When and Where Is It Cheaper to Issue Inflation-linked Debt?

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Inflation-linked Debt: Example

- Suppose you hold a 2 year 2% coupon inflation-linked bond with \$1,000 principal
- Inflation in year 1 is 1%
- Inflation in year 2 is 3%
- Cash flows:
  - Year 1: Without inflation, coupon would be $\$1000 \times 0.02 = \$20$, but as there was 1% inflation, you will receive $\$20 \times (1 + 0.01) = \$20.20$
  - Year 2: Without inflation, coupon would be $\$1000 \times 0.02 = \$20$ and principal would be \$1,000, so you would receive \$1,020, but as inflation over 2 years is $(1 + 0.01) \times (1 + 0.03)$, you will receive $\$1,020 \times (1 + 0.01) \times (1 + 0.03) = \$1,061.11$

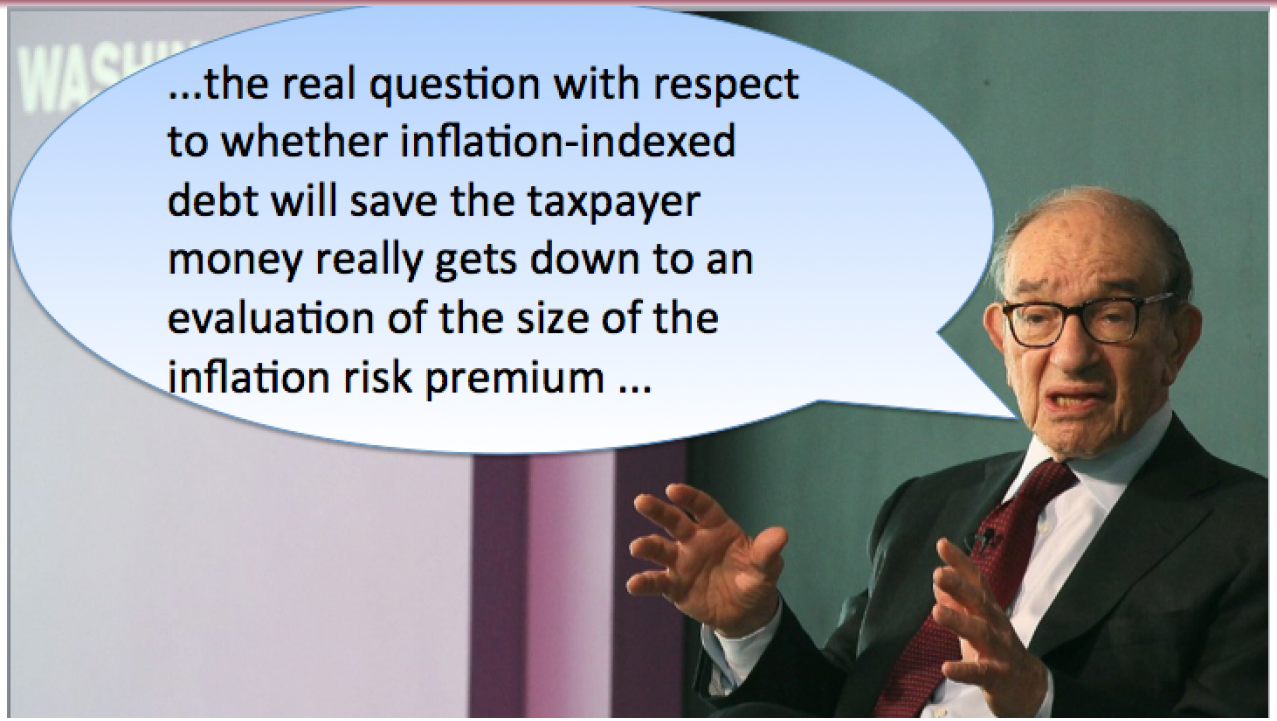
Inflation-linked Government Bonds in Developed Countries (end of 2019)

Country	Inception Year	Market Value (USD billion)	Inflation-linked/nominal debt
Australia	1985	26	7%
Canada	1991	39	10%
France	1998	254	15%
Germany	2006	81	7%
Japan	2004	100	2%
Korea	2007	8	1%
Sweden	1994	21	34%
UK	1981	596	39%
US	1997	1507	11%

