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

G. Andrew Karolyi, Kuan-Hui Lee, and Mathijs A. van Dijk*

April 2019

Abstract

We uncover a link between U.S. monetary policy and liquidity risk premia in stock markets around the world. Liquidity risk premia vary considerably over time and strongly co-move across countries. They are significantly lower when U.S. monetary policy tightens. A positive shock to the Federal Funds futures rate of 10 basis points is associated with a 41 basis points decline in the liquidity risk premium. This effect is concentrated among high liquidity risk stocks and is more acute when the foreign claims by U.S. banks on the country of interest are unusually high. Overall, our results indicate that U.S. monetary policy shocks affect the pricing of liquidity risk around the world and highlight the importance of a "bank channel" in the transmission of these shocks.

Keywords: Monetary policy, liquidity risk premia, cross-border bank credit, portfolio flows

JEL Codes: G21; G28; G34; G38.

* Karolyi is at the Cornell SC Johnson College of Business, Cornell University; Lee is at Seoul National University Business School; van Dijk is at the Rotterdam School of Management, Erasmus University. E-mail addresses: gak56@cornell.edu, kuanlee@snu.ac.kr, and madijk@rsm.nl. Lee appreciates financial support from the Institute of Management Research and the Institute of Finance and Banking at Seoul National University. We thank Geert Bekaert, Thiago de Oliveira Souza, Matthias Hanauer, Ulf Nielsson, Francisco Palomino, Julienne Penasse, Per Strömberg, and seminar participants at Erasmus University, HEC Paris, Seoul National University, Technical University Munich, the 2017 European Finance Association Meetings (Mannheim, Germany), and the 2nd SDU Finance Workshop (Odense, Denmark) for valuable comments. Lee acknowledges that this work was supported by the Institute of Management Research and the Institute of Finance and Banking at Seoul National University.

1. Introduction.

The asset pricing literature has produced abundant evidence on the pricing of liquidity as a characteristic and also as a systematic risk factor in stock markets in the U.S. (Amihud and Mendelson, 1986; Brennan and Subrahmanyam, 1996; Amihud, 2002; Pástor and Stambaugh, 2003; Acharya and Pedersen, 2005) and around the world (Lee, 2011; Amihud, Hameed, Kang, and Zhang, 2015). We also know that there is substantial time-variation in the illiquidity premium as well as in the liquidity risk premium in the U.S. stock market (Jensen and Moorman, 2010; Watanabe and Watanabe, 2008) and considerable common time-variation in illiquidity premia across international stock markets (Amihud, Hameed, Kang, and Zhang, 2015). However, the economic determinants of such time- and cross-country variation remain less well understood. We contribute to this literature by investigating whether (common) variation in liquidity risk premia around the world is systematically linked to macroeconomic forces; specifically, through changes in monetary conditions associated with shifts in U.S. Federal Reserve policy.

Jensen and Moorman (2010) were the first to uncover an important role for U.S. monetary policy in driving time-variation in the U.S. illiquidity premium. They find that a tightening of U.S. monetary policy is associated with a drop in the price of illiquid stocks relative to liquid stocks (consistent with a flight to liquidity), and thus a contemporaneous reduction in the realized illiquidity premium. Other research suggests that U.S. monetary policy not only affects investors' preferences for illiquid versus liquid stocks (and thus the illiquidity premium), but also their degree of risk aversion and thus the pricing of risk (Bekaert, Hoerova, and Lo Duca, 2013; Borio and Zhu, 2012). This is the case not only in the U.S. but also in stock markets around the world (Ehrmann and Fratzscher 2009; Ammer, Vega, and Wongswan, 2010). Based on this body of evidence, we hypothesize whether U.S. monetary policy conditions also influence investors' preferences for high versus low liquidity risk stocks in international stock markets and, if so, how much it can explain of the common variation in liquidity risk premia around the world.

