When do Treasuries Earn the Convenience Yield? — A Hedging Perspective

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The Hedging Perspective of the Convenience Yield

- Broad recognition that Treasury yields price in some degree of benefits beyond the promised cash-flows: safety, liquidity, collateral use—the *convenience yield*.
  - Other terms: safety premium, exorbitant privilege, bubble.

Treasury Convenience Yield

- **One proxy for Treasury convenience: the TIPS-Treasury premium (Fleckenstein, Longstaff and Lustig (2014)).**

	mean	p5	p50	p95	sd
Prem. 10y	0.26	0.07	0.25	0.41	0.15

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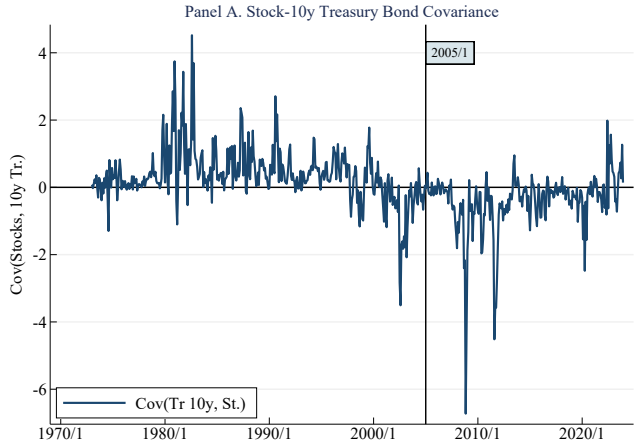
- Theoretical literature: often assumes safety and/or preference for money-like assets in the utility function.
  - Examples: Holmström and Tirole (2001), Krishnamurthy and Vissing-Jorgensen (2012).

- **Main claim here: Treasury convenience yield consistent with the "hedging perspective" of safe assets.**
  - Acharya and Pedersen (2005) meets Brunnermeier, Merkel and Sannikov (2022).

The Stock-Bond Covariance



Stock ret.: CRSP VW Market Port. Bond ret.: 10-year rate from Gürkaynak et al. (2007). 30 trading day lookback window; use the sum of last three daily returns, divided by $\sqrt{3}$.

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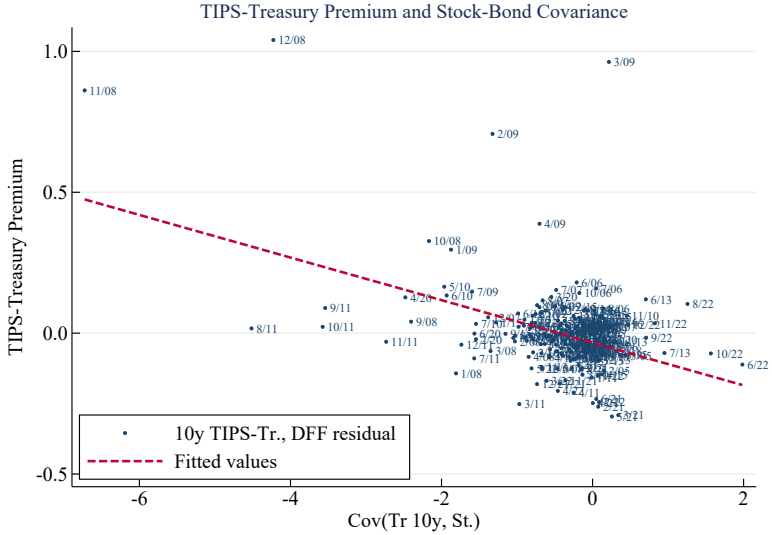
- **Our finding: the covariance of Treasury and stock returns explains a substantial portion of time-series variation in the convenience yield.**

$$\text{Convenience Yield}_t \cong -\Lambda \, \text{Cov}_t \left(r_{t+1}, r^M_{t+1} \right).$$

Stock-Bond Covariance and Treasury Convenience



Today's Talk

1. **A new decomposition of the stock-bond covariance.**
   - The convenience yield contributes materially to the aggregate stock-bond covariance.

2. Stock-bond covariance and the convenience yield.
   - Periods when the stock-bond covariance is low—bonds are a good hedge—see higher convenience yields.
   - Short vs. long maturity convenience yields.
   - Alternatives: corporates, foreign safe assets.

3. Drivers of the convenience yield:
   - Inflation dynamics.
   - Treasury supply.
   - Default risk.

Decomposition of the Stock-Bond Covariance

- Goal: quantify the contribution of the convenience yield on the stock-bond covariance.
- **Define the TIPS-Treasury premium following Fleckenstein et al. (2014).** Construct a "synthetic" nominal Treasury out of TIPS and traded inflation swaps:

$$\begin{aligned}\text{Premium}_{n,t} =& \text{TIPS Yield}_{n,t} + \text{Inflation Swap}_{n,t} - \text{Treasury Yield}_{n,t} \\ =& \text{Synthetic Treasury Yield}_{n,t} \quad - \text{Treasury Yield}_{n,t},\end{aligned}$$

- Implies a return decomposition of the maturity n yield at time t:

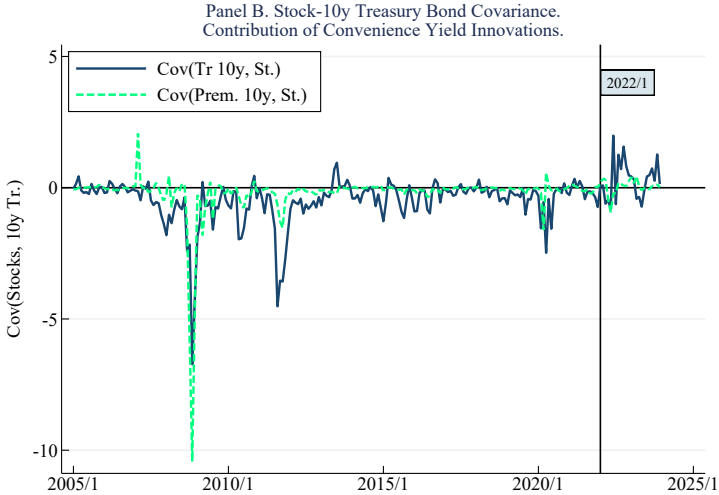
$$\text{Yield}_{t,n} = \text{Risk-free}_{t,n} + \text{CDS}_{t,n} - \text{Premium}_{t,n}.$$

- **The yield decomposition allows to decompose the stock-bond covariance:**

$$\text{Cov}(\text{Yield}, \text{Stocks}) = \text{Cov}(\text{Risk-free}, \text{St.}) + \text{Cov}(\text{CDS}, \text{St.}) - \text{Cov}(\text{Premium}, \text{Stocks}).$$

Decomposition of the Stock-Bond Covariance

- Conditional stock-bond covariance, and the contribution of the convenience yield.