Research Questions

- What kind of debt should countries issue?
- Which economic factors determine the choice between inflation-linked and nominal debt and explain the cross-country variation?
- **Issuance costs are an important factor**

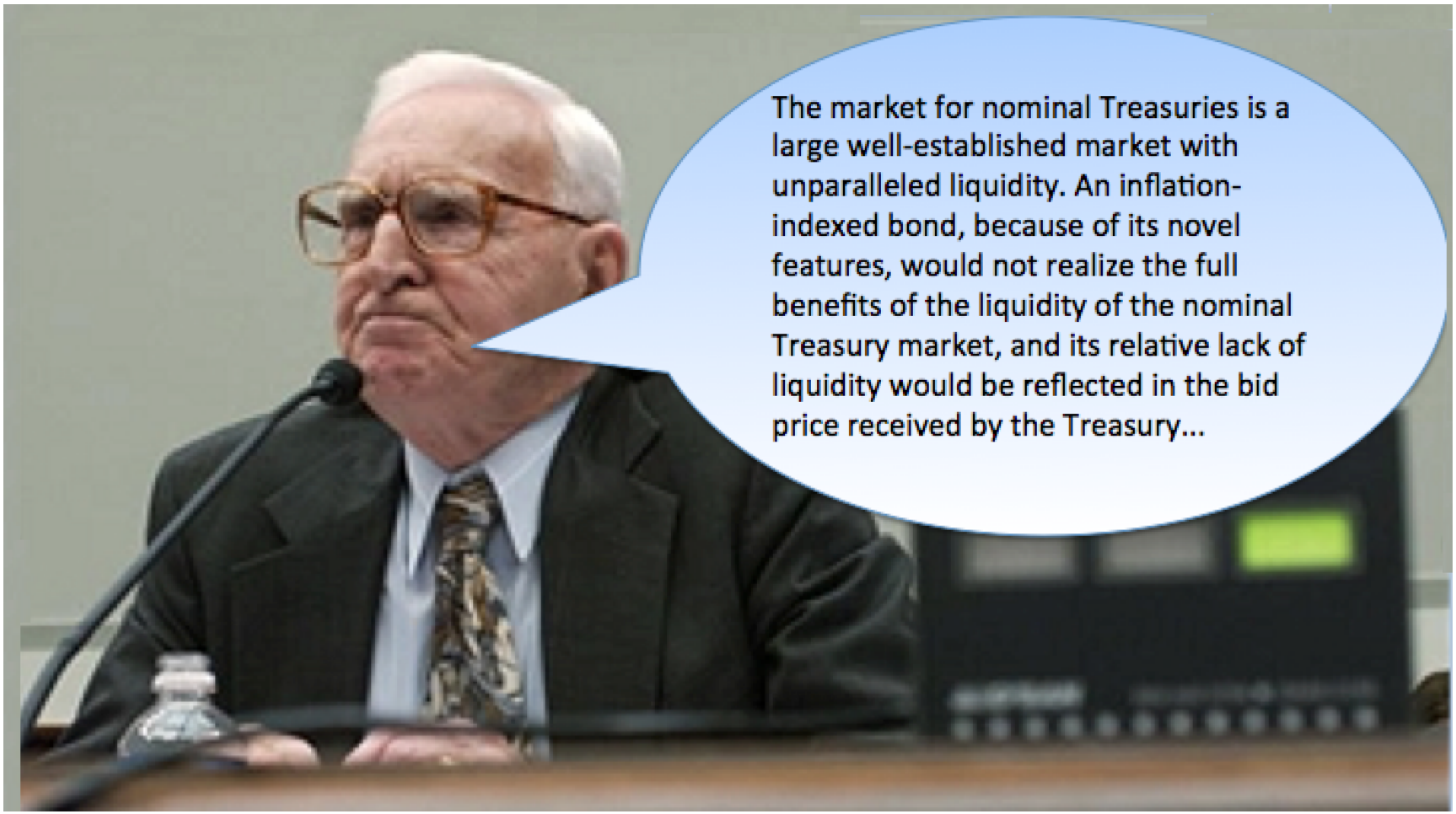
Nominal Debt Cost: Inflation Risk Premium



Alan Greenspan, Chairman of the Federal Reserve Board, "Inflation Indexing of Government Securities", a hearing before the Subcommittee on Trade, Productivity, and Economic Growth of the Joint Economic Committee

- Inflation risk premium=compensation for inflation being correlated with real stochastic discount factor

Inflation-linked Debt Cost: Liquidity premium



Francis X. Cavanaugh, Director, Office of the Secretary of the Treasury, "Inflation Indexing of Government Securities", a hearing before the Subcommittee on Trade, Productivity, and Economic Growth of the Joint Economic Committee

Why Do Issuance Costs Matter?

