

Appendix to An Empirical Decomposition of Risk and Liquidity in Nominal and Inflation-Indexed Government Bonds

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Table A.I
Forecasted Real Short Rate

Overlapping quarterly realized real return on nominal 3 month T-bill onto the nominal 3 month T-bill, 3 month lagged realized real return on 3 month T-bill and inflation over the past year. Newey-West standard errors with 4 lags in parentheses. * and ** denote significance at the 5% and 1% level.

	(1)	(2)
$y_{1,t}^{\$} - \pi_{t+1}$	US	UK
$y_{1,t}^{\$}$	0.55** (0.20)	0.79** (0.13)
$y_{1,t}^{\$} - \pi_t$	0.10 (0.08)	-0.08 (0.05)
$(\pi_{t-3} + \pi_{t-2} + \pi_{t-1} + \pi_t) / 4$	0.10 (0.08)	-0.07 (0.04)
<i>Const.</i>	-0.52** (0.09)	-0.26* (0.12)
p-value	0.00	0.00
R^2	0.48	0.48
Sample	1982.1-2010.12	

Table A.II
Univariate Liquidity Regressions

Variables as in Table II. Newey-West standard errors with three lags in parentheses. The p-value of the F-test for no predictability is shown. * and ** denote significance at the 5% and 1% level.

$y_{n,t}^{\$} - y_{n,t}^{TIPS} - \pi^{SPF}$	(1)	(2)	(3)	(4)	(5)
Off-the-Run Spr.	-2.67** (0.35)				
Asset-Swap Spr.		-1.15** (0.33)			
TransactionVol.			0.22 (0.14)		
CFNAI				0.25** (0.05)	
Synthetic-Cash					-1.81** (0.40)
<i>const.</i>	0.38** (0.07)	0.23 (0.13)	-0.07 (0.13)	-0.10* (0.04)	0.33** (0.12)
<i>p - value</i>	0.00	0.00	0.13	0.00	0.00
<i>R</i> ²	0.57	0.27	0.06	0.38	0.34
Sample	1999.3-2010.12				

Table A.III
Estimating Liquidity in Quarterly Changes

We replicate Table II using quarterly changes. Newey-West standard errors with three lags in parentheses. The p-value of the F-test for no predictability is shown. * and ** denote significance at the 5% and 1% level.

$\Delta (y_{n,t}^S - y_{n,t}^{TIPS} - \pi^{SPF})$	(1)	(2)	(3)	(4)	(5)
Δ Off-the-Run Spr.	-2.76** (0.67)	-1.38* (0.56)	-1.36* (0.55)	-1.27* (0.53)	-1.82** (0.48)
Δ Asset-Swap Spr.		-1.18** (0.34)	-1.18** (0.36)	-1.13** (0.35)	
Δ TransactionVol.			-0.19 (0.19)	-0.18 (0.19)	-0.23 (0.19)
Δ CFNAI				0.07* (0.03)	0.07* (0.03)
Δ Synthetic-Cash					-1.02** (0.19)
<i>const.</i>	0.00 (0.03)		0.01 (0.03)	0.02 (0.03)	0.01 (0.03)
<i>p - value</i>					
R^2	0.34	0.42	0.44	0.45	0.45
Sample			1999.3-2010.12		

Table A.IV
Estimating Liquidity with Additional Controls

We replicate Table II including interaction terms and the TIPS bid-ask spread. The TIPS bid-ask spread is from Tradeweb and available 2005.3-2010.6. We set to its 2005.3 value before 2005.3 and to its 2010.6 value after 2010.6. Newey-West standard errors with three lags in parentheses. The p-value of the F-test for no predictability is shown. * and ** denote significance at the 5% and 1% level.

$y_{n,t}^{\$} - y_{n,t}^{TIPS} - \pi^{SPF}$	(1)	(2)	(3)	(4)
Off-the-Run Spr.	1.17 (0.92)	1.31 (1.06)	1.06 (1.04)	-1.20** (0.35)
Asset-Swap Spr.	-0.38 (0.27)	-0.41 (0.29)	-0.17 (0.61)	-0.61* (0.30)
Transaction Vol.	0.35** (0.09)	0.31 (0.18)	0.35** (0.10)	0.28** (0.09)
CFNAI	0.14** (0.04)	0.14** (0.03)	0.14** (0.04)	0.12** (0.03)
(Off-the-Run) ²	-4.43** (1.63)	-4.48** (1.64)	-3.60 (3.11)	
Off-the-Run $\times$ Transaction Vol.		0.20 (0.77)		
Off-the-Run $\times$ Asset-Swap Spr.			-0.65 (1.78)	
TIPS Bid-Ask Spread				-0.03 (0.31)
<i>const.</i>	0.20 (0.13)	0.20 (0.13)	0.16 (0.17)	0.50** (0.11)
$p - value$	0.00	0.00	0.00	0.00
R^2	0.67	0.67	0.67	0.66
Sample	1999.3-2010.12			