Decomposition of the Stock-Bond Covariance

- **Covariance terms corresponding to frictionless risk-free rate and the convenience yield are of comparable magnitude and volatility:**

	mean	p1	p10	p50	p90	p99	sd	count
Cov(Tr 10y, St.)	-0.42	-4.23	-1.28	-0.23	0.26	1.27	0.89	228
Cov(Prem. 10y, St.)	-0.19	-4.63	-0.31	-0.05	0.08	0.44	0.90	228
Cov(Rf 10y, St.)	-0.29	-3.26	-0.95	-0.18	0.29	2.20	0.80	228
Cov(CDS 10y, St.)	0.06	-0.12	-0.02	0.00	0.18	0.94	0.18	228

- **Both the convenience yield and risk-free component are positively correlated with the aggregate stock-bond covariance:**

	Cov(Tr 10y, St.)	Cov(Prem. 10y, St.)	Cov(Rf 10y, St.)	Cov(CDS 10y, St.)
Cov(Tr 10y, St.)	1.000			
Cov(Prem. 10y, St.)	0.644***	1.000		
Cov(Rf 10y, St.)	0.431***	-0.391***	1.000	
Cov(CDS 10y, St.)	-0.192***	-0.074	-0.354***	1.000

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2. **Stock-bond covariance and the convenience yield.**
   - Periods when the stock-bond covariance is low—bonds are a good hedge—see higher convenience yields.
   - Short vs. long maturity convenience yields.
   - Alternatives: corporates, and foreign safe assets.

3. Drivers of the convenience yield:
   - Inflation dynamics.
   - Treasury supply.
   - Default risk.

Convenience Yield and Stock-Bond Covariance

	2005-2023	
	Prem. 10y	Prem. 10y
Cov(Tr 10y, St.)	-0.078**	
	(-2.23)	
Cov(Prem. 10y, St.)		-0.106***
		(-7.03)
Cov(Rf 10y, St.)		-0.004
		(-0.23)
Cov(CDS 10y, St.)		0.239**
		(1.96)
Eff. Fed Funds	0.012**	0.014***
	(2.00)	(2.63)
Constant	0.233***	0.229***
	(10.83)	(12.57)
Observations	228	228
R^2	0.198	0.458

- **Negative stock-bond covariance associated with larger convenience yields.**
- Relationship particularly strong for the stock-bond covariance term corresponding to innovations in the convenience yield:

$$\text{Convenience Yield}_t \cong -\Lambda \operatorname{Cov}_t \left(r_{t+1} - r^f_{t+1}, r^M_{t+1} \right),$$

where r^f_{t+1} is the "frictionless" risk-free rate at the appropriate maturity.

Alternative Convenience Yield Measures

- **10y TIPS-Tr**: TIPS-Treasury premium constructed following Fleckenstein et al. (2014).
- **30y Swap Spread**: 30 year spread between the LIBOR swap and Treasury par rate.
- **10y Richness**: 10 year Treasury Richness relative to repo swap rates following Fleckenstein and Longstaff (2024).
- **Box Spread**: 2 year convenience yield implied by the Box rate constructed in van Binsbergen, Diamond and Grotteria (2022) and Diamond and Van Tassel (2021).
- **GC-Tr 3m**: 3 month General Collateral Repo minus Treasury bill rate.
- **FF-Tr 3m**: 3 month Fed funds rate minus Treasury bill rate.
- **-1*Z-Spread**: Negative of the Z-spread constructed in Greenwood, Hanson and Stein (2015).
- **FN 30y - Tr. Spread**: Agency MBS-Treasury spread constructed in He and Song (2022).

Main Result Robustness: Alternative Measures

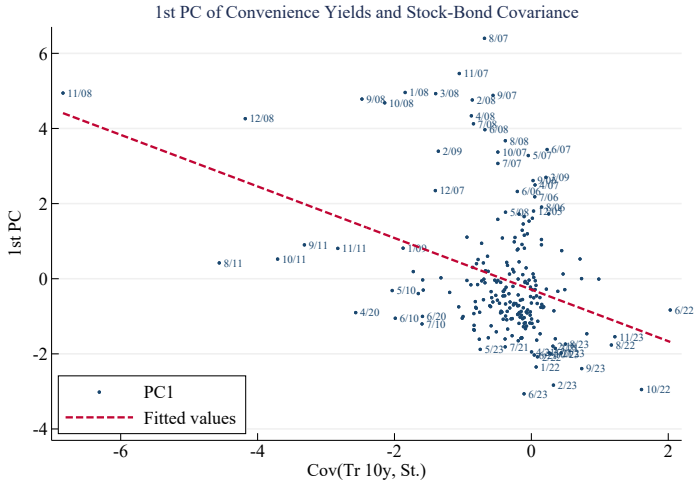
- **Use the 1st PC of convenience yield proxies as the dependent variable.**

	PC1, 2005-2022	
Cov(Tr 10y, St.)	-0.891***	
	(-4.30)	
Cov(Prem. 10y, St.)		-0.998***
		(-7.18)
Cov(Rf 10y, St.)		-0.668**
		(-2.40)
Cov(CDS 10y, St.)		-0.521
		(-0.49)
Eff. Fed Funds	0.406***	0.402***
	(2.68)	(2.58)
Constant	-0.986***	-0.957***
	(-5.04)	(-4.67)
Observations	228	228
R^2	0.318	0.333

	PC1, 2005-2022	
Cov(Prem. 10y, St.)	-1.153***	-0.576***
	(-2.69)	(-3.48)
Crisis	2.406***	
	(2.77)	
Crisis x Cov(Prem., St.)	0.741	
	(1.63)	
VIX		3.561
		(1.26)
Eff. Fed Funds	0.381**	0.379**
	(2.45)	(2.23)
Constant	-0.957***	-1.375**
	(-4.92)	(-2.51)
Observations	228	228
R^2	0.419	0.282

$\Longrightarrow$ PC Details

Stock-Bond Covariance and PC1



⟹ Subsamples

Main Result Robustness: Longer Samples

- **Negative stock-bond covariance associated with larger convenience yields.**
- In longer samples lose some of the convenience yield proxies.

