Internet Appendix

accompanying the paper:

U.S. monetary policy transmission and liquidity risk premia around the world

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In this internet appendix, we use principal components analysis as an alternative way to study the degree of "commonality in liquidity risk premia" in the stock markets in our sample and we show that the first principal component is strongly related to the liquidity risk premium in U.S. markets. Furthermore, we show that our baseline results are similar when we rerun our panel regressions of the local liquidity risk premium in the markets in our sample on our measure for unexpected U.S. monetary policy shocks, our proxy for the "bank channel", as well as their interaction when including a host of additional control variables.

Appendix A. Supplementing Datastream Codes to Exclude Non-Common Stocks.

For markets outside the U.S., we manually exclude non-common stocks by examining the names of the individual stocks, as Datastream does not provide a code for discerning non-common shares from common shares.

We drop stocks with names including “REIT”, “REAL EST”, “ADR”, “GDR”, “PF”, “PREF”, or “PRF” as these terms may represent REITs, ADRs, GDRs, or preferred stocks. We drop stocks with names including “DUPLICATE”, “DUPL”, “WARRANT”, “WTS”, “DEBENTURE”, “RLST”, “ADS”, “RESPT”, “UNIT” (except for United Airlines, etc.), “TST”, “TRU.S.T”, “INCOME FD”, “INCOME FUND”, “UTS”, “RST”, “CAP.SHS”, “INV”, ‘INV TRU.S.T”, “HDG”, ‘UNIT TST”, “UNIT TRU.S.T”, “BOND FUND”, “SBVTG”, “VTG.SAS”, “GW.FD”, “RTN.INC”, “VCT”, “ORTF”, “HI.YIELD”, ‘YIELD”, “YLD”, “PARTNER”, ”HIGH INCOME”, “INC.&GROWTH”, and “INC.&GW” due to various special features.

Following Griffin et al. (2010), we also applied industry selection criteria by excluding financial firms using the Datastream industry codes of “ITSPL”, “ITPEQ”, ”INVNK”, “ITINT”, “UNITS”, “RLDEV”, “CURFD”, “COMUT”, “INSPF”, “OFFSH”, “INVTO”, “PRPUT”, “OEINC”, “ITVCT”, “EXTRF”, “RITIO”, “RITRT”, “RITRS”, “RITDV”, “RITSP” , “RITMG”, “RITHL”, “ITHSI”, “RLSRV”, “MUTFS”, “PENSF”, “HEDGE”, “MMFDS”, and “ITSPL”.

For the U.S., we use the CRSP share codes 10 and 11 to extract common shares.

Appendix B. Principal components analysis of commonality in liquidity risk premia.

In Table 3 of the paper, we assess the degree of commonality in the time-variation in liquidity risk premia in the markets in our sample using time-series regressions of the local liquidity risk premia on the U.S. and global liquidity risk premium. Here, we pursue a different avenue to evaluate the degree of commonality in liquidity risk premia. In particular, we measure the intensity of common global co-variation in these liquidity risk premia by means of a principal components analysis (PCA).

Since we have an unbalanced panel of liquidity risk premia across countries, handling missing observations is an important issue in extracting the principal components (PCs). We use the expectations maximization (EM) algorithm developed by Stock and Watson (2002) to cope with this issue. The details of the procedure are as follows. First, we fill the missing observations using the unconditional mean of non-missing liquidity risk premia across countries in that month. Then, we obtain the principal components of the premia across countries in this balanced panel with missing values filled with the initial value of unconditional mean of premia. Subsequently, we regress the liquidity premium on the first N PCs obtained in the previous step. The number of PCs, N, is chosen such that the proportion of variation of the premium explained by the PCs should be larger than 50%. With the estimated coefficient in hand, we project the missing premium as a combination of estimated coefficients and the non-missing PCs. We repeat the procedure until the subsequent PC estimates are sufficiently close, the degree being measured by the sum of the squared prediction errors, to those obtained in the previous iteration.