Table A.V
Return Predictability Liquidity US
Nonlinear Liquidity

Return-predictability regressions as in Table III. We adjust for nonlinear liquidity as estimated in Table A.IV (1). Newey-West standard errors with three lags appear in parentheses. The p-value of the F-test for no predictability is shown. * and ** denote significance at the 5% and 1% level, respectively.

		$xr_{n,t}^{TIPS-L}$	$xr_{n,t}^{TIPS-L}$	$xr_{n,t}^{TIPS-L}$	$xr_{n,t}^{TIPS-L}$	$r_{n,t+1}^L$
$(y_{n,t}^{TIPS} - L_{n,t}) - y_{1,t}^{TIPS}$		2.71*	2.79		-1.72	-0.21
	Newey-West SE	(1.31)	(1.48)		(1.21)	(0.54)
	Bootstrap p-value	25.6%	19.5%		13.7%	29.1%
$(b_{n,t} + L_{n,t}) - b_{1,t}$			-0.34	4.63**	5.37**	-0.38
	Newey-West SE		(2.83)	(1.60)	(1.53)	(1.81)
	Bootstrap p-value		18.7%	0.05%	0.0%	41.2%
$L_{n,t}$		4.06	3.93	-6.63	-3.74	15.43**
	Newey-West SE	(8.47)	(9.08)	(4.46)	(5.49)	(4.14)
	Bootstrap p-value	17.7%	27.0%	11.6%	23.8%	0.0%
$p - value$		0.06	0.12	0.02	0.01	0.00
R^2		0.07	0.07	0.11	0.13	0.22
Sample		1999.6-2010.12				

Table A.VI
Return Predictability Liquidity US
Tradeable Excess Returns

We run liquidity-adjusted return-predictive regressions as in Table III. We consider liquidity-adjusted log nominal bond returns on TIPS over nominal returns on the nominal T-bill rate $r_{n,t}^{TIPS-L} - r_t^{Tbill}$ as a tradeable version of liquidity-adjusted log excess returns of TIPS. We also consider liquidity-adjusted log nominal bond returns on TIPS over log nominal bond returns on nominal bonds $r_{n,t}^{TIPS-L} - r_{n,t}^{nom}$ as a tradeable version of liquidity-adjusted breakeven returns. Newey-West standard errors with three lags appear in parentheses. The p-value of the F-test for no predictability is shown. * and ** denote significance at the 5% and 1% level, respectively.

		$(r_{n,t}^{TIPS-L} - r_t^{Tbill})$		$(r_{n,t}^{TIPS-L} - r_{n,t}^{nom})$	
$(y_{n,t}^{TIPS} - L_{n,t}) - y_{1,t}^{TIPS}$		2.38	2.65	-1.49	
	Newey-West SE	(1.55)	(1.75)	(1.66)	
	Bootstrap p-value	36.2%	27.5%	30.5%	
$(b_{n,t} + L_{n,t}) - b_{1,t}$			-1.02	5.20*	5.85**
	Newey-West SE		(2.50)	(2.12)	(2.23)
	Bootstrap p-value		12.7%	0.5%	0.1%
$L_{n,t}$		4.20	3.71	-7.77	-4.59
	Newey-West SE	(8.49)	(9.24)	(5.65)	(7.33)
	Bootstrap p-value	20.2%	24.9%	10.1%	21.4%
$p - value$		0.12	0.20	0.04	0.07
R^2		0.05	0.06	0.10	0.11
Sample		1999.6-2010.12			

Table A.VII
Sub-Period Betas US

We regress liquidity-adjusted and non liquidity-adjusted excess log government bond returns onto excess log stock returns. All variables are described in Table IV. Newey-West standard errors are computed with 3 lags. * and ** denote significance at the 5% and 1% level for $\hat{\alpha}$ and $\hat{\beta}$, respectively.