	1996-2023	1996-2022	1991/5-2023			1972-2023	
	Libor Spr. 30y	Rich. 10y	GC-Tr 3m	FF-Tr 3m	-1*Z-Spr.	FF-Tr 3m	-1*Z-Spr.
Cov(Tr 10y, St.)	-0.062*	-0.058***	-0.034**	-0.091***	-0.043*	-0.123***	-0.016
	(-1.91)	(-3.41)	(-2.22)	(-2.97)	(-1.92)	(-2.72)	(-0.71)
Eff. Fed Funds	0.138***	0.079***	0.027***	0.094***	-0.018***	0.199***	-0.035***
	(6.31)	(5.51)	(4.06)	(6.30)	(-4.02)	(11.47)	(-6.87)
Constant	-0.290***	-0.007	0.063***	-0.107***	0.117***	-0.373***	0.170***
	(-5.53)	(-0.19)	(3.41)	(-3.10)	(7.06)	(-5.28)	(8.15)
Observations	324	312	392	392	392	624	624
R^2	0.438	0.393	0.157	0.247	0.182	0.572	0.264

Robustness: Alternative Decompositions

- **Use alternatives to the TIPS-Treasury premium to decompose the stock-bond covariance.**

	2005-2022	2005-2023
	PC1	PC1
Cov(Rich. 10y, St.)	-1.390***	
	(-4.35)	
Cov(Tr - Rich. 10y, St.)	-0.754***	
	(-3.46)	
Cov(OIS Spr. 10y, St.)		-1.185**
		(-2.04)
Cov(Tr - OIS Spr. 10y, St.)		-0.906***
		(-4.52)
Eff. Fed Funds	0.592***	0.399***
	(5.50)	(2.60)
Constant	-1.055***	-0.985***
	(-5.66)	(-5.18)
Observations	216	228
R^2	0.483	0.315

Short and Long Horizon PC1

- **Construct PC1 separately with short and long maturity convenience yields.**
- Stronger relationship between short maturity proxies and short maturity stock-bond covariance.

	2005-2023					
	Short PC1	Short PC1	Short PC1	Long PC1	Long PC1	Long PC1
5 x Cov(Tr 2y, St.)	-0.952***			-0.910***		
	(-3.72)			(-3.62)		
2 x Cov(Tr 5y, St.)		-0.799***			-0.884***	
		(-3.70)			(-4.21)	
Cov(Tr 10y, St.)			-0.568***			-0.709***
			(-3.00)			(-4.92)
Eff. Fed Funds	0.115	0.167	0.179	0.267**	0.325***	0.349***
	(1.04)	(1.43)	(1.44)	(2.34)	(2.96)	(3.12)
Constant	-0.422***	-0.544***	-0.508***	-0.640***	-0.814***	-0.822***
	(-2.78)	(-3.28)	(-3.20)	(-3.04)	(-3.85)	(-3.80)
Observations	228	228	228	228	228	228
R^2	0.269	0.238	0.167	0.290	0.320	0.289

Other Tests and Measures

- Have established a negative correlation between stock-bond covariance and Treasury convenience.

- Consider alternative measures of the convenience yield:
  - Corporate spreads: P2 - Tr. (Krishnamurthy and Li (forthcoming)),
    AAA - Tr.,
    EBP (Gilchrist, Wei, Yue and Zakrajšek (2021)),
    U.S. Treasury Premium (Du, Im and Schreger (2018)) $\Longrightarrow$

- **Again find negative relationships.**

- Robustness:
  other proxies of the frictionless rate;
  other lookback windows $\Longrightarrow$

Substitutes: Corporate Securities

- Negative stock-bond covariance is associated with larger Treasury spreads over safe corporate yields.

- **Covariance term corresponding to convenience yield the major contributor.**

	2005-2023				2005-2022/6
	P2 CP-Tr 3m	AAA-Tr	BBB-AAA	EBP	US Prem. 10y
Cov(Prem. 10y, St.)	-0.627***	-0.455***	-0.375***	-0.501***	-0.033**
	(-7.57)	(-8.30)	(-8.02)	(-8.10)	(-2.40)
Cov(Rf 10y, St.)	-0.171	-0.122	-0.105*	-0.104	-0.015
	(-1.31)	(-1.43)	(-1.69)	(-1.06)	(-0.52)
Cov(CDS 10y, St.)	-0.106	0.240	1.309***	0.766***	0.052
	(-0.27)	(0.97)	(4.53)	(2.59)	(0.68)
Eff. Fed Funds	0.050	0.005	-0.088***	0.004	0.017
	(1.61)	(0.34)	(-3.41)	(0.15)	(1.08)
Constant	0.333***	0.660***	1.209***	-0.151**	-0.197***
	(6.99)	(17.12)	(13.27)	(-2.07)	(-7.69)
Observations	228	228	228	228	222
R^2	0.504	0.502	0.541	0.469	0.062

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3. **Drivers of the convenience yield:**
   - Inflation dynamics.
   - Treasury supply.
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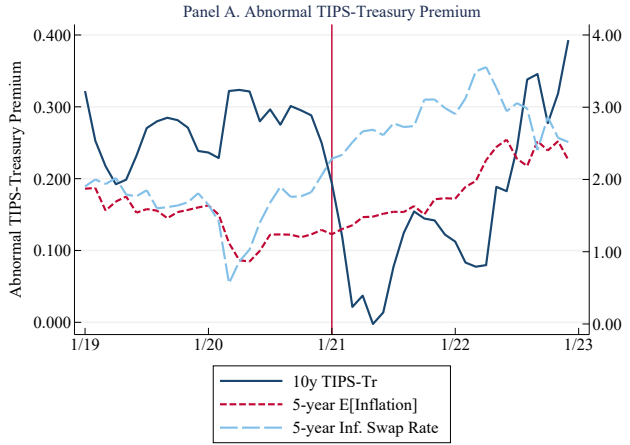
Inflation Expectations

- **The bout of inflation starting in 2021 saw a substantial dip in the TIPS-Treasury premium.**