Table IA1 shows the proportion and the cumulative proportion of the variation in liquidity risk premia, obtained from equally-weighted (EW; Panel A) and value-weighted (VW; Panel B) portfolios, explained by the N^{th} principal component obtained in the Stock and Watson procedure. In both panels, we see that the first PC (PC1) explains about 20% of the variation in the liquidity risk premium across countries and the first seven PCs explain more than 50% of the variation, implying the presence of considerable commonality in liquidity risk premia around the world.

Figure IA1 shows the dynamics of the first PC (PC1), obtained using the EM algorithm of Stock and Watson (2002), across the liquidity premia in the 43 markets in our sample over 1995-2013. To reduce noise, we plot the six-month moving average of the principal component based on the EW and VW liquidity risk premia. Consistent with Figure 1 of the paper, we observe large fluctuations in the first principal component over the sample period and spikes in the first principal component coincide with the several well-known events in global financial markets.

To examine which market's liquidity risk premium is most strongly related to the common variation captured by the first principal component, Table IA2 shows the Pearson correlations of the liquidity risk premium in each of the 43 markets in our sample with the first principal component. Markets are sorted based on the rank by correlation in column (1), from high to low. For both EW and VW returns, the liquidity risk premium for the NYSE and Nasdaq show the highest correlations with the first principal component. The correlations of the NYSE liquidity risk premium with the first principal component are above 0.80 and those of the Nasdaq liquidity risk premium are above 0.7. These substantial correlations hint at a possible central role of U.S. markets in driving commonality in liquidity risk premia around the world. We further observe in Table IA2 that markets whose liquidity risk premium is highly correlated with the first principal component are mostly from developed countries, while the liquidity risk premia in emerging markets show relatively low correlations with the first principal component.

Appendix C. Assessing the effect of U.S. monetary policy shocks on liquidity risk premia with additional controls

Table IA3 shows the results of panel regressions of the local liquidity risk premium in the non-U.S. markets in our sample on the FFF measure as well as the FFF measure interacted with U.S. bank claims. The panel regressions include country fixed effects as well as a number of additional control variables compared to Table 7 of the paper. Like in Table 7, Panels A, B, and C of Table IA3 present the results for, respectively, the liquidity risk premium, the returns of high liquidity risk stocks, and the returns of low liquidity risk stocks (both EW and VW in each panel). The results are discussed in Section 5.1 of the paper.

References

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Lustig, H., Roussanov, N., Verdelhan, A., 2011. Common risk factors in currency markets. *Review of Financial Studies* 24, 3731-3777.

Stock, J.H., Watson, M.W., 2002. Forecasting using principal components from a large number of predictors. *Journal of the American Statistical Association* 97, 1167-1179.

Table IA1. Principal components in liquidity risk premia

This table shows the proportion as well as the cumulative proportion of the variation in the liquidity risk premium in local stock markets explained by the N^{th} principal component (PC). The monthly local market liquidity risk premium in each of the 43 markets in the sample is defined as the difference in the returns of portfolios of stocks with high and low liquidity risk (in US$ and in % per month; see Table 2 of the paper). Principal components are extracted using the EM algorithm of Stock and Watson (2002) in an unbalanced panel of liquidity risk premia across markets. The proportion are reported as a fraction between 0 and 1, where 1 indicates 100% of the variation explained. Panel A and Panel B report the results based on, respectively, the equally-weighted (EW) and the value-weighted (VW) average liquidity risk premia.

Panel A. Principal components in EW liquidity risk premia			**Panel B. Principal components in VW liquidity risk premia**		
N^{th} PC	Proportion	Cumulative Proportion	N^{th} PC	Proportion	Cumulative Proportion
1	0.199	0.199	1	0.194	0.194
2	0.083	0.282	2	0.074	0.268
3	0.059	0.341	3	0.064	0.331
4	0.049	0.390	4	0.049	0.380
5	0.043	0.433	5	0.047	0.427
6	0.042	0.475	6	0.046	0.472
7	0.037	0.512	7	0.041	0.514
8	0.036	0.547	8	0.035	0.548
9	0.029	0.577	9	0.029	0.577
10	0.026	0.603	10	0.025	0.602