Our paper is inspired to take this argument one step further into the global arena by the recent work of Bruno and Shin (2015a, 2015b), which builds a theoretical framework for the role of the international banking system in the propagation of funding liquidity shocks. Bruno and Shin's (2015b) "double-decker" model of global banks has local banks borrow from global banks to lend to local borrowers, while global banks finance such cross-border bank lending by tapping U.S. dollar-denominated money market funds. Combined, these model features generate a "bank channel" in which cross-border bank credit plays a central role in propagating funding liquidity shocks. In particular, a key prediction of their model is that when the U.S. interest rates rise – for example, stemming from a tightening of U.S. monetary policy – there are spillover effects on global financial conditions because of diminished cross-border bank credit from global to local banks and thus tighter funding liquidity conditions in the target countries of those bank claims.

Bruno and Shin (2015a) propose that this bank channel can explain how the propagation of U.S. monetary policy tightening across borders reduces the willingness of market participants to take on risk exposures in other markets (consistent with Bekaert, Hoerova, and Lo Duca, 2013; Borio and Zhu, 2012) through the tightening of local funding conditions. They find reliable evidence that a contractionary shock to U.S. monetary policy is associated with a decrease in cross-border bank capital flows to a target country, as Bruno and Shin's theory predicts. What they do not examine is whether this tightening of funding conditions in the target country that arises through their bank channel results in a repricing of liquidity risk among locally-traded securities. We seek to investigate that link in this paper.

Of course, we acknowledge that there may be alternative channels through which U.S. monetary policy shocks can affect the pricing of stocks in international equity markets. After all, the impact of monetary policy on investors' risk aversion can influence cross-border portfolio flows directly. Recent studies by Chari, Stedman, and Lundblad (2017) and Karolyi and McLaren (2017) offer just such evidence for emerging market stocks during the "taper tantrum" period in 2013 when the Federal Reserve announced the beginning of the end of their quantitative-easing program. Our paper complements these studies by offering that the bank channel may very well be the linchpin that connects U.S. monetary policy transmission and the repricing of liquidity risk in overseas markets. To give additional power to our inferences, we test for an alternative "portfolio channel" by examining whether portfolio flows involving U.S. residents and their positions in foreign markets around also shifts in U.S. monetary policy are linked to liquidity risk premia around the world. We find no evidence for a portfolio channel.

We build our evidence in three steps. First, we measure liquidity risk premia over time and for a large number of stock markets around the world. In particular, we construct monthly estimates of the local market liquidity risk premium using daily Datastream data on 35,389 individual stocks from 43 developed and emerging stock markets over 1995-2013. For each market, we first compute a monthly, market-wide measure of stock market liquidity as the value-weighted average across individual stocks' average daily Amihud (2002) liquidity within a given month. Then, in the spirit of Pástor and Stambaugh (2003), we compute the covariance of an individual stock's return with innovations in market liquidity as the measure of its liquidity risk (i.e., its "liquidity beta"). Subsequently, we sort stocks into portfolios each year based on their size and liquidity risk, and compute the monthly liquidity risk premium as the return on the high liquidity risk portfolio minus the return on the low liquidity risk portfolio equally across size portfolios.

We note that our country-level time-series of the liquidity risk premium represent *ex post* measures of the realized liquidity risk premium (as opposed to *ex ante* measures of the expected liquidity risk premium). We would thus expect an increase in the price of risk (for example, stemming from an decrease in risk-bearing capacity due to a monetary policy tightening) to be associated with a contemporaneous *reduction* in the ex post realized liquidity risk premium, as the price of high liquidity risk stocks falls relative to the price of low liquidity risk stocks. This sequence is consistent with a flight to safety.