Inflation Expectations

- **The relationship between the convenience yield and expected inflation holds in the full sample.**
- Use the Federal Reserve Bank of Cleveland inflation expectations series.
- **Heightened inflation expectations erode the convenience yield and reflect higher covariance.**

	2005-2023					1982-2023	1972-2023
	Cov(Tr, St.)	Cov(Prem., St.)	Cov(Rf, St.)	Cov(CDS, St.)	10y TIPS-Tr	Cov(Tr, St.)	Cov(Tr, St.)
5-year E[Inflation]	0.549***	0.195**	0.445**	-0.095**	-0.013	0.424***	
	(2.80)	(1.96)	(2.47)	(-2.33)	(-0.29)	(7.42)	
PTR							0.277***
							(8.00)
Constant	-1.430***	-0.550**	-1.104***	0.232***	0.309***	-1.196***	-0.855***
	(-3.48)	(-2.16)	(-2.99)	(2.60)	(3.11)	(-6.42)	(-5.89)
Observations	228	228	228	228	228	504	624
R^2	0.063	0.008	0.052	0.046	0.001	0.292	0.228

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   - Longer sample.
   - Alternatives: corporates, gold (and foreign safe assets).

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Event Study: 2011 Debt Ceiling Standoff

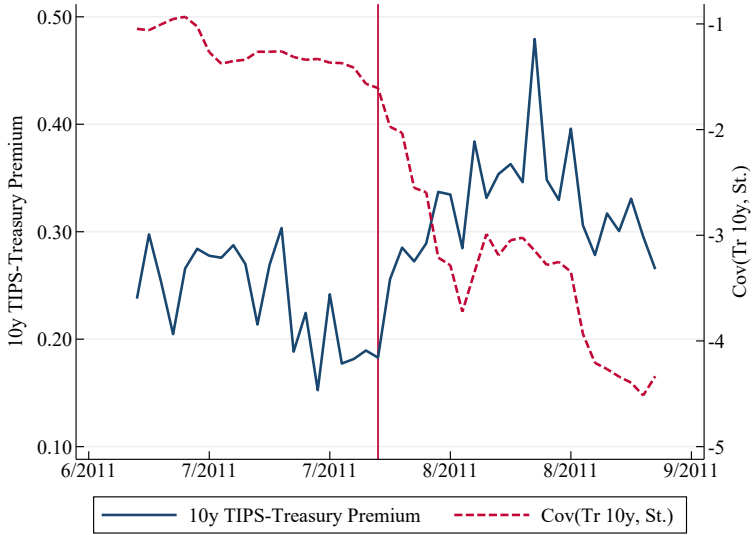
- Debt ceiling standoffs present a unique situation where Treasury cash-flows, and, Treasury convenience was called into question.
- Document convenience yields pre- and post-resolution.

2011 debt crisis. Cutoff date August 1, 2011

	Prem. 2y	Prem. 10y	PC1	Short PC1	Long PC1
After Cutoff Date	0.004	0.087***	0.231***	0.174***	0.116*
	(0.13)	(3.91)	(3.09)	(2.61)	(1.79)
Constant	0.200***	0.201***	-0.130*	-0.179***	0.057
	(18.34)	(12.78)	(-1.80)	(-5.44)	(0.93)
Observations	41	41	41	41	41
R^2	0.001	0.406	0.316	0.237	0.088

Event Study: 2011 Debt Ceiling Standoff

- August 2, 2011 indicated.



Event Study: GFC

Date	Description	Abbreviation	Conv. pred.
11/25/2008	Fed to purchase up to 100 billion GSE and 500 billion MBS	QE, #1	+
12/1/2008	Ben Bernanke states that "the Federal Reserve could purchase longer-term Treasury or agency securities...in substantial quantities"	QE, #2	+
3/18/2009	The FOMC will a purchase "up to an additional 750 billion of agency mortgage-backed securities, "up to 100 billion" in agency debt, and "up to 300 billion of longer-term Treasury securities over the next six months."	QE, #3	+
8/12/2009	The FOMC "decided to gradually slow the pace" of Treasury purchases	QE, #4	–
8/10/2010	The FOMC will reinvest "principal payments from agency debt and agency mortgage-backed securities in longer-term Treasury securities."	QEII, #1	+
11/3/2010	The FOMC "intends to purchase a further 600 billion of longer-term Treasury securities"	QEII, #2	+
9/21/2011	The FOMC intends to purchase 400 billion of long-term Treasuries, sell equivalent amount of short-term Treasuries.	OT	+
9/13/2012	The FOMC "will increase the Committees holdings of longer-term securities by about 85 billion each month through the end of the year,	QEIII	+

Event Study: GFC

- Seven out of eight events follow the predicted pattern.

	10y TIPS-Treasury Prem.		Cov(Prem. 10y, St.)	
QE, #1	0.046		-4.024***	
	(0.54)		(-10.73)	
QE, #2	-0.186**		1.148***	
	(-2.16)		(3.06)	
QE, #3	0.202**		-0.118	
	(2.34)		(-0.31)	
QE, #4	-0.131		0.225	
	(-1.52)		(0.60)	
QEII, #1	0.063		0.108	
	(0.73)		(0.29)	
QEII, #2	0.040		0.198	
	(0.46)		(0.53)	
OT	0.108		-0.664*	
	(1.25)		(-1.77)	
QEIII	0.030		-0.023	
	(0.34)		(-0.06)	
Combined		0.054*		-0.450***
		(1.77)		(-3.25)
Constant	-0.000	-0.000	0.002	0.002
	(-0.15)	(-0.20)	(0.22)	(0.18)
Observations	1299	1299	1299	1299
R^2	0.012	0.002	0.091	0.008

Event Study: Covid Response

- **Similarly, large shifts in expected supply around the Covid policy response.**
- Event dates based on Haddad et al. (2021).

Date	Description	Abbreviation	Conv. pred.
3/15/2020	Purchase 500 billion of Treasuries, and 200 billion of Agency MBS.	Purchases	+
3/23/2020	Extend the range of accepted collateral at emergency facilities.	Collateral	–
3/31/2020	Allow certain foreign counterparties to repo Treasuries with the Fed directly.	Foreign	+
4/1/2020	Exclude Treasuries and deposits from leverage calculations for bank holding companies.	Exclude	–

Event Study: Covid Response

- Three out of four follow the predicted pattern—though note the third event window overlaps with the subsequent one.