Table IA2. Pearson correlations of liquidity risk premia with the first principal component

This table shows the Pearson correlation of the liquidity risk premium in each of the 43 stock markets in our sample with the first principal component (PC1), extracted using the EM algorithm of Stock and Watson (2002) in an unbalanced panel of liquidity risk premia across markets (See Table IA1). The monthly local market liquidity risk premium is defined as the difference in the returns of portfolios of stocks with high and low liquidity risk (in US$ and in % per month; see Table 2 of the paper). The first (second) column shows the Pearson correlation of the equally-weighted or EW (value-weighted or VW) local liquidity risk premium with the first principal component extracted from the EW (VW) liquidity risk premia across all markets. The final two columns show the rank of the correlation in column (1) and (2), respectively. The markets are sorted on the rank based on the correlation in column (1). *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Correlation of EW liquidity risk premium with PC1 (1)	Correlation of VW liquidity risk premium with PC1 (2)	Rank by (1)	Rank by (2)
U.S.: NYSE	0.83 ***	0.86 ***	1	1
U.S.: Nasdaq	0.72 ***	0.74 ***	2	2
Switzerland	0.69 ***	0.65 ***	3	4
Japan	0.59 ***	0.57 ***	4	8
Singapore	0.58 ***	0.55 ***	5	10
Spain	0.58 ***	0.54 ***	6	11
Belgium	0.57 ***	0.45 ***	7	19
Australia	0.57 ***	0.52 ***	8	13
Malaysia	0.55 ***	0.47 ***	9	16
Germany	0.52 ***	0.62 ***	10	5
Netherlands	0.51 ***	0.69 ***	11	3
Sweden	0.50 ***	0.52 ***	12	12
Hong Kong	0.50 ***	0.46 ***	13	18
France	0.49 ***	0.38 ***	14	25
Canada	0.49 ***	0.60 ***	15	6
India	0.47 ***	0.56 ***	16	9
Taiwan	0.44 ***	0.45 ***	17	21
Thailand	0.44 ***	0.45 ***	18	20
Turkey	0.44 ***	0.18 **	19	36
U.K.	0.43 ***	0.46 ***	20	17
Greece	0.41 ***	0.38 ***	21	26
Norway	0.40 ***	0.40 ***	22	22
Denmark	0.40 ***	0.51 ***	23	14
Austria	0.39 ***	0.38 ***	24	24
Italy	0.37 ***	0.36 ***	25	27
Brazil	0.36 ***	0.59 ***	26	7
Philippines	0.36 ***	0.30 ***	27	29
Ireland	0.33 ***	0.17 *	28	38
Israel	0.33 ***	0.48 ***	29	15
Poland	0.32 ***	0.31 ***	30	28
Finland	0.32 ***	0.24 ***	31	32
Indonesia	0.30 ***	0.21 ***	32	33
Argentina	0.29 ***	0.26 ***	33	31
South Africa	0.28 ***	0.39 ***	34	23
South Korea	0.26 ***	0.26 ***	35	30
Peru	0.21 *	0.20 *	36	34
Chile	0.15 **	0.07	37	40
Mexico	0.13 *	0.08	38	39
Pakistan	0.11	0.03	39	43
Sri Lanka	0.10	0.18 **	40	35
Portugal	0.07	0.17 **	41	37
New Zealand	0.01	0.04	42	42
China	-0.05	0.05	43	41

Table IA3. Robustness: U.S. monetary policy shocks and local market liquidity risk premia with additional control variables