In line with prior studies (among others, Lee, 2011), we find little evidence that the unconditional liquidity risk premium across markets is reliably different from zero. The cross-country average across the 43 markets in our sample of the unconditional value-weighted local liquidity risk premium is close to zero. But the unconditional average liquidity risk premium for individual countries varies dramatically from -78 basis points per month for Australia to 84 basis points for Mexico, and it is equal to 10 basis points for Nasdaq and 42 basis points for the NYSE. Further, we document considerable time-variation in the liquidity risk premium across markets. The typical market among the 43 markets in our sample reveals a time-series standard deviation of the monthly liquidity risk premium of a striking 5.7% per month. Consider, as an illustration, that although the unconditional liquidity risk premium is positive for the NYSE (albeit not statistically significant), low liquidity risk stocks regularly outperform high liquidity risk stocks by as much as 10% in some key months (for example, in October 2008 during the global financial crisis period). Conversely, the return spread between high- and low-liquidity risk stocks can assume large positive values in certain months for the NYSE; most notably, by over 30% in April 2009. We observe similarly volatile patterns for other markets during our period of analysis.

The patterns observed in the time-varying liquidity risk premia of individual markets do not appear to be random. These risk premia tend to spike around significant global events affecting financial markets, such as the 1997 Asian financial crisis, the 1998 Long-Term Capital Management (LTCM) crisis, the 2000 burst of Dotcom bubble, the 2008-2009 global financial crisis, and the 2010-2012 Euro area sovereign debt turmoil. The spikes in the liquidity risk premia during the 2008-2009 period are particularly pronounced for most developed markets, while many emerging markets show similar patterns of elevated volatility in liquidity risk premia around the Asian and LTCM crises.

We proceed to investigate the degree of co-movement in the liquidity risk premium across markets over time, what we call "commonality in liquidity risk premia" – a concept closely related to the work of Amihud, Hameed, Kang, and Zhang (2015). We run regressions of the local market liquidity risk premium in each of the countries in our sample on the global aggregate liquidity risk premium as well as the U.S. liquidity risk premium. We document significant co-movement in local market liquidity risk premia with global and U.S. liquidity risk premia. The coefficients on the global and U.S. liquidity risk premia are positive, often statistically significant, and they imply large economic magnitudes. These findings are suggestive of a considerable degree of cross-country commonality in liquidity risk premia and they hint that U.S. markets may play a special role in guiding it.

The second step in the analysis involves our main hypothesis that an unexpected tightening of U.S. monetary policy is associated with a drop in funding liquidity and risk-bearing capacity in many local markets around the world, which lowers the price of high liquidity risk stocks relative to the price of low liquidity risk stocks in those markets, and thus contemporaneously reduces the liquidity risk premium. To measure unexpected shifts in U.S. monetary policy, we adopt techniques from Kuttner (2001), Bernanke and Kuttner (2005), Gürkaynak, Sack, and Swanson (2005), and Gertler and Karadi (2015) to measure monetary policy surprises using event studies around meetings of the Federal Open Market Committee (FOMC). In particular, we use the change in the implied Federal Funds futures (FFF) rates around FOMC meetings as our main measure for U.S. monetary policy surprises, where an increase (decrease) in the implied rate represents a tightening (easing) of monetary policy. We refer to this as the "FFF measure" in the remainder of the paper. The main advantage of the FFF measure relative to other commonly-used measures of monetary policy (such as changes in the Federal Funds target rate itself, as in Jensen and Moorman, 2010) is that it is a market-based measure designed to pick up unexpected changes in *de facto* monetary policy as well as potential "forward guidance," a term that is used to reflect the type of communication that has increasingly been used by the Federal Reserve to guide market beliefs about the path of short-term rates (Gürkaynak, Sack, and Swanson, 2005).

We estimate panel regression models of the monthly liquidity risk premia across the 43 markets in our sample on the FFF measure. We estimate these models separately for value-weighted and equally-weighted liquidity risk premia and the specifications include country fixed effects, local market returns, volatility, and levels of illiquidity, as well as global market, size, value, and momentum factors as control variables. We find that the coefficient on the FFF measure is reliably negative and statistically significant for both value-weighted and equally-weighted liquidity risk premia. That is, liquidity risk premia tend to be lower (higher) in months of tightening (loosening) U.S. monetary policy. The economic magnitudes implied by the coefficients are substantial. A positive shock to the implied Federal Funds futures rate of 10 basis points is associated with a reduction in the value-weighted (equally-weighted) liquidity risk premium of 41 (48) basis points.