	10y TIPS-Treasury Prem.		Cov(Prem. 10y, St.)	
Purchases	0.039		-0.387*	
	(0.73)		(-1.69)	
Collateral	-0.124**		-0.656***	
	(-2.33)		(-2.86)	
Foreign	-0.055		0.076	
	(-1.04)		(0.33)	
Exclude	-0.094*		-0.212	
	(-1.76)		(-0.92)	
Combined		0.050*		0.139
		(1.88)		(1.20)
Constant	0.001	-0.000	0.005	-0.000
	(0.25)	(-0.03)	(0.33)	(-0.00)
Observations	248	248	236	236
R^2	0.040	0.014	0.049	0.006

⟹ Figure

Literature

Our paper brings together two large literatures: one on the stock-bond comovement and the other on the convenience yield on Treasury securities.

- Aggregate stock-bond covariance: Shiller and Beltratti (1992), Campbell and Ammer (1993), Campbell, Sunderam and Viceira (2017), Campbell, Pflueger and Viceira (2018), Pflueger (2023).

- Non-inflation explanations of the time variation in stock-bond comovement: Kozak (2022), Laarits (2021), Chernov, Lochstoer and Song (2023) and Jones and Pyun (2022), Duffee (2022).

- Treasury convenience yields: Duffee (1996), Longstaff (2004), Krishnamurthy and Vissing-Jorgensen (2012), Greenwood, Hanson and Stein (2015), Sunderam (2015), Krishnamurthy and Li (forthcoming), Li, Fu and Xie (2022), Fleckenstein and Longstaff (2024).

- Hedging property of safe assets: Acharya and Pedersen (2005), Brunnermeier et al. (2022).

Conclusion

- Have demonstrated that the convenience yield is consistent with the "hedging perspective" of safe assets.
- **Convenience yield part of Treasury yields counter-cyclical with regard to variations in inflation and inflation expectations.** $\Longrightarrow$ A double whammy for Treasury prices.
- Convenience yield must be "earned": monetary and fiscal stability. When not earned, the convenience yield can erode swiftly.

Thank You!

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Appendix Overview

Summary Statistics

- **The stock-bond covariance and its constituent elements.**

	mean	p1	p10	p50	p90	p99	sd	count
Cov(Tr 10y, St.)	-0.42	-4.23	-1.28	-0.23	0.26	1.27	0.89	228
Cov(Prem. 10y, St.)	-0.19	-4.63	-0.31	-0.05	0.08	0.44	0.90	228
Cov(Rf 10y, St.)	-0.29	-3.26	-0.95	-0.18	0.29	2.20	0.80	228
Cov(CDS 10y, St.)	0.06	-0.12	-0.02	0.00	0.18	0.94	0.18	228

Summary Statistics

- Convenience yield proxies, inflation measures.

	mean	p1	p10	p50	p90	p99	sd	count
Prem. 10y	0.26	-0.01	0.12	0.25	0.35	1.13	0.15	228
GC-Tr 3m	0.13	-0.13	0.01	0.10	0.30	0.62	0.13	228
FF-Tr 3m	0.08	-0.50	-0.13	0.03	0.39	1.20	0.28	228
-1*Z-Spr.	0.14	-0.23	-0.01	0.13	0.27	0.78	0.15	228
Libor Spr. 30y	-0.14	-0.68	-0.55	-0.25	0.52	0.68	0.37	228
FN-Tr 30y	0.48	0.09	0.21	0.42	0.84	1.42	0.27	228
Rich. 10y [2005-2022]	0.09	-0.26	-0.16	0.08	0.37	0.53	0.21	216
Box USD 2y [2005/9-2020/7]	0.36	0.12	0.18	0.30	0.62	1.33	0.22	179
PC1	-0.00	-2.83	-1.58	-0.44	2.35	4.96	1.68	228
Short PC1	0.00	-2.89	-1.08	-0.22	1.28	5.37	1.30	228
Long PC1	-0.00	-2.09	-1.50	-0.45	2.20	4.20	1.45	228
Eff. Fed Funds	1.50	0.05	0.07	0.29	5.05	5.33	1.85	228

Summary Statistics

- Convenience yield measures using corporates, commodities, foreign currency bonds.

	mean	p1	p10	p50	p90	p99	sd	count
Tr 10y	2.94	0.68	1.59	2.76	4.61	5.11	1.15	228
Rf 10y	2.89	0.69	1.44	2.68	4.82	5.40	1.24	228
CDS 2y	0.16	0.01	0.01	0.12	0.30	0.71	0.14	228
CDS 10y	0.32	0.02	0.03	0.31	0.58	0.71	0.19	228
E[Inflation] 2y	1.85	0.56	1.28	1.75	2.62	2.93	0.52	228
E[Inflation] 10y	1.93	1.23	1.53	1.88	2.46	2.67	0.35	228
P2 CP-Tr 3m	0.57	0.07	0.17	0.39	1.06	4.74	0.72	228
AAA-Tr	0.80	0.44	0.53	0.65	1.04	3.82	0.55	228
BBB-AAA	1.25	0.57	0.65	1.11	1.91	4.17	0.66	228
EBP	0.02	-0.79	-0.48	-0.14	0.66	3.33	0.68	228
US Prem. 10y [2005-2022/6]	-0.16	-0.53	-0.34	-0.17	0.06	0.14	0.15	222

Alternative constructions of the stock-bond covariance.

- Alternatives using the Liu and Wu (2021) yield curve, actual traded bond returns, and the MSCI index return.

	PC1, 2005-2023			PC1, 1991/5-2023		
Cov(Tr 10y LW, St.)	-0.839***			-0.367***		
	(-5.11)			(-3.43)		
Cov(Raw Tr 10y, St.)		-1.103***			-0.458***	
		(-3.92)			(-2.98)	
Cov(Tr 10y, MSCI)			-0.917***			-0.441***
			(-3.61)			(-3.09)
Eff. Fed Funds	0.394**	0.400***	0.392**	0.284***	0.282***	0.282***
	(2.57)	(2.62)	(2.57)	(5.20)	(5.17)	(5.27)
Constant	-0.969***	-1.014***	-0.936***	-0.842***	-0.849***	-0.845***
	(-5.01)	(-5.15)	(-4.71)	(-6.61)	(-6.53)	(-6.63)
Observations	228	228	228	392	392	392
R^2	0.326	0.325	0.299	0.241	0.237	0.244

