Flight-to-Liquidity and Global Equity Returns

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Links between stock & bond markets

- Through **volatility**:
  - Fleming et al. (1998), Scruggs & Glabadanidis (2003), Connolly et al. (2005) find strong volatility and market uncertainty impact on stock and bond returns.
- Not so strong through **macro factors**:
  - Shiller, and Beltratti (1992), Campbell & Ammer (1993), Li (2002), and Baele, Bekaert, and Inghelbrecht (2007) find that the existing levels of co-movement in stock and bond markets cannot be justified by economic fundamentals such as interest rates or inflation.
- Much stronger through **liquidity**:
  - Chordia, Sarkar, and Subrahmanyam (2005) Goyenko (2006), Goyenko & Ukhov (2007), and Baele, Bekaert, and Inghelbrecht (2007) find that illiquidity has a cross-market effect.

What we do

- Establish the link between the US Treasury illiquidity and global and local stock market illiquidity.
- Develop and test an international asset pricing model with global US Treasury bonds based illiquidity factor.
- Consider T-bond illiquidity as a proxy for a "flight-to-liquidity" /"flight-to-quality" risk around the world.

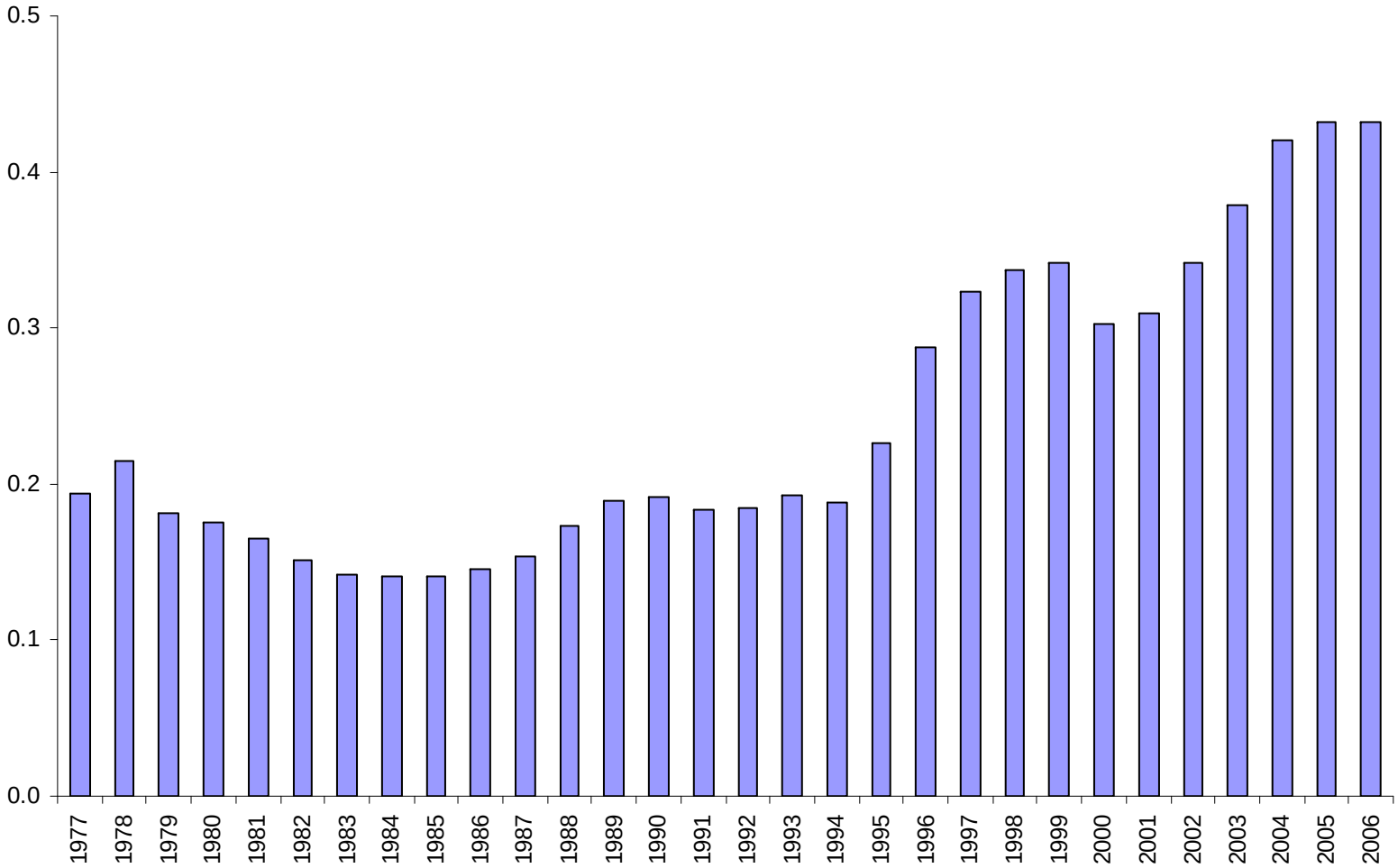
Asset allocation impact

- US Treasuries constitute one of the largest markets and trade around-the-clock and around-the-world.

- In market downturns, investors chase safest and most liquid securities such as US Treasures, increasing the liquidity premium of T-bonds (Longstaff, 2004).

- The allocation of funds to or from equity markets is not limited to financial crises but also occurs in response to daily market news (Goetzmann & Massa, 2002).

Foreign holdings of US Treasuries



Importance of interest rate based factors

- Most papers on global asset returns effectively assume segmentation of the stock and bond markets and so price equity returns using solely global and/or local stock market based risk factors.

- There are few exceptions:
  - Chen, Roll, & Ross (1986) find that default and term spreads are priced in the stock market.
  - Ferson & Harvey (1993) use US bond and T-bill returns in a set of global risk factors.
  - Scruggs (1998) shows that bond returns are important for explaining expected market returns.