This effect is concentrated among the high liquidity risk stocks in a country. In similar panel models of the returns of the high and low liquidity risk stocks separately on the FFF measure and the same set of control variables, we obtain a large and statistically significant negative coefficient on the FFF measure for high liquidity risk stocks, and only a small and insignificantly positive coefficient for low liquidity risk stocks. This finding suggests that a tightening of U.S. monetary policy affects liquidity risk premia on stock markets around the world primarily by associating declines in the prices of stocks with larger exposures to liquidity risk (consistent with a flight away from risky securities). The insignificant effect on the price of low liquidity risk stocks may indicate that perhaps other securities than low liquidity risk stocks serve as safe havens for investors shunning high liquidity risk stocks in times of U.S. monetary policy tightening.

The third step in our analysis pursues the additional hypothesis that the global lending activity of U.S. banks is a key channel through which U.S. monetary policy affects liquidity risk premia in stock markets around the world. Since globally active U.S. banks play an important role in extending credit to many countries (Cetorelli and Goldberg, 2012b) and since their activities are likely to be directly affected by the U.S. monetary policy stance (Cetorelli and Goldberg, 2012a; Bruno and Shin, 2015a), they represent a potentially important channel through which U.S. monetary policy can influence the funding liquidity and risk-bearing capacity in local stock markets outside the U.S. We thus expect the negative effects of a tightening of U.S. monetary policy on local liquidity risk premia to be more acute when the foreign claims of U.S. banks on the country of interest are relatively larger. To this end, we obtain quarterly data on the consolidated claims of U.S. banks on individual countries over the period 1995-2013 from the Bank for International Settlements (BIS). We assess whether U.S. bank claims on a given country are unusually high in a given month by considering the deviation of the bilateral foreign claims in the respective quarter from the long-run trend for that country.

The focus of our test on the "bank channel" is the interaction term of the FFF measure with the U.S. bank foreign claims variable in our panel regressions for liquidity risk premia. The key result is that the coefficient on the interaction term is negative and reliably different from zero, which indicates that the reduction in the local realized liquidity risk premium associated with a tightening of U.S. monetary policy arises most notably when the foreign claims by U.S. banks on the country of interest are unusually high. In terms of economic magnitude, the direct effect of the FFF measure is slightly greater in specifications that include the interaction term, suggesting that a positive shock to the implied Federal Funds futures rate of 10 basis points is associated with a reduction in the liquidity risk premium of now closer to 60 basis points. In addition, a one standard deviation (about U.S.$9.3 billion) upward shift in the foreign claims of U.S. banks on the target country (relative to its long-run trend) is associated with a further 20 basis point reduction in the liquidity risk premium. The significantly negative effect of the interaction between U.S. monetary policy shocks and U.S. bank claims is again concentrated among the high liquidity risk stocks.

An alternative to the "bank channel" in the transmission of U.S. monetary policy shocks to stock markets around the world is formed by U.S. investors globally active in these markets, or what we call the "portfolio channel." U.S.-based portfolio investors are important constituents for many local stock markets (US$8.4 trillion, according to the U.S. Treasury's Report on U.S. Portfolio Holdings of Foreign Securities in 2018). Since their access to funding and risk-bearing capacity could be affected by U.S. monetary policy directly, their investing behavior may affect the pricing of low and high liquidity risk stocks in many markets directly, and thus the realized local liquidity risk premium. We explore this potential falsification test by including interaction terms of the FFF measure with the monthly equity portfolio flows from U.S. investors into each target market (obtained from the U.S. Treasury's Treasury International Capital, or TIC, database) in our panel regressions. We find no evidence of an effect of net U.S. portfolio flows on the local liquidity risk premium, neither directly nor as a "carrier" of U.S. monetary policy shocks.