Alternative Stock-Bond Covariance Calculations

	2005-2023		2005-2022	2005-2023
	PC1	PC1	PC1	PC1
Cov(Tr 10y, St.)	-0.904***			
	(-4.27)			
Cov(Prem. 10y, St.)		-1.006***		
		(-7.08)		
Cov(Tr - Prem. 10y, St.)		-0.717***		
		(-2.59)		
Cov(Rich. 10y, St.)			-1.390***	
			(-4.35)	
Cov(Tr - Rich. 10y, St.)			-0.754***	
			(-3.46)	
Cov(OIS Spr. 10y, St.)				-1.185**
				(-2.04)
Cov(Tr - OIS Spr. 10y, St.)				-0.906***
				(-4.52)
Eff. Fed Funds	0.395**	0.394**	0.592***	0.399***
	(2.57)	(2.52)	(5.50)	(2.60)
Constant	-0.973***	-0.947***	-1.055***	-0.985***
	(-5.00)	(-4.63)	(-5.66)	(-5.18)
Observations	228	228	216	228
R^2	0.313	0.327	0.483	0.315

Short and Long Maturity Convenience Yields

- **Separately construct 1st PCs of short- and long-maturity covariance proxies.**
- Stock-bond covariance with 2- and 5-year Treasury returns.
- (Covariances scaled for direct comparability with the 10-year calculation.)

	2005-2023					
	Short PC1	Short PC1	Short PC1	Long PC1	Long PC1	Long PC1
Cov(Tr 2y, St.)	-0.952***			-0.910***		
	(-3.85)			(-3.70)		
Cov(Tr 5y, St.)		-0.799***			-0.888***	
		(-3.84)			(-4.33)	
Cov(Tr 10y, St.)			-0.568***			-0.714***
			(-3.08)			(-5.05)
Eff. Fed Funds	0.115	0.167	0.179	0.281***	0.339***	0.363***
	(1.09)	(1.49)	(1.51)	(2.69)	(3.38)	(3.55)
Constant	-0.422***	-0.544***	-0.508***	-0.661***	-0.837***	-0.846***
	(-2.91)	(-3.44)	(-3.36)	(-3.29)	(-4.15)	(-4.09)
Observations	228	228	228	228	228	228
R^2	0.269	0.238	0.167	0.297	0.328	0.299

Covariance Calculation Lookback Windows

- **Construct stock-bond covariance in different look-back windows.**

	PC1, 2005-2023			PC1, 1991-2023		
Cov(Tr 10y, St.)	-0.907***			-0.368***		
	(-4.44)			(-2.99)		
Cov(Tr 10y, St.), 60 days		-1.141***			-0.411**	
		(-3.31)			(-2.52)	
Cov(Tr 10y, St.), 252 days			-1.974***			-0.629***
			(-3.91)			(-2.76)
Eff. Fed Funds	0.407***	0.447***	0.615***	0.283***	0.293***	0.350***
	(2.86)	(3.04)	(4.15)	(5.25)	(5.01)	(4.92)
Constant	-0.993***	-1.131***	-1.776***	-0.830***	-0.860***	-1.055***
	(-5.29)	(-5.13)	(-5.71)	(-6.75)	(-6.20)	(-5.33)
Observations	228	228	228	392	392	392
R^2	0.321	0.314	0.380	0.232	0.222	0.226

$\Longrightarrow$ Back

Treasury Holdings

- Have argued that a substantial amount of the aggregate stock-bond covariance corresponds to innovations in the convenience yield.
- Such benefits beyond the promised cash-lows accrue to the holder of the asset.
- As different investors might value such non-cash-flow aspect differentially, expect that covariance should account for holdings.
- **Confirm using holdings data from *Financial Accounts of the U.S.***

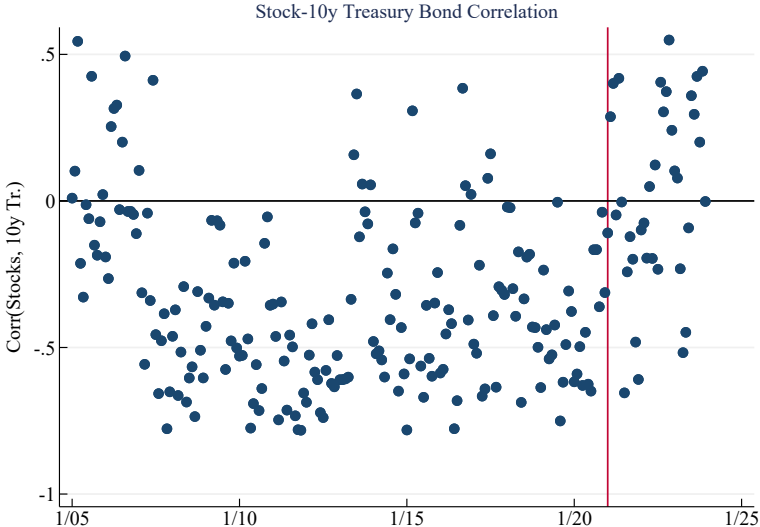
Holdings

- Quarterly data 2005-2022.
  - Money market funds (MMF), rest-of-the-world (ROW), and pension funds increase holdings with negative covariance.
  - Depository institutions, mutual funds and monetary authority tend to hold less with negative covariance.

	B-D	Depos.	HH	Insur	MMF	Mutual	Monet.	Pension	ROW
Cov(Prem. 10y, St.)	-0.012	0.582***	0.403	-0.080	-0.623***	0.556***	2.670***	-1.017***	-1.422***
	(-0.25)	(4.62)	(1.63)	(-1.40)	(-3.25)	(5.16)	(6.52)	(-5.68)	(-3.77)
Cov(Rf 10y, St.)	0.044	0.640**	-0.190	-0.143*	0.351	0.428***	1.837**	-0.547*	-1.979**
	(0.61)	(2.36)	(-0.58)	(-1.83)	(1.00)	(3.16)	(2.07)	(-1.88)	(-2.46)
Cov(CDS 10y, St.)	0.165	-0.458	1.531*	0.140	-0.231	-0.489	-1.966	0.198	1.055
	(1.46)	(-1.09)	(1.84)	(1.08)	(-0.43)	(-1.63)	(-1.05)	(0.26)	(0.82)
Eff. Fed Funds	-0.412***	-0.264***	-0.707***	0.262***	-0.619***	-0.298***	-0.812***	1.493***	-0.295
	(-9.28)	(-3.61)	(-4.36)	(7.04)	(-5.55)	(-4.99)	(-4.25)	(14.96)	(-1.18)
Constant	0.861***	3.220***	6.168***	2.015***	5.289***	5.232***	17.501***	12.182***	38.169***
	(12.57)	(14.58)	(18.97)	(31.11)	(14.01)	(30.19)	(27.11)	(50.14)	(46.73)
Observations	74	74	74	74	74	74	74	74	74
R^2	0.575	0.256	0.270	0.418	0.270	0.230	0.326	0.638	0.183

⟹ Back

The Stock-Bond Correlation



Correlation and Stock Betas

- Replace covariance measures on the RHS with betas or correlations.