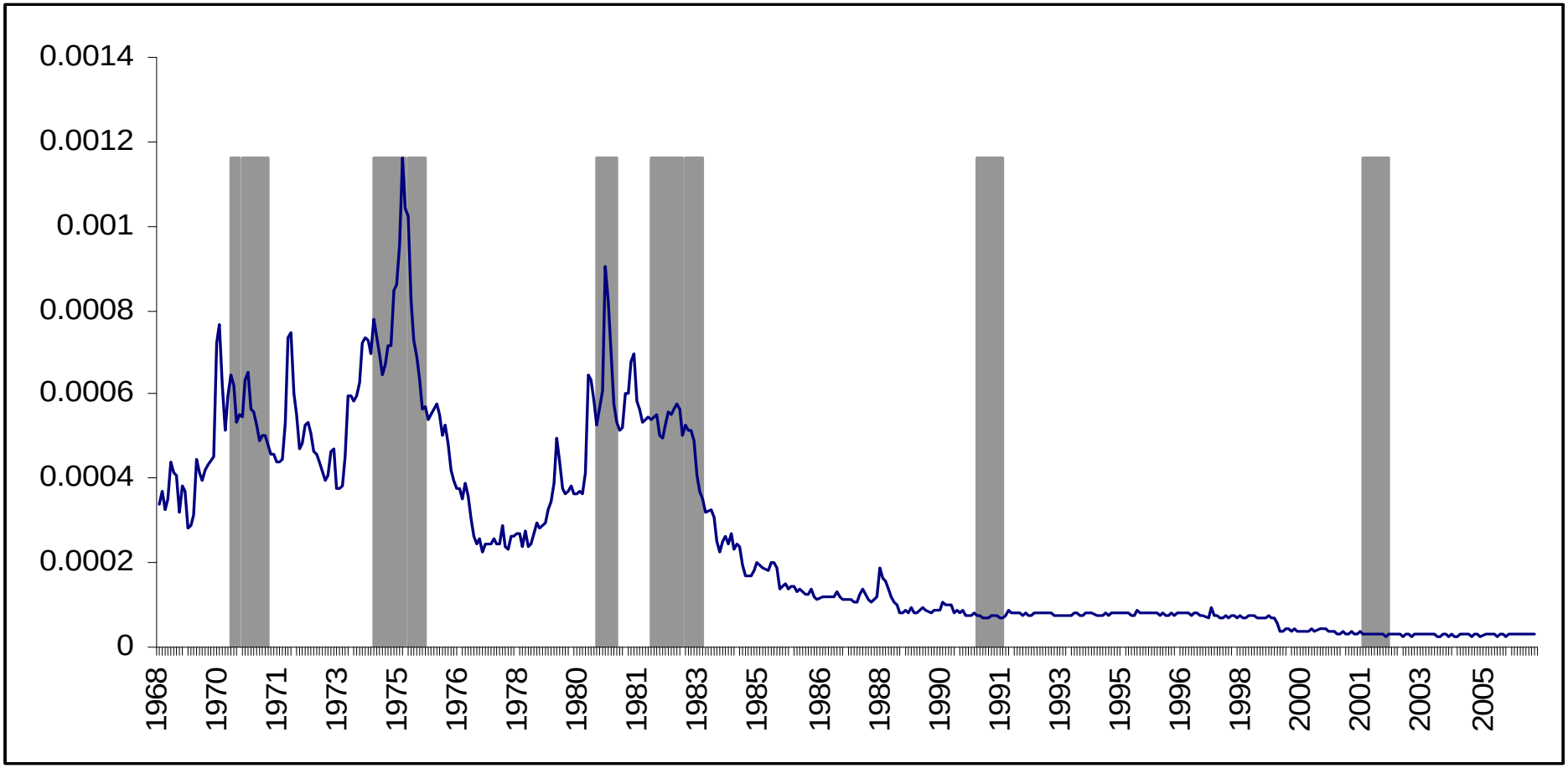
Main findings

- US Treasury bond illiquidity is a **predictor of stock market illiquidity around the world**.
- Bond illiquidity is a **predictor of equity returns** in both developed and emerging markets.
- Bond illiquidity is a **priced factor** even in the presence of other risks, such as the world and local market, exchange rate, and stock market illiquidity.
- The average annual **flight-to-liquidity risk premium** is between 0.35% and 0.75% depending on the model.

Data

- Cross-sectional sample:
  - 46 countries, where 23 are developed and 23 emerging.
- Time series sample:
  - The 30-year period of monthly data from 1977:01 to 2006:12.
- Flight-to-liquidity/quality proxy:
  - The average percentage bid-ask spread of off-the-run US T-bills with maturities of up to one year (Goyenko, Subrahmanyam, and Ukhov (2007)) .