- Redistribution between domestic borrowers and foreign investors (e.g., Campbell and Shiller, 1996)
- Even domestically borrowers and lenders often represent different socioeconomic groups (Bilbiie et al., 2013); income inequality implications (e.g., Anselmann and Krämer, 2017, or Arbogast, 2020)
- Cost of market-based inflation expectations

This Paper

- The most comprehensive academic study is Christensen and Gillan (2012): 5 year US bonds 2004-2010
- My paper:
  - Longer maturities: large market size + theoretically, inflation risk premium should increase with maturity (e.g., Gabaix, 2012)
  - International cross-section and -2019 sample $\Rightarrow$ economic factors behind cross-country and time series variation

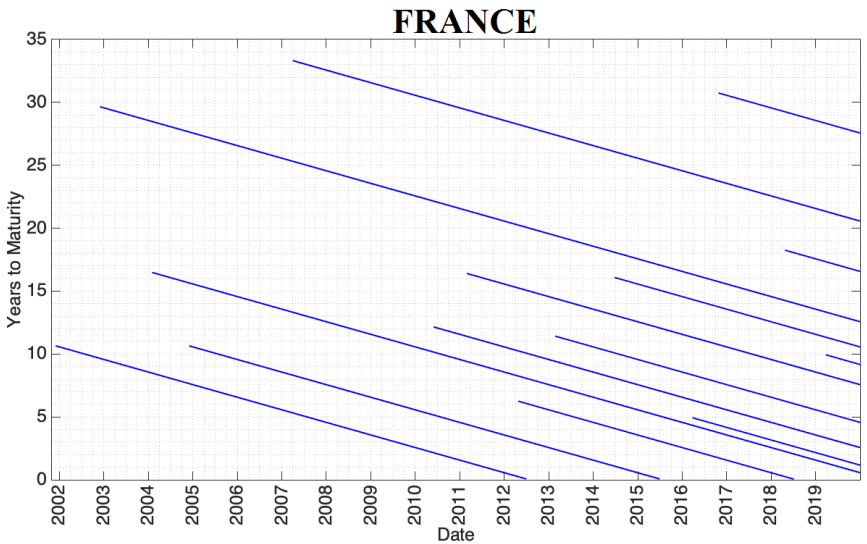
Methodology

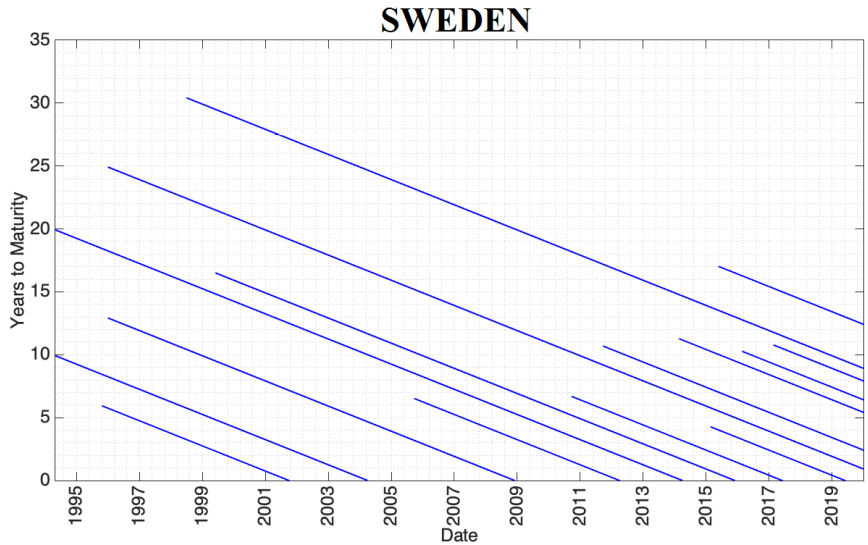
- $y_{n,t}^{\text{inflation-linked}} = y_{n,t}^{\text{real}} + y_{n,t}^{\text{liquidity premium}}$
- $\Rightarrow y_{n,t}^{\text{liquidity premium}} = y_{n,t}^{\text{inflation-linked}} - y_{n,t}^{\text{real}}$
- $y_{n,t}^{\text{nominal}} = y_{n,t}^{\text{real}} + y_{n,t}^{\text{expected inflation}} + y_{n,t}^{\text{inflation risk premium}}$
- $\Rightarrow y_{n,t}^{\text{inflation risk premium}} = y_{n,t}^{\text{nominal}} - y_{n,t}^{\text{real}} - y_{n,t}^{\text{expected inflation}}$
- $\Rightarrow y_{n,t}^{\textbf{inflation risk premium}} - y_{n,t}^{\textbf{liquidity premium}} = y_{n,t}^{\textbf{nominal}} - y_{n,t}^{\textbf{expected inflation}} - y_{n,t}^{\textbf{inflation-linked}}$