Panel A: US	1999.6-2010.12		1999.6-2006.12		2002.1-2010.12	
	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$
Excess Log Return Nominal	-0.19**	4.21*	-0.23*	3.66	-0.19**	4.21*
Excess Log Return TIPS	0.01	4.66*	-0.16*	4.36**	0.03	4.89*
Excess Log Return BEI	-0.21*	-0.45	-0.07	-0.69	-0.22*	-0.01
Liq.-Adj. Exc. Log Ret. BEI	-0.09	0.54	-0.04	0.72	-0.09	0.71
Liq.-Adj. Exc. Log Ret. TIPS	-0.11	3.67*	-0.19**	2.94*	-0.10	4.16*
Log Return Liquidity	0.12**	0.99	0.03	1.41**	0.13**	0.72

Panel B: UK	1985.7-2010.12		1985.7-2006.12		1985.7-1998.12		1999.1-2010.12	
	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$
Excess Log Return Nominal	0.15	3.16	0.19	3.45	0.31	4.26	-0.07	0.86
Excess Log Return TIPS	0.14**	1.63	0.13*	1.58	0.16*	0.53	0.13	2.77
Excess Log Return BEI	0.01	1.53	0.06	1.87	0.15	3.73	-0.20*	-1.91

Table A.VIII
Four Factor Regressions

US liquidity-adjusted and non liquidity-adjusted excess log government bond returns onto excess log stock returns xr_{t+1}^{equity} , the SMB factor, the HML factor, and innovations in the Pastor-Stambaugh liquidity factor. Annualized (%). Newey-West standard errors with 3 lags in brackets. * and ** denote significance at the 5% and 1% level.

Panel A: 1999.6-2010.12	$xr_{n,t+1}^{\$}$	$xr_{n,t+1}^{TIPS}$	$xr_{n,t+1}^b$	$xr_{n,t+1}^{TIPS-L}$	$xr_{n,t+1}^{b+L}$	$r_{n,t+1}^L$
xr_{t+1}^{equity}	-0.13*	0.08	-0.21*	-0.04	-0.09	0.12**
	(0.06)	(0.11)	(0.09)	(0.07)	(0.06)	(0.04)
HML	0.02	-0.03	0.05	-0.04	0.05	0.01
	(0.06)	(0.07)	(0.06)	(0.07)	(0.06)	(0.02)
SMB	-0.16*	-0.11	-0.05	-0.14*	-0.02	0.03
	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.02)
Pastor-Stambaugh	-0.07*	-0.08*	0.01	-0.07*	-0.00	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.01)
const.	5.00*	5.23**	-0.22	4.56**	0.45	0.67
	(1.99)	(1.81)	(1.60)	(1.50)	(1.31)	(0.64)

Table A.IX
Dickey-Fuller Unit Root Tests

We report Dickey-Fuller test for the null-hypothesis of a unit root with twelve lags. $Supply_t$ denotes the amount of inflation-indexed bonds outstanding relative to all nominal and inflation-indexed bonds outstanding. $\Delta Supply_t$ denotes the relative issuance of inflation-indexed bonds relative to all nominal and inflation-indexed bonds issuance.

$\Delta Supply_t - \Delta Supply_{t-12}$ is the change in relative issuance over the past 12 months.

* and ** denote significance at the 5% and 1% level respectively.

Panel A: US

	$Supply_t$	$\Delta Supply_t$	$\Delta Supply_t - \Delta Supply_{t-12}$
	-2.02	-2.12	-3.25*
Sample	1999.1 – 2010.12	1999.2 – 2010.12	2000.2 – 2010.12

Panel B: UK

	$Supply_t$	$\Delta Supply_t$	$\Delta Supply_t - \Delta Supply_{t-12}$
	-1.96	-4.75**	-2.65
Sample	1986.1 – 2010.12	1986.1 – 2010.12	1987.1 – 2010.12

Table A.X
Supply Autoregression

We regress relative issuance $\Delta Supply_t$, as described in Table V onto its own twelve lags. We also regress the 12-month change in relative issuance onto its own twelve lags. We report the sum of the twelve autoregressive coefficients.