  - GovPX intraday spreads (1992-2006)
- Stock market illiquidity:
  - The value-weighted proportion of zero daily returns across all firms in a given country during a month.

Off-the-Run Short-Term



Stock market & T-bond illiquidity

	$L_{w,t}$	$L_{w,t-1}$	$L_{i,t}$	$L_{i,t-1}$
$L_{B,t-1}$	0.1325^{*} (1.77)		0.2680^{***} (4.73)	
$L_{B,t}$		0.0007 (0.16)		0.0001 (0.29)

Stock market, T-bond illiquidity, & controls

	$L_{w,t}$	$L_{w,t}$	$L_{i,t}$	$L_{i,t}$
$L_{B,t-1}$	0.4822*	0.1714**	0.3094***	0.3107***
	(1.81)	(2.17)	(5.35)	(5.34)
$r_{w,t-1}$	-0.0060	-0.0028		
	(-0.19)	(-0.09)		
$\sigma_{w,t-1}$	0.5923	0.6497		
	(1.30)	(1.41)		
$r_{i,t-1}$			-0.0010	0.0001
			(-0.11)	(0.01)
$\sigma_{i,t-1}$			0.2911***	0.3107***
			(3.19)	(3.38)
FED_{t-1}		0.2194		0.3659**
		(1.10)		(2.28)
$TERM_{t-1}$		0.0177		0.0071
		(1.45)		(0.89)