In two further tests, we find no evidence that U.S. monetary policy shocks affect the illiquidity premium (as opposed to the liquidity risk premium) in international stock markets, nor evidence of a "bank channel" in the transmission of European Central Bank (ECB) monetary policy shocks to the liquidity risk premium in Euro area stock markets. Our results thus specifically highlight the special role of U.S. monetary policy shocks in shaping liquidity risk premia around the world.

Overall, our new evidence is consistent with the view that U.S. monetary policy shocks have the potential to influence the pricing of risk in stock markets around the world, and with U.S. banks playing an important role in the transmission of these shocks. Our paper also furthers our understanding of the economic forces driving (co-movement in) the liquidity risk premium in international equity markets as well as of the far-reaching impact of unexpected shocks to U.S. monetary policy.

2. Data.

2.1 Sample of stocks around the world.

We collect daily stock data for stock markets in 41 countries from Datastream and for the New York Stock Exchange and Nasdaq from CRSP over the period from 1995 to 2013.[1] Based on the "advanced economies" classification of the International Monetary Fund (IMF), our sample covers 17 emerging markets (Argentina, Brazil, Chile, China, India, Indonesia, Israel, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, South Africa, Sri Lanka, Thailand, and Turkey) and 26 developed markets (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, U.K., and NYSE and Nasdaq for the U.S).

Following Lee (2011), Karolyi, et al. (2012) and Amihud et al. (2015), we restrict the sample stocks to those listed on the major exchanges in each country. Most countries in our sample have a single major exchange except for Canada (Toronto and TSX Venture), China (Shanghai and Shenzen), India (National India and BSE Ltd.), Japan (Tokyo and Jasdaq), Poland (Warsaw and Warsaw Continuou), South Korea (KOSPI and Kosdaq), Spain (Madrid and Madrid-SIBE), Taiwan (Taiwan and Taiwan OTC), and the U.S. (NYSE and Nasdaq). We use only common stocks and our sample includes delisted stocks to avoid survivorship bias.[2] We drop days with more than 90% of stocks in a given country have zero returns as non-trading days from the sample. Following Ince and Porter (2006), we set both daily and monthly returns to be missing if the total return index for either day (month) t or t-1 is less than or equal to 0.01. Daily (monthly) gross returns for both t and t-1 are set to be missing if $R_{i,t-1}\times R_{i,t} < 1.5$ and at least one of the two returns is over 200% for daily and 300% for monthly returns. We set daily trading volume to missing if the dollar volume on that day is less than US$100. We drop stock-month observations with fewer than 5 days of trading or more than 80% of zero returns in a given month. Following Griffin et al. (2010) and Amihud et

[1] For U.S. markets, we use data from 1990 for the estimation of liquidity risk, but our regressions use data starting in 1995.

[2] 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. See our accompanying internet appendix for details.

al. (2015), daily returns greater than 200% and monthly returns greater than 500% are also set to missing. Following Lee (2011), we exclude stock-year observations if the previous year-end stock price is in the top or bottom 1% of the cross-sectional distribution by country. After implementing all these screens, our sample includes 35,389 stocks and 3,332,484 stock-month observations.

For each stock on each day, we compute the Amihud price impact proxy (Amihud, 2002) as a measure of the stock's illiquidity on that day:

$$Illiq_{i,d} \equiv \frac{|R_{i,d}| \cdot 1000}{P_{i,d} VO_{i,d}}, \tag{1}$$

where $P_{i,d}$ is the price of stock i on day d and $VO_{i,d}$ is the trading volume (in 1000 shares). The Amihud measure is the recommended illiquidity proxy in Hasbrouck (2009) and Goyenko, Holden, and Trzcinka (2009). Similar to Amihud (2002), we set the top 1% of the daily cross-sectional illiquidity distribution in a given country to missing. We then compute the average by stock of the daily Amihud estimates across the days in a given month and use it as our monthly, stock-level proxy for illiquidity.