This table shows the results of panel regressions of the liquidity risk premium in the stock markets in our sample (excluding NYSE and Nasdaq) on U.S. monetary policy shocks interacted with excess claims of U.S. banks on the country of interest over the period 1995:01-2013:12. The dependent variable in Panel A is the monthly local market liquidity risk premium in each of the 41 markets, defined as the difference in the returns of portfolios of stocks with high and low liquidity risk (in US$ and in % per month; see Table 2 of the paper). The dependent variable in Panel B (Panel C) is the monthly return of the portfolio of stocks with high (low) liquidity risk. The key independent variable is the contemporaneous monthly change in the Federal Funds futures rate (ΔFFF), defined as the cumulative change in the implied Federal Funds futures (FFF) rates around FOMC meetings held within the month (in %; see Table 4 of the paper). The interaction variable to assess the "bank channel" is the excess claims of U.S. banks on the country of interest, defined as the consolidated claims, on immediate borrower basis, of U.S. banks on each country, obtained from Table B4 of the Bank for International Settlements (in US$b.; see Table 6 of the paper). This variable is de-trended by regressing it on a time trend over the sample period for each country and the data of most recent past quarter is matched with the current month liquidity risk premium. All panel models further include the following control variables: the local market return, volatility, and illiquidity (see Table 1 of the paper); the global as well as U.S. market (MKT-Rf), size (SMB), value (HML) and momentum (WML) factors from Ken French's website; the U.S. default spread (in %) defined as the difference between Moody's Baa and Aaa corporate bond yields from FRED; the U.S. term spread (in %) defined as the difference between the 3-month AA non-financial commercial paper rate and the 3-month Treasury Bill rate from FRED; the change in U.S. industrial production (in %) defined as the monthly change in the industrial production index from the FRB; the local interest rate (%) defined as the base rate or target rate of each country; the dollar risk factor and the carry trade risk factor from Lustig et al. (2011); U.S. portfolio flows from TIC (see Table 7 of the paper); gross capital flow / GDP defined as the sum of the gross purchases and sales of foreign stocks by foreigners to/from US from TIC, divided by GDP; the capital control (overall) and capital control (equity) indicators from Fernández et al. (2015) defined as, respectively, an overall capital restrictions and an equity flow restrictions index ranging from 0 (no restriction) to 1 (strong restriction).All panel models include country fixed effects. Panels A, B, and C each report the following results based on both the equally-weighted (EW) and the value-weighted (VW) average liquidity risk premia and returns of the high and low liquidity risk portfolios: coefficients, *t*-statistics based on standard errors that are clustered by country and month (in italics below the coefficients), adjusted R^2, the number of country-month observations, and the number of countries included in the panel models. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table IA3 – continued