T-bond illiquidity & policy variables

	(1)	(2)	(3)	(4)
$L_{w,t-1}$	-0.0027 (-0.58)	-0.0015 (-0.35)	-0.0020 (-0.45)	-0.0001 (-0.05)
$r_{w,t-1}$	-0.0031 (-0.82)	-0.0004 (-0.11)	-0.0001 (-0.04)	-0.0001 (-0.02)
$\sigma_{w,t-1}$	-0.1032* (-1.85)	-0.0729 (-1.32)	-0.0516 (-0.92)	-0.0338** (-2.06)
FED_{t-1}		0.0914*** (3.82)	0.0784*** (4.26)	0.0411* (1.82)
$TERM_{t-1}$		-0.0009 (-0.64)		
$DY_{w,t-1}$			0.0007** (2.00)	0.0001 (0.03)

Predictive regressions

Regression model	All Countries	Developed	Emerging
$r_{i,t-1}$	0.054***	0.058***	0.046*
	(3.11)	(3.84)	(1.86)
$DY_{i,t-1}$	4.154***	2.870***	4.560***
	(4.13)	(3.08)	(2.90)
$TERM_{t-1}$	0.019**	0.013*	0.034*
	(2.38)	(1.70)	(1.76)
$L_{B,t-1}$	-1.272***	-1.011***	-11.15***
	(-3.81)	(-3.25)	(-3.52)
$L_{i,t-1}$	-0.006	-0.018***	0.011
	(-0.82)	(-3.57)	(0.67)

Methodology: General framework

- If a country is fully integrated with the world, then:

$$E_{t-1}\left(r_{i,t}\right)=\lambda_w \operatorname{Cov}_{t-1}\left(r_{i,t},r_{w,t}\right)+\lambda_{LB} \operatorname{Cov}_{t-1}\left(r_{i,t},L_{B,t}\right)$$

- If a country is partially integrated with the world, then:

$$E_{t-1}\left(r_{i,t}\right)=\lambda_w \operatorname{Cov}_{t-1}\left(r_{i,t},r_{w,t}\right)+\lambda_{LB} \operatorname{Cov}_{t-1}\left(r_{i,t},L_{B,t}\right)+\lambda_i \operatorname{Var}_{t-1}\left(r_{i,t}\right)$$

- Extensions: addition of **foreign exchange rate** and **stock market illiquidity** factors.

Methodology: Practical considerations

- We estimate asset pricing models in **two stages**.
- First stage:
  - Use **multivariate GARCH(1,1)** and estimate conditional variances of equity market returns and their covariances with all risk factors depending on the model specification.
  - Market equity returns and risk factors are assumed to be linear functions of global and local information variables.
- Second stage:
  - Use **panel GMM** and estimate pricing moments across all countries (or country groups) and the world market.

Example of stage I estimation

- GARCH(1,1) estimation for the model that includes five risk factors: world market, T-bond illiquidity, currency, as well as local market and local stock market illiquidity.

$$r_{i,t} = \delta_{10} + \delta_{11} r_{i,t-1} + \delta_{12} DY_{i,t-1} + \delta_{13} TERM_{t-1} + \delta_{14} L_{B,t-1} + \delta_{15} L_{i,t-1} + e_{i,t}$$

$$r_{w,t} = \delta_{20} + \delta_{21} r_{wi,t-1} + \delta_{22} DY_{w,t-1} + \delta_{23} TERM_{t-1} + \delta_{24} L_{B,t-1} + \delta_{25} L_{w,t-1} + e_{w,t}$$

$$L_{B,t} = \delta_{40} + \delta_{41} \sigma_{w,t-1} + \delta_{42} FED_{t-1} + e_{LB,t}$$

$$r_{c,t} = \delta_{30} + \delta_{31} r_{c,t-1} + \delta_{32} FED_{t-1} + e_{c,t}$$