	Panel A: US	Panel B: UK
	$\Delta Supply_t$ $-\Delta Supply_{t-12}$	$\Delta Supply_t$
Sum of Coeff.	0.44	0.23
<i>const.</i>	-0.25	0.00
	(0.21)	(0.00)
R^2	0.29	0.04
Sample	2000.2 – 2010.12	1986.1 – 2010.12

Table A.XI

Sample Correlations of Excess Returns and Spreads

Monthly data of quarterly overlapping returns and inflation 1999.6-2010.12.

Annualized (%). All data are described in Table III.

Correlations Excess Returns

	$xr_{n,t+1}^{TIPS-L}$	$xr_{n,t+1}^{b+L}$	$r_{n,t+1}^L$
$xr_{n,t+1}^{TIPS-L}$	1	-0.07	-0.02
$xr_{n,t+1}^{b+L}$	.	1	-0.20
$r_{n,t+1}^L$	.	.	1

Correlations Spreads

	$(y_{n,t}^{TIPS} - L_{n,t}) - y_{1,t}^{TIPS}$	$(b_{n,t} + L_{n,t}) - b_{1,t}$	$L_{n,t}$
$(y_{n,t}^{TIPS} - L_{n,t}) - y_{1,t}^{TIPS}$	1	0.31	0.37
$(b_{n,t} + L_{n,t}) - b_{1,t}$	.	1	0.07
$L_{n,t}$	.	.	1

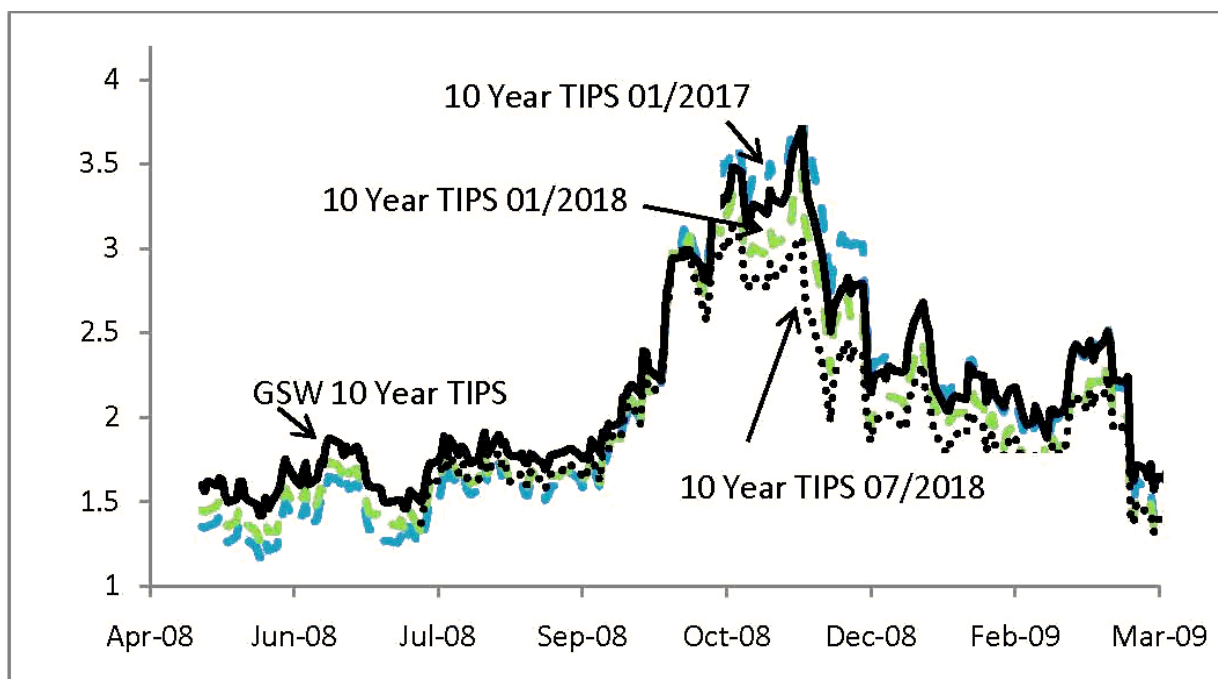


Figure A.1. Recently Issued and Less Recently Issued 10 Year TIPS. GSW 10 Year TIPS yields from Gurkaynak, Sack and Wright (2010); 10 Year TIPS maturing in 07/2018 (reference CPI 215.7), 01/2018 (reference CPI 209.5) and 01/2017 (reference CPI 201.7) from Bloomberg.