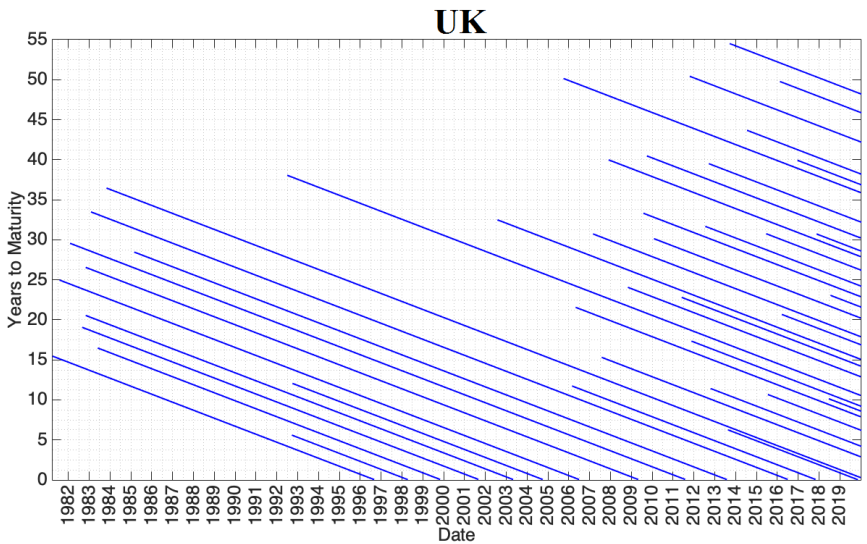
Data

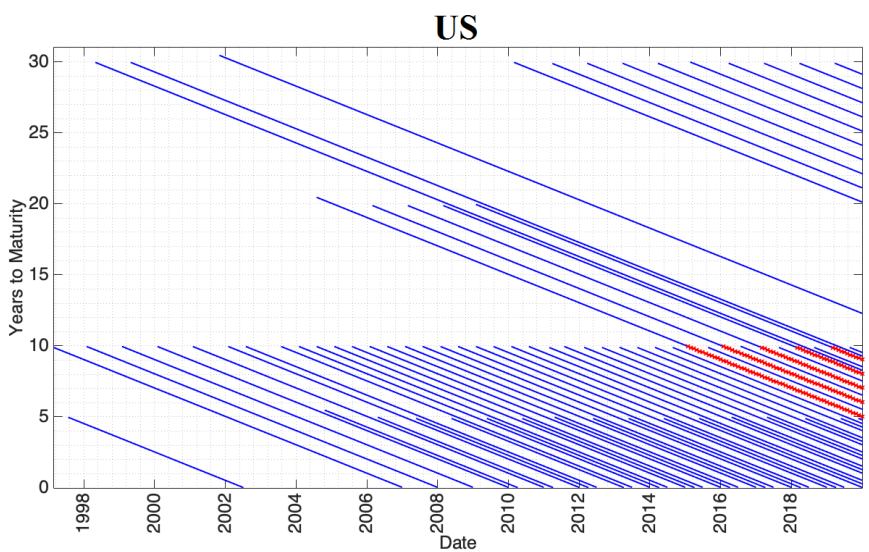
- Nominal yields: central banks
- Expected inflation: survey inflation expectations (=best out-of-sample inflation predictors, e.g., Ang et.al., 2008)
- Inflation-linked yields:
  - Inflation-linked bond prices from Bloomberg
  - Estimate zero-coupon yields assuming a flexible functional form (Nelson and Siegel, 1987) $\Rightarrow$ **dataset of international inflation-linked zero-coupon yields available**