	Panel A. Liquidity risk premium (High-Low)		Panel B. High liquidity risk portfolio return		Panel C. Low liquidity risk portfolio return	
	EW	VW	EW	VW	EW	VW
ΔFFF (in %)	-5.520 ***	-4.821 **	-3.632	-3.020	1.888	1.801
	-3.39	*-2.40*	*-1.50*	*-1.39*	*0.73*	*0.84*
U.S. bank claims	-0.002	-0.004	0.004	0.002	0.006	0.006
	-0.48	*-1.13*	*0.95*	*0.54*	*1.29*	*1.39*
ΔFFF × U.S. bank claims	-0.226 ***	-0.239 **	-0.097 **	-0.091	0.129 **	0.148 ***
	-3.23	-2.25	-2.28	-1.28	2.34	2.95
Local market return	0.191 ***	0.192 ***	0.926 ***	0.954 ***	0.735 ***	0.763 ***
	4.23	*3.88*	*12.80*	*12.36*	*13.53*	*12.21*
Local market volatility	0.561	0.595	0.561	0.506	0.000	-0.089
	1.36	*1.16*	*0.93*	*0.89*	*0.00*	*-0.42*
Local market illiquidity	-0.256	0.528	-4.008 ***	-2.783 ***	-3.752 ***	-3.310 ***
	-0.30	*0.60*	*-4.01*	*-3.16*	*-4.52*	*-4.47*
Global MKT-Rf	0.195 *	0.189	0.128	0.159	-0.066	-0.031
	1.67	*1.28*	*0.77*	*0.87*	*-0.66*	*-0.28*
Global SMB	0.374 ***	0.343 **	1.188 ***	0.925 ***	0.814 ***	0.582 ***
	2.81	*2.47*	*6.42*	*5.87*	*8.36*	*7.57*
Global HML	-0.041	-0.133	0.178	0.064	0.219 **	0.198 **
	-0.40	-1.13	1.20	0.50	2.06	2.32
Global WML	0.005	-0.035	-0.106	-0.153 **	-0.110 **	-0.119 **
	0.07	*-0.42*	*-1.28*	*-2.01*	*-2.12*	*-2.41*
U.S. Mkt-Rf	-0.031	0.006	0.137	0.097	0.167 *	0.090
	-0.28	*0.05*	*0.92*	*0.63*	*1.96*	*1.15*
U.S. SMB	-0.101	-0.053	-0.392 ***	-0.269 ***	-0.291 ***	-0.216 ***
	-1.55	*-0.69*	*-4.67*	*-3.45*	*-6.78*	*-5.78*
U.S. HML	0.036	0.078	-0.037	0.014	-0.073	-0.064
	0.58	*1.09*	*-0.41*	*0.19*	*-1.29*	*-1.61*
U.S. WML	-0.091 *	-0.070	-0.053	-0.006	0.039	0.064 *
	-1.77	*-1.16*	*-0.92*	*-0.10*	*0.99*	*1.75*
U.S. default spread	0.822 **	0.857 **	0.823 **	0.807 **	0.001	-0.049
	2.57	*2.43*	*2.05*	*2.27*	*0.01*	*-0.24*
U.S. term spread	-0.149 *	-0.220 **	-0.229 *	-0.280 **	-0.080	-0.060
	-1.65	*-2.25*	*-1.70*	*-2.55*	*-0.76*	*-0.65*
Δ U.S. IP (%)	-0.010	-0.018	-0.063	-0.057	-0.053	-0.039
	-0.19	*-0.35*	*-0.95*	*-0.95*	*-1.11*	*-1.07*
Local interest rate	0.001	-0.001	-0.138 ***	-0.129 ***	-0.139 ***	-0.128 ***
	0.03	*-0.03*	*-3.05*	*-3.28*	*-7.03*	*-6.55*
Dollar risk factor	-0.337 ***	-0.250 **	-0.064	-0.039	0.273 ***	0.211 ***
	-3.75	*-2.25*	*-0.70*	*-0.39*	*3.91*	*2.92*
Carry trade risk factor	0.062	0.054	0.203 **	0.158 *	0.141 ***	0.104 ***
	1.00	*0.70*	*2.33*	*1.88*	*2.85*	*2.90*
U.S. portfolio flows	0.003	0.003	-0.002	-0.001	-0.006 ***	-0.003 **
	1.36	*1.03*	*-0.86*	*-0.35*	*-3.39*	*-2.12*
Gross U.S. capital flows	-1.810 **	-1.803 ***	-1.986 ***	-1.595 **	-0.176	0.208
	-2.40	*-3.13*	*-2.87*	*-2.40*	*-0.17*	*0.37*
Capital control (overall)	0.091	1.207	-0.490	0.320	-0.581	-0.886
	0.10	*0.87*	*-0.42*	*0.27*	*-0.60*	*-0.94*
Capital control (equity)	0.283	-0.520	0.090	-0.460	-0.193	0.060
	0.38	*-0.44*	*0.07*	*-0.37*	*-0.20*	*0.07*
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2 (%)	15.7	15.1	65.5	68.9	65.0	68.8
# Obs.	4,870	4,870	4,870	4,870	4,870	4,870
# Countries	39	39	39	39	39	39

Figure IA1. The first principal component of liquidity risk premia across markets

The figure shows the six-month moving average of the first principal component, extracted using the EM algorithm of Stock and Watson (2002), across the liquidity risk premia in the 43 markets in our sample over the period 1990:01-2013:12. The monthly local market liquidity risk premium is defined as the difference in the returns of portfolios of stocks with high and low liquidity risk (in US$ and in % per month; see Table 2 of the paper). The figure shows both the principal component extracted from the equally-weighted (EW) and the value-weighted (VW) liquidity risk premia.