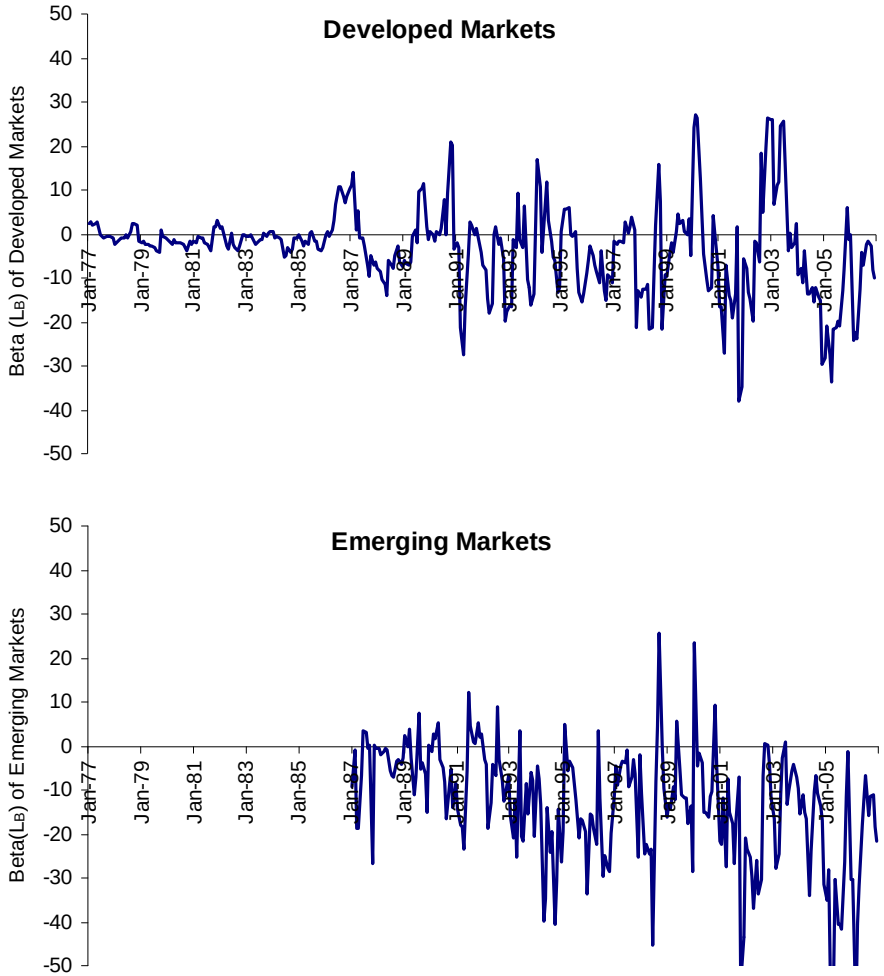
$$L_{i,t} = \delta_{50} + \delta_{51} L_{i,t-1} + \delta_{52} L_{B,t-1} + \delta_{53} r_{i,t-1} + \delta_{54} \sigma_{i,t-1} + e_{Li,t}$$