Availability of Inflation-linked Bonds 1/2

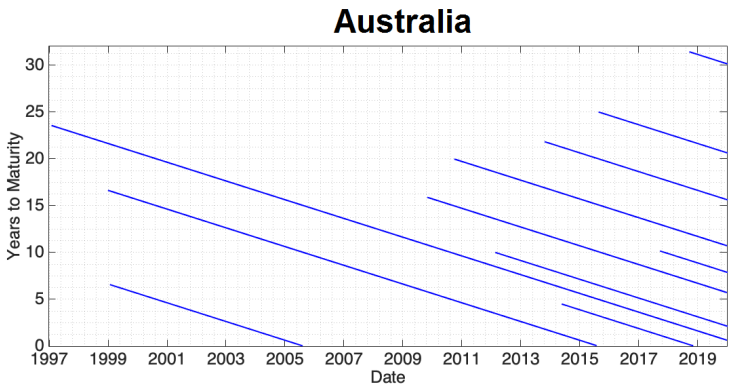


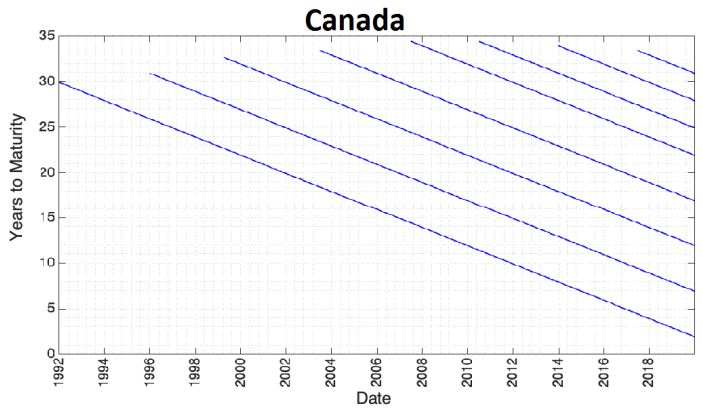


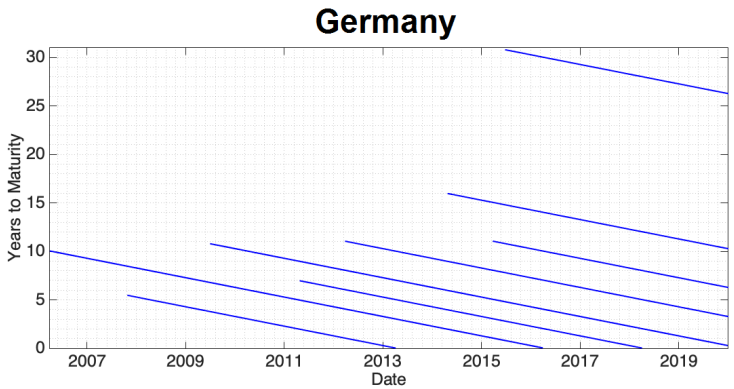


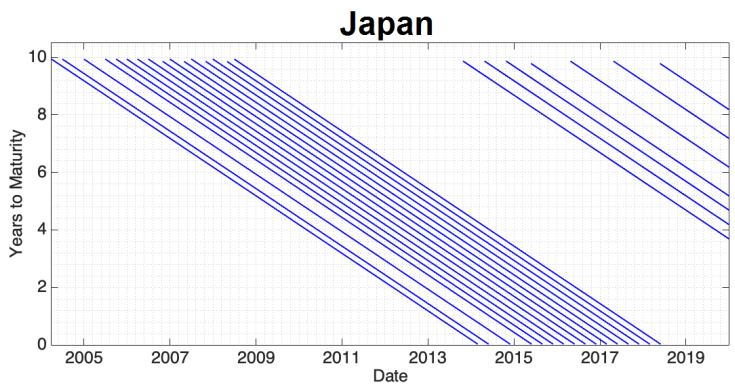


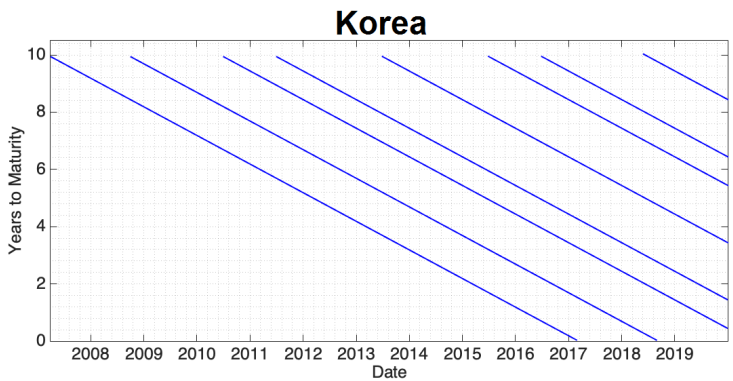
Availability of Inflation-linked Bonds 2/2











Unconditional Analysis: Theoretical Motivation

- Theoretically, most macro finance models predict that inflation risk premium is increasing with maturity (e.g., Wachter, 2006, Gabaix, 2012, Bansal and Shaliastovich, 2013)

- E.g., in Bansal and Shaliastovich (2013) expected consumption and inflation are persistent and on average negatively correlated: longer-term nominal bonds are riskier, because their prices will be lower through recessions

Unconditional Analysis

Annualized differences between inflation risk premium and liquidity premium

Maturity	5 year	10 year	15 year
France	-0.27%**	0.00%	0.17%*
	(0.11%)	(0.10%)	(0.09)
Sweden	-0.39%***	-0.11%	-0.01%
	(0.09%)	(0.12%)	(0.06%)
UK	-0.29%**	-0.01%	0.27%*
	(0.13%)	(0.12%)	(0.15%)
US	-0.42%***	-0.09%	0.03%
	(0.11%)	(0.08%)	(0.09%)