Table 1 reports the average of the monthly market-wide Amihud (2002) illiquidity measure (multiplied by 10,000 to rescale), market return, market volatility, and the median of the average illiquidity, return, and volatility of the stocks traded in each market. The first four columns show, for each market in the sample, the first month in the sample, the number of unique stocks, the average number of stocks per month, and the number of stock-month observations. The next three columns show the time-series averages (over the period from the first month in the sample to December 2013) of the value-weighted average of the Amihud illiquidity and return (in US$ and in % per month) across the individual stocks in each market, and the market-wide volatility (monthly standard deviation of the daily value-weighted market return). The final three columns show the medians across stocks traded in each market of the average stock return, illiquidity, and standard deviation of monthly stock returns over the sample period. The table distinguishes between emerging markets (Panel A) and developed markets (Panel B), based on the "advanced economies" classification of the IMF.

2.2 Liquidity risk and liquidity risk premia.

As in Pástor and Stambaugh (2003), we use the covariance of an individual stock's return with market illiquidity (liquidity beta) as our measure of stock-level liquidity risk. Since it is well known that liquidity is persistent, we first obtain innovations in the market-wide illiquidity of each market in the sample as the residuals of AR(2) regressions of log(1+$Illiq_{m,t}$), where $Illiq_{m,t}$ is defined as the value-weighted average of the monthly stock-level illiquidity measure for each market in the sample (we take logs to mitigate the influence of outliers). We refer to the monthly innovations in each market's illiquidity as $IlliqShock_{m,t}$.

We use monthly stock returns and innovations in market-wide illiquidity over the past five years to estimate the liquidity risk of stock i in year t. The liquidity risk of individual stocks is estimated using regressions of stock returns (in local currency) on $IlliqShock_{m,t}$, based on at least 36 valid monthly observations in the five-year estimation window:

$$LiqRisk_{i,t} = {Cov(r_{it}, IlliqShock_{m,t})} \Big/ {Var(r_{mt} - IlliqShock_{m,t})}. \quad (2)$$

Since we use an illiquidity measure rather than a liquidity measure, estimates of liquidity risk defined in equation (2) tend to be negative. Thus, a large negative value of $LiqRisk_{i,t}$ indicates that the stock has a "high" degree of liquidity risk, while a small negative value of $LiqRisk_{i,t}$ indicates that the stock has a "low" degree of liquidity risk.[3]

To create a country-level measure of the realized local market liquidity risk premium, we first sort the stocks in each market in each year t into two portfolios based on the stocks' previous year-end market capitalization, and subsequently into three or five portfolios based on the stocks' liquidity risk in year t. The number of portfolios used for these sorts for a specific country is based on the total number of stocks in the sample for that country. If the minimum number of unique stocks in a month over the sample period for a country is larger than 50, we use 2×5 size-liquidity risk portfolios for that country, while if the number is less than or equal to 50, we use 2×3 portfolios.

---

[3] A positive value of $LiqRisk_{i,t}$ for a certain stock would indicate that the stock provides a hedge against episodes of market-wide illiquidity and this suggests, in turn, that investors may be willing to accept a lower return on the stock – thereby paying an insurance premium for the hedge. However, such stocks are relatively rare.

3. Common variation in liquidity risk premia around the world.

In this section, we first present summary statistics of the local liquidity risk premia in the 43 stock markets in our sample and examine how these risk premia vary over time (Section 3.1). We then investigate the degree of "commonality in liquidity risk premia" by assessing to what extent local liquidity risk premia co-move with global and U.S. liquidity risk premia (Section 3.2).

