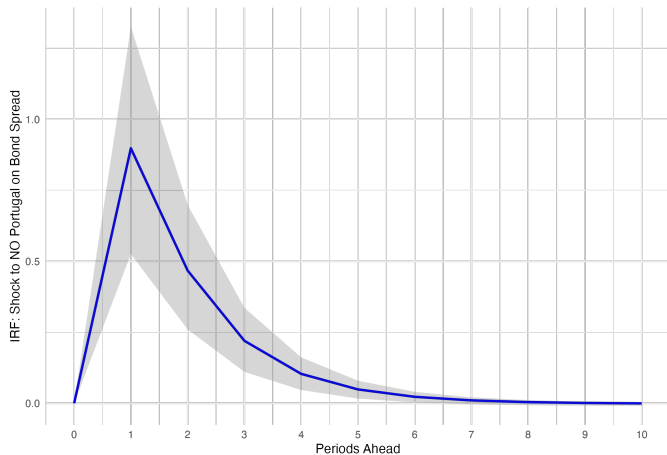
Note: 95% Bootstrap CI, 1000 runs.

Figure: Orthogonalized Impulse response Function (Spain)



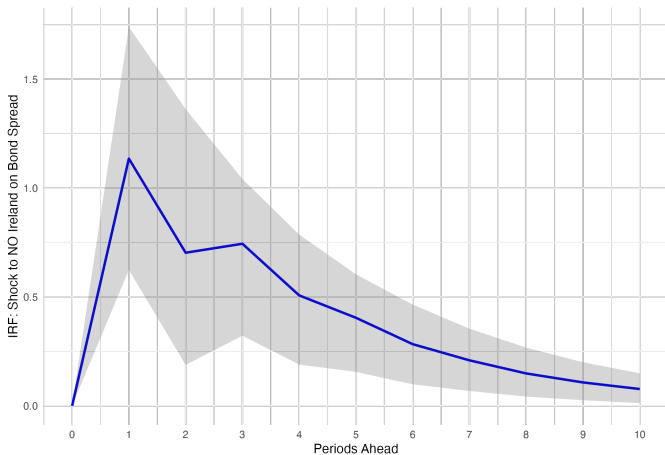
Note: 95% Bootstrap CI, 1000 runs.

Figure: Orthogonalized Impulse response Function (Portugal)



Note: 95% Bootstrap CI, 1000 runs.

Figure: Orthogonalized Impulse response Function (Ireland)



Note: 95% Bootstrap CI, 1000 runs.

Take away and contribution

- A novel channel through which countries gain or lose reputation.

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- Reputational transfer even in the cases of well-known countries.

Take away and contribution

- A novel channel through which countries gain or lose reputation.
- Reputational transfer even in the cases of well-known countries.
- A novel strategy to measure reputational transfer.

Dissertation Overview: Media Frames and Financial Markets

- Media moral frames, reputation, the PIIGS and the European Sovereign Bond Crises.

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THANK YOU!