Example of stage II estimation

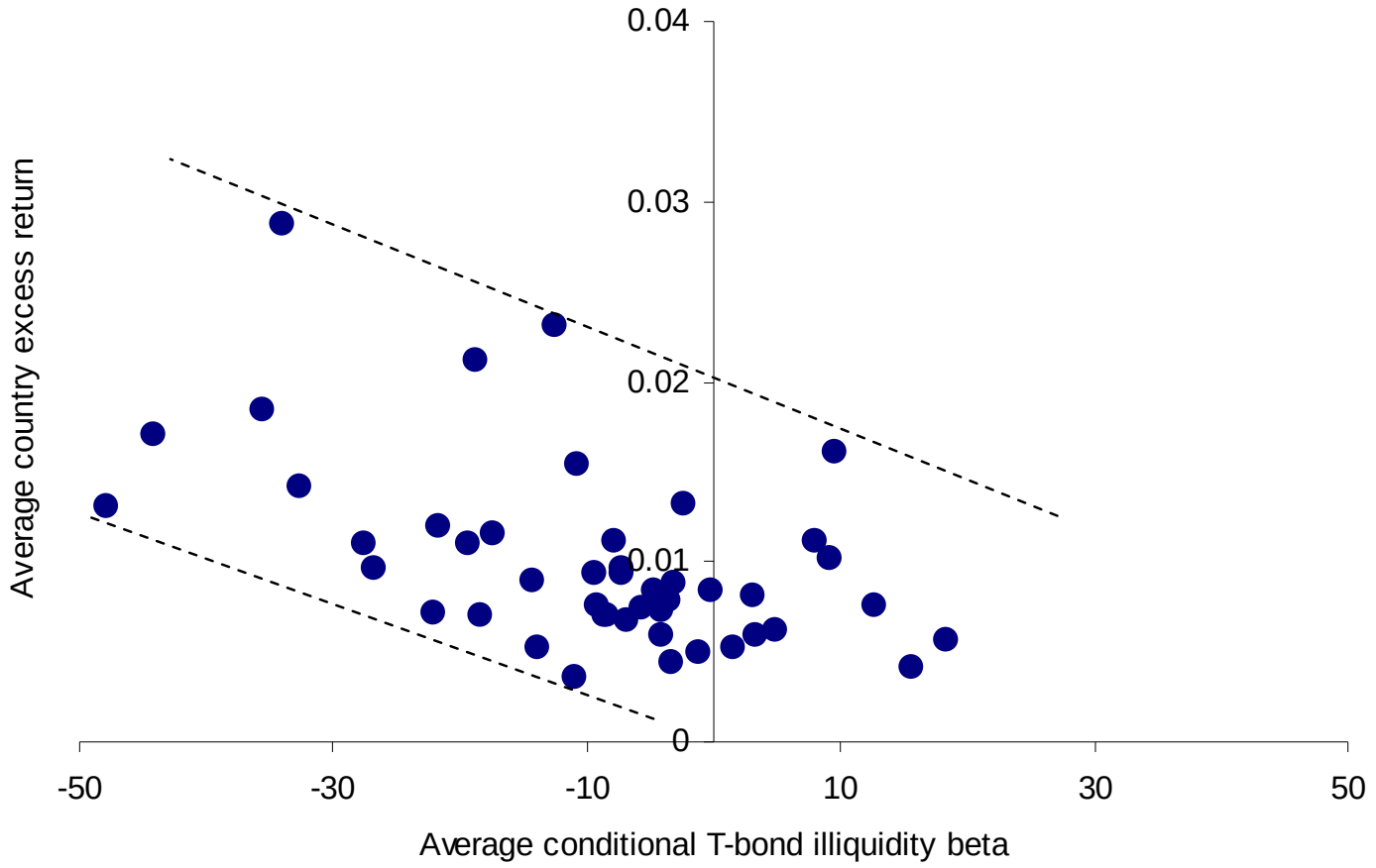
- GMM estimation for the model that includes five risk factors: world market, T-bond illiquidity, currency, as well as local market and local stock market illiquidity.