3.1 Variation in liquidity risk premia across countries and over time.

Table 2 reports the average liquidity risk and the average returns of the low and high liquidity risk portfolios for each of the 43 markets in the sample (17 emerging markets in Panel A and 26 developed markets in Panel B). The first column shows the number of portfolios used for the double sorts to create the low and high liquidity risk portfolios (either 2×3 or 2×5). The next two columns show the time-series averages of the average liquidity risk (liquidity beta) of the low and high liquidity risk portfolios, where more negative betas indicate greater liquidity risk. The next four columns show the time-series averages of the equally-weighted (EW) returns of the low risk and high liquidity risk portfolio, the liquidity risk premium (returns on the high minus low risk portfolio), and the time-series standard deviation of the monthly EW liquidity risk premium. The final four columns show the same statistics but then for value-weighted (VW) returns.

The low liquidity risk portfolio exhibits a negative liquidity beta in most markets, although we observe small positive numbers for some markets. The beta of the high liquidity risk portfolio is negative in all markets and usually of substantial economic magnitude, indicating that investors in these stocks are exposed to the risk that their investments have a poor pay-off in economic states when the market is illiquid.

However, on average across the 43 markets in our sample over our sample period, investors do not get compensated for this risk in the form of higher returns. The EW (VW) liquidity risk premium is positive for only 16 (21) of the 43 stock markets, and significantly so for only 3 (1) of these markets. For the majority of markets, we thus do not observe a significant liquidity risk premium, while for some markets it is significantly negative. There is a remarkable degree of cross-country variation in the unconditional average liquidity risk premium, with point estimates of the VW premium ranging from -78 basis points per month for Australia to 84 basis points for Mexico. For the U.S. markets in our sample, the point estimate of the VW liquidity risk premium is positive and of considerable economic magnitude (10 basis points per month for Nasdaq and 42 basis points for the NYSE) – consistent with Pástor and Stambaugh (2003) – but not statistically significant over our sample period.

Overall, in line with Lee (2011), we thus find little evidence of significant liquidity risk premia in international stock markets. Yet, this finding does not imply that a stock's liquidity risk is not a relevant concern for investors in these markets that may affect its pricing. First, the liquidity beta estimates reported in Table 2 indicate that high liquidity risk stocks do tend to perform poorly in illiquid market states, an attribute that investors should care about. Second, average return estimates – and thus risk premium estimates – are notoriously noisy (e.g., Elton, 1999) and, at less than 20 years, our sample period is relatively short. This period is also "contaminated" by a number of significant global events (such as the 2008-2009 global financial crisis) that could potentially render average realized returns over the sample period a poor proxy for expected returns. Third, we know from prior work on the U.S. liquidity risk premium that it varies significantly over time (Watanabe and Watanabe, 2008). Consequently, even when the unconditional liquidity risk premium is not statistically significant, there might be important patterns in the *conditional* liquidity risk premium that are relevant to investors in international stock markets and that may reveal how these investors price low and high liquidity risk stocks in different time periods.

Indeed, the standard deviations of the EW and VW liquidity risk premia reported in Table 2 indicate a great deal of time-variation in the liquidity risk premium over time in many markets. The standard deviation of the VW liquidity risk premium over our sample period varies from 3.3% per month for Chile to 10.7% per month for Ireland, with a typical market among the 43 markets in our sample of no less than 5.7% per month. These statistics highlight the conditional nature of the realized liquidity risk premium.

To get a better sense of the time-series patterns in the liquidity risk premium around the world, we plot the average liquidity risk premium across countries in Figure 1. To reduce noise in these plots, we first compute the six-month moving average of the liquidity risk premium for each market. Then, we compute the equally-weighted average liquidity risk premium across the 17 emerging markets (Panel A) and the 26 developed markets in our sample (Panel B) based on this six-month moving average. As a benchmark, Panel C shows the six-month moving average of the liquidity risk premium for the NYSE. Each panel shows both the equally-weighted (EW) and the value-weighted (VW) liquidity risk premium.