Unconditional Analysis: Long Maturities

Annualized differences between inflation risk premium and liquidity premium

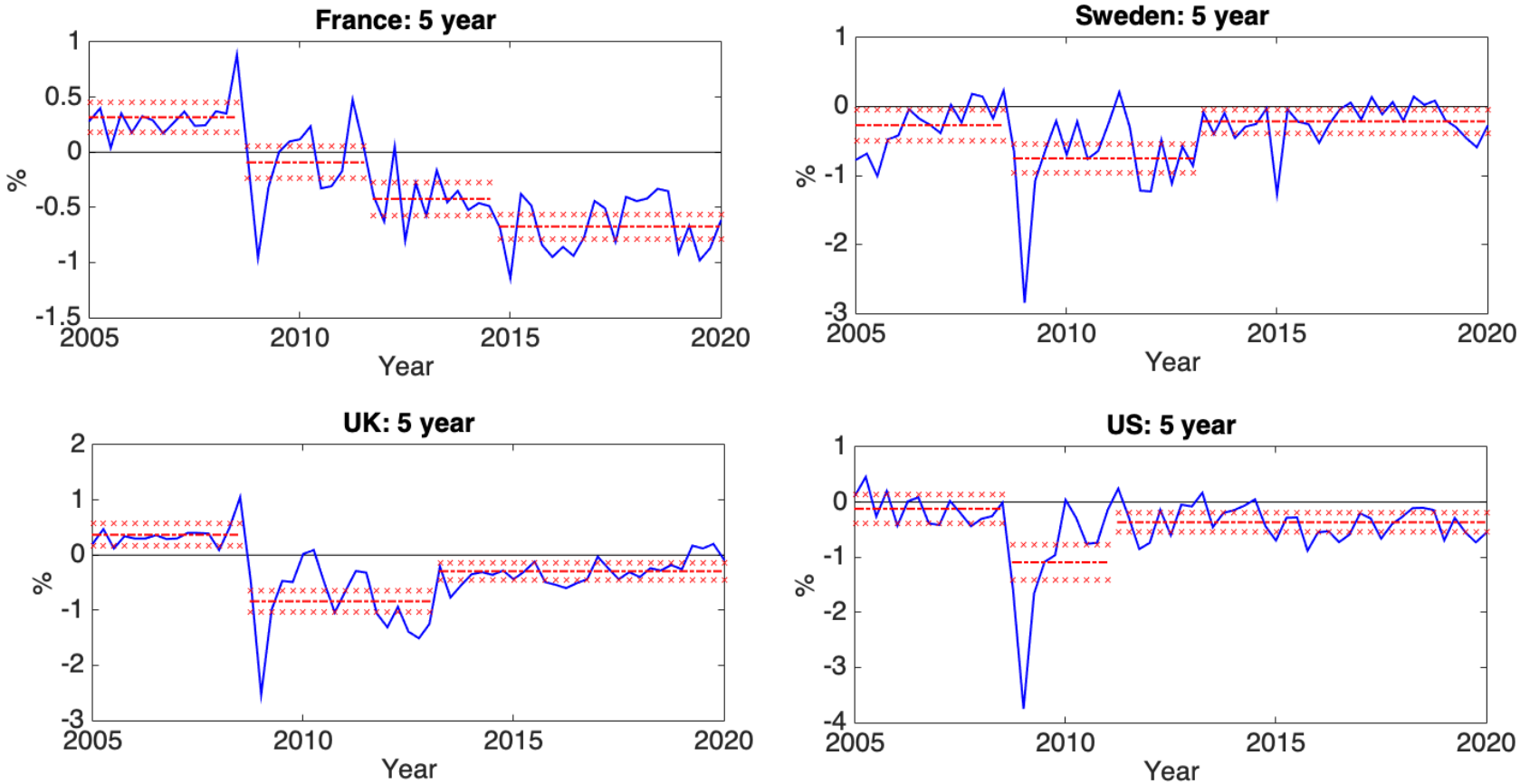
Maturity	20 year	25 year	30 year
Canada	0.23%**	0.18%*	0.16%
	(0.11%)	(0.11%)	(0.10%)
France	0.24%**	0.30%***	
	(0.10%)	(0.10%)	
UK	0.44%***	0.52%***	0.89%***
	(0.07%)	(0.06%)	(0.07%)
US	0.09%	0.14%*	0.23%***
	(0.10%)	(0.09%)	(0.08%)