	PC1, 2005-2023				PC1, 1991/5-2023	
St. Beta Tr 10y	-1.497**				-0.681**	
	(-2.31)				(-2.51)	
St. Beta Prem. 10y		-2.802**				
		(-2.29)				
St. Beta Rf 10y		-1.530**				
		(-2.30)				
St. Beta CDS 10y		-4.945				
		(-1.34)				
Corr(Tr 10y, St.)			-1.309***			-0.598**
			(-2.61)			(-2.31)
Corr(Prem. 10y, St.)				-1.359**		
				(-2.41)		
Corr(Rf 10y, St.)				-0.937*		
				(-1.93)		
Corr(CDS 10y, St.)				-0.574		
				(-1.34)		
Eff. Fed Funds	0.340**	0.359**	0.362**	0.373**	0.279***	0.291***
	(2.15)	(2.26)	(2.32)	(2.36)	(4.52)	(4.52)
Constant	-0.737***	-0.757***	-0.898***	-0.892***	-0.748***	-0.825***
	(-2.83)	(-2.84)	(-3.39)	(-3.36)	(-5.57)	(-5.37)

Back-of-the-Envelope Magnitudes

- Suppose the market return $R^M_{0,t}$ prices assets. Expected returns are given by:

$$\mathrm{E}_0[R_{0,t}] = R^f_{0,t} + \Lambda \operatorname{Cov}_0\left(R_{0,t}, R^M_{0,t}\right),$$

  where Λ measures risk aversion.

- Back-of-the-envelope check:
  - Unconditional TIPS-Treasury premium: 29 bps.
  - Average covariance between market and premium: -.0021 (reported in percent units as -.21)
  - **Implies:**

$$\begin{aligned} .0029 =& \gamma \times .0021 \\ \Longrightarrow & \gamma = 1.4 \end{aligned}$$

First Principal Component Loadings

- PC estimated with the six proxies available in the entire 2005-2022 sample.
- **First PC explains 42% of the variaton.**

	2005-2023						2005-2022	2005/9-2020/7
	Prem. 10y	GC-Tr 3m	FF-Tr 3m	-1*Z-Spr.	Libor Spr. 30y	FN-Tr 30y	Rich. 10y	Box USD 2y
PC1	0.037*	0.048***	0.128***	0.028**	0.163***	0.108***	0.098***	0.107***
	(1.85)	(5.32)	(5.43)	(2.05)	(6.69)	(4.54)	(9.06)	(5.71)
Constant	0.256***	0.130***	0.084***	0.143***	-0.136***	0.481***	0.080***	0.323***
	(13.62)	(9.93)	(4.25)	(8.75)	(-3.50)	(15.72)	(4.45)	(20.00)
Observations	228	228	228	228	228	228	216	179
R^2	0.166	0.393	0.596	0.093	0.537	0.440	0.615	0.677

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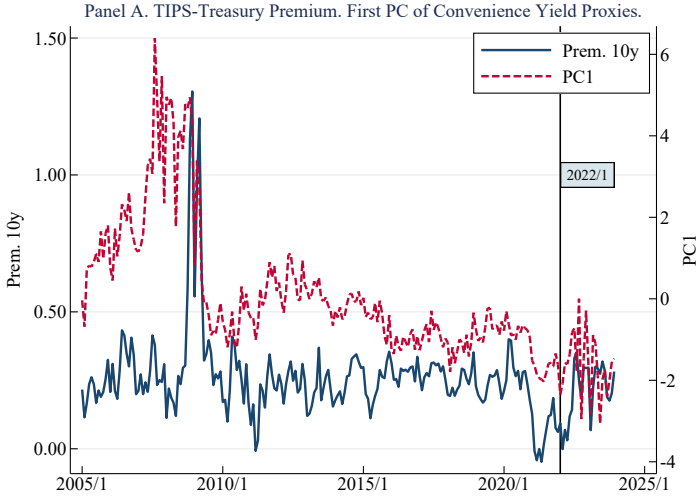
First Principal Component



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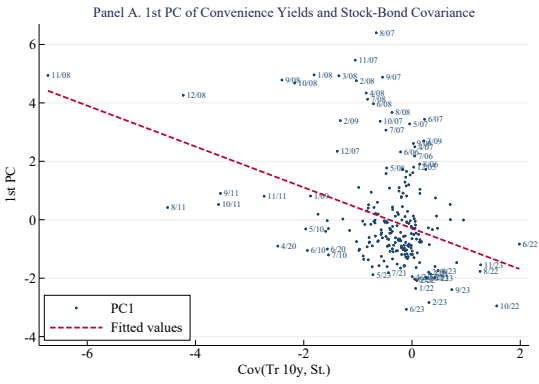
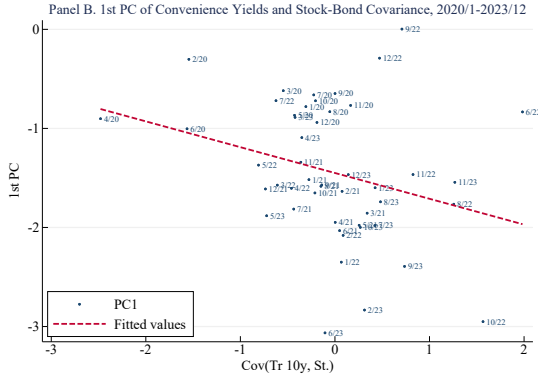
Stock-Bond Covariance and PC1

- **Aggregate stock-bond covariance.**

Full Sample:



2020-2023 only:



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Event Study: 2023 Debt Ceiling Standoff