$$\zeta_{i,t} = r_{i,t} - \lambda_w \hat{\mathrm{Cov}}_{t-1}\left(r_{i,t}, r_{w,t}\right) - \lambda_{LB} \hat{\mathrm{Cov}}_{t-1}\left(r_{i,t}, L_{B,t}\right) - \lambda_c \hat{\mathrm{Cov}}_{t-1}\left(r_{i,t}, r_{c,t}\right) -$$
$$- \lambda_i \hat{\mathrm{Var}}_{t-1}\left(r_{i,t}\right) - \lambda_{Li} \hat{\mathrm{Cov}}_{t-1}\left(r_{i,t}, L_{i,t}\right)$$
$$\zeta_{w,t} = r_{w,t} - \lambda_w \hat{\mathrm{Var}}_{t-1}\left(r_{w,t}\right) - \lambda_{LB} \hat{\mathrm{Cov}}_{t-1}\left(r_{i,t}, L_{B,t}\right) - \lambda_c \hat{\mathrm{Cov}}_{t-1}\left(r_{i,t}, r_{c,t}\right) -$$
$$- \lambda_{Lw} \hat{\mathrm{Cov}}_{t-1}\left(r_{i,t}, L_{w,t}\right)$$

Conditional T-bond illiquidity beta



Country returns & T-bond illiquidity betas



Explaining T-bond illiquidity betas

	(1)	(2)	(3)	(4)	(5)	(6)
CORR	21.727**	-7.924				
	(2.31)	(-0.62)				
SIZE		6.233*			4.018	3.455
		(1.67)			(1.41)	(0.89)
LISTINGS		11.776***			8.392***	7.957**
		(3.90)			(3.16)	(2.72)
PE			23.997**		19.021	21.619*
			(1.91)		(1.57)	(1.77)
RATE			-17.721**		-7.530	-5.100
			(-2.29)		(-1.50)	(-0.98)
FREEDOM				0.633***		0.237
				(2.62)		(0.68)
LAW				-2.882		-8.142
				(-0.28)		(-0.91)
RMSE	14.24	12.93	13.24	13.95	12.17	12.30

Full integration models

	Parameters	All Countries	Developed	Emerging
Model 1FI	λ_W	4.361*** (5.09)	3.435*** (3.36)	3.682*** (3.10)
	λ_{LB}	-0.269** (-2.14)	-0.296** (-2.16)	-7.235*** (-3.48)
	p-value of J-stat	>0.999	0.877	>0.999
Model 2FI	λ_W	3.195*** (3.58)	2.557** (2.38)	3.146** (2.23)
	λ_{LB}	-0.294** (-2.02)	-0.329** (-2.09)	-8.401*** (-3.29)
	λ_C	-2.082 (-1.02)	-0.764 (-0.32)	4.034 (0.86)
	p-value of J-stat	>0.999	0.725	0.959

Partial integration models

	Parameters	All Countries	Developed	Emerging
Model 1PI	λ_w	4.067*** (3.98)	3.419*** (3.06)	4.113** (2.25)
	λ_{LB}	-0.467*** (-2.60)	-0.469** (-2.54)	-5.095** (-2.13)
	Ave λ_i	0.805 (1.43)	0.834 (1.39)	0.833 (1.23)
	p-value of J-stat	0.996	0.817	0.915
Model 2PI	λ_w	2.858*** (3.00)	2.966*** (2.82)	4.554** (2.52)
	λ_{LB}	-0.571*** (-2.76)	-0.437** (-2.02)	-0.783** (-2.09)
	Ave λ_i	3.771 (0.39)	0.571 (0.53)	-0.053 (-0.01)
	Ave λ_{Li}	-0.613 (-0.26)	-0.380 (-0.14)	-0.168 (-0.57)
	p-value of J-stat	>0.999	0.928	0.952

Conclusions

- Shifts in asset allocation strategies from less liquid assets around the world to more liquid and safe ones give the rise to the flight-to-liquidity/quality risk.
- The flight-to-liquidity/quality risk commands an economically and statistically significant premium across both developed and emerging countries.
- The higher (in absolute value) is the sensitivity of a country's equity market portfolio to the increase in the US T-bond illiquidity, the larger is its expected return.