Unconditional Analysis: Economic Significance

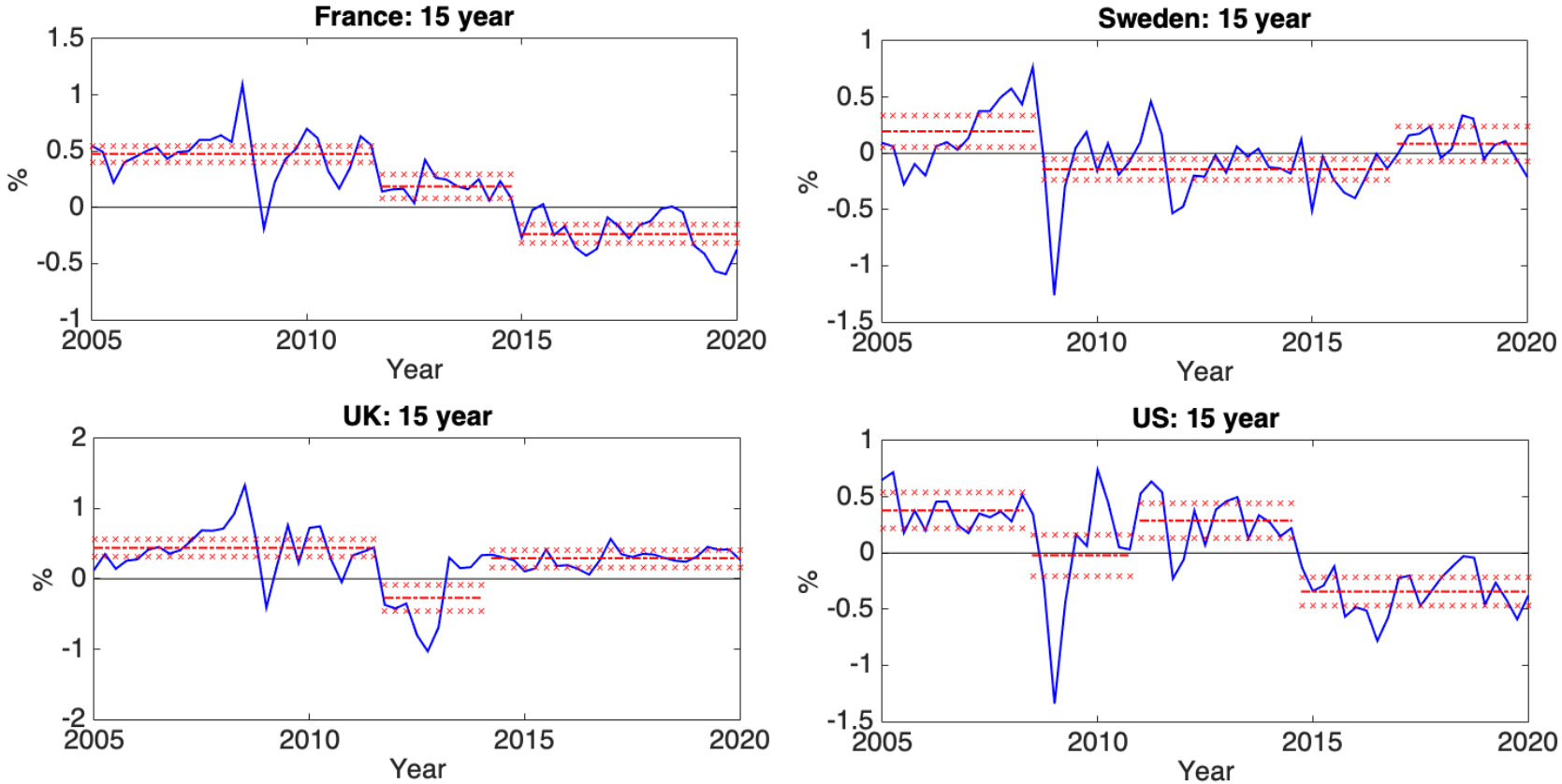
- Back-of-the-envelope US calculation: net long-term bond issuance $502 billion in 2020
- 5 year annualized difference of -0.42% $\Rightarrow$ 210 basis points difference at issuance
- 2.1% $\times$ $502 billion = $10.5 billion

Unconditional Analysis: Economic Significance

Time Series: 5 Year Bonds



Time Series: 15 Year Bonds



Issuance Costs and Economic Factors

- Which factors are driving time and cross-country variation in issuance costs?
- Theory suggests:
  - Consumption growth-inflation covariance: investors require higher inflation risk premium if inflation is more counter-cyclical (e.g., Piazzesi and Schneider, 2006)
  - Time since inception of inflation-linked debt and ratio of outstanding inflation-linked debt to total outstanding debt (search frictions, as, e.g., in Duffie et al., 2005)

Issuance Costs and Economic Factors

Panel Regression 2004Q4-2019Q4
5 year inflation risk premium-liquidity premium
France, Sweden, UK, US

	Specification 1	Specification 2	Specification 3	Specification 4
Consumption growth-inflation covariance	-1.10***	-1.01**		
	(0.42)	(0.39)		
Log(share of inflation-linked debt)	0.20**		0.13	
	(0.09)		(0.12)	
Log(quarters since inception of inflation-linked debt)	0.00			0.03
	(0.10)			(0.11)
Adjusted R^2	11.48%***	9.23%	0.92%	0.06%

Conclusion

- Comparison of inflation-linked versus nominal government debt issuance costs in developed countries
- Substantial time, cross-country and -maturity variation
- On average cheaper to issue nominal bonds at shorter maturities and inflation-linked bonds at longer maturities
- Lower inflation-linked debt issuance costs associated with more counter-cyclical inflation and higher proportions of inflation-linked debt
- **Data on international zero-coupon inflation-linked yields available!**