2023 debt crisis. Cutoff date May 31, 2023

	Prem. 2y	Prem. 10y	PC1	Short PC1	Long PC1
After Cutoff Date	0.060***	0.040**	0.155	0.115	0.170***
	(3.42)	(2.36)	(1.49)	(0.77)	(3.13)
Constant	0.170***	0.270***	-1.818***	-1.371***	-1.041***
	(14.76)	(17.58)	(-28.27)	(-12.30)	(-31.52)
Observations	41	41	41	41	41
R^2	0.310	0.295	0.066	0.021	0.357

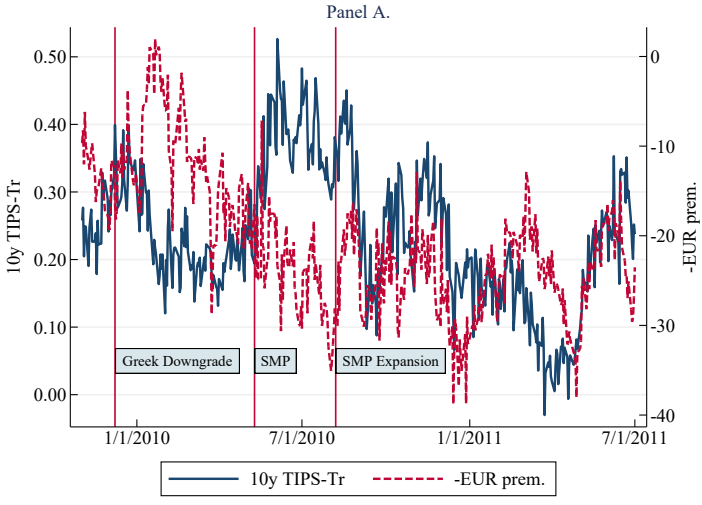
Event Study: Eurozone Debt Crisis

- **Finally, the Eurozone sovereign debt crisis presents an opportunity to study the behavior of U.S. and foreign safe debt premia.**
- In addition to the U.S. premium document the relative premium of German Bunds.
- Broadly, vulnerability of the Eurozone sees the U.S. convenience yields increase, but relative EUR convenience yields increase more.
- Stabilization measures by the ECB dampen flight-to-safety to German Bunds.

Date	Description	Abbreviation
5/10/2010	Securities Market Programme (SMP) introduction	SMP, #1
8/6/2010	SMP expansion	SMP, #2
12/1/2011	Long Term Refinancing Operations (LTRO)	LTRO, #1
12/8/2011	LTRO official introduction	LTRO, #2
3/9/2012	Greek default	Greece
7/26/2012	Outright Monetary Transactions (OMT), "whatever it takes" speech	OMT , #1
8/2/2012	OMT announcement	OMT, #2
9/6/2012	OMT official introduction	OMT, #3

› Figure

Event Study: Eurozone Crisis



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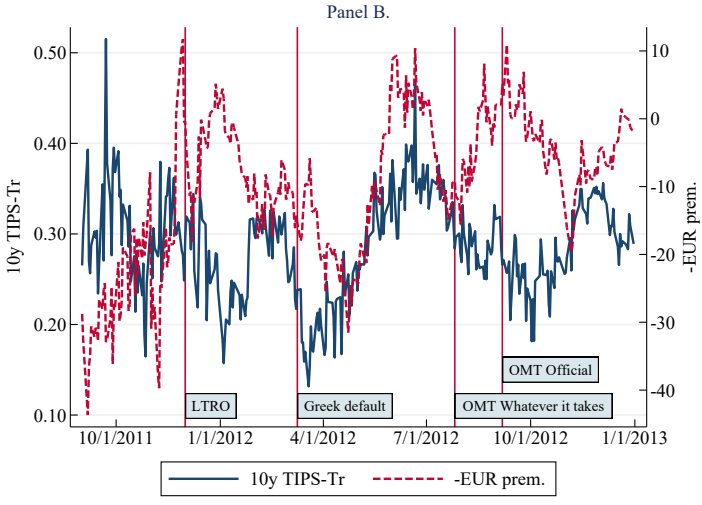
Event Study: Eurozone Crisis



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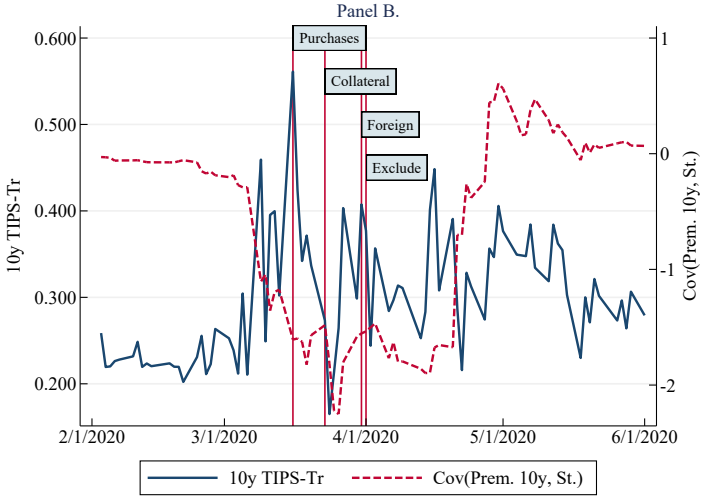
Event Study: Eurozone Crisis

	10y TIPS-Tr	Cov(Prem. 10y, St.)	EUR prem.
SMP, #1	0.157***	-0.430***	0.123***
	(8.88)	(-4.67)	(5.88)
SMP, #2	0.016	-0.160**	0.134***
	(0.99)	(-2.34)	(6.87)
LTRO, #1	0.094***	-0.175***	-0.030
	(10.36)	(-4.78)	(-1.05)
LTRO, #2	0.058***	-0.042	-0.045*
	(3.97)	(-0.99)	(-1.83)
Greece	0.076***	0.040	-0.019
	(3.74)	(1.09)	(-0.60)
OMT, #1	0.073***	0.027	-0.001
	(7.81)	(0.78)	(-0.05)
OMT, #2	0.075***	-0.014	-0.100***
	(6.46)	(-0.40)	(-3.90)
OMT, #3	0.070***	-0.036	-0.079***
	(4.87)	(-0.93)	(-3.31)
Constant	0.212***	-0.143***	0.120***
	(24.07)	(-4.21)	(7.00)
Observations	727	727	727
R^2	0.248	0.150	0.582

Event Study: Covid Response



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Treasury Inconvenience