We observe significant fluctuations in the realized liquidity risk premium in all panels over the sample period. The premium is large and positive in some specific periods; for example, the six-month moving-average VW premium is 4.8% *per month* in early 1998 and 4% per month in mid 2009 for emerging markets (Panel A), close to 6% per month in mid 2009 for developed markets (Panel B), and over 10% per month in the third quarter of 2009 for the NYSE (Panel C). We note that this moving average masks even higher realized liquidity risk premia in individual months in those periods. To illustrate, high liquidity risk stocks outperformed low liquidity risk stocks by more than 30% for the NYSE in April 2009. The graphs also show large negative spikes in the liquidity risk premium in the late 1990s, early 2000s, 2008, as well as the 2010-2012 period.

The positive and negative spikes in the liquidity risk premium do not appear to be random. They coincide with well-known episodes of financial market turmoil, such as the 1997 Asian financial crisis, the 1998 Long-Term Capital Management (LTCM) crisis, the 2000 burst of Dotcom bubble, the 2008-2009 global financial crisis, and the 2010-2012 Euro area sovereign debt crisis. For example, the positive and negative spikes in the liquidity risk premium in the late 1990s are more conspicuous for emerging market countries than for developed market countries, reflecting the larger turmoil in Asian countries than in developed markets in that period.

Overall, the patterns in the liquidity risk premia in Figure 1 suggest the possibility that investors significantly reprice high liquidity risk stocks relative to low liquidity risk stocks during periods of financial market turmoil. In particular, the graphs indicate that the prices of high liquidity risk stocks tend to fall relative to those of low liquidity risk stocks at the outset of a market turmoil episode (resulting in a negative realized liquidity risk premium), while high liquidity risk stock prices recover relative to low liquidity risk stock prices in the subsequent period (resulting in a positive realized liquidity risk premium). A case in point is the 2008-2009 global financial crisis: the realized liquidity risk premium is large and negative around the Lehman collapse in September 2008 in all three panels of Figure 1, and large and positive in 2009. These patterns could be consistent with the prices of high liquidity risk stocks being depressed because of investors' diminished risk bearing capacity in crisis periods (and a subsequently recovery as risk appetite is restored), and a potential role of U.S. monetary policy in driving these effects. However, they may also indicate that other economic forces are at play.

In the next subsection, we examine the degree of common time-variation in the liquidity risk premia across the markets in our sample. Such common time-variation would suggest that one or more common factors drive variation in liquidity risk premia around the world, and could provide a pointer for our primary hypothesis that U.S. monetary policy actions and the bank channel through which they may propagate around the world may represent an important common global factor.

3.2 Commonality in liquidity risk premia.

Inspired by Amihud, Hameed, Kang, and Zhang (2015), we are interested in the degree of "commonality in liquidity risk premia" across stock markets around the world. To that end, Table 3 presents the results of time-series regressions of the monthly local realized liquidity risk premium in the markets in our sample on the U.S. and the global liquidity risk premium. We run these regressions both in a panel setting (Panel A) as well as in individual country-by-country time series regressions (Panel B). All of these regressions include local market returns, volatility, and illiquidity as control variables.[4] As the U.S. liquidity risk premium, we use the premium for the NYSE. As the global liquidity risk premium, we use the equally-weighted average liquidity risk premium across the 42 markets in our sample (excluding the country of interest), which we orthogonalize relative to the U.S. premium.[5]

---

[4] In all tables that include these control variables, local market volatility is defined as the log of the monthly standard deviation of the value-weighted daily local market returns, and local market illiquidity is defined as the log of one plus the market-wide (that is, value-weighted average) Amihud illiquidity in a country. We take logs to mitigate the influence of outliers.

[5] We isolate the role of the U.S. liquidity risk premium in this way because we are specifically interested in the role of U.S. economic forces in driving the liquidity risk premium around the world. Of course, we acknowledge that our orthogonalization might lead us to overstate the degree of commonality of local liquidity risk premia with the U.S. liquidity risk premium relative to the global premium. In unreported results, we find that, when we do not orthogonalize the global premium with respect to the U.S. premium, the coefficient on the U.S. premium in the panel regressions is still positive but no longer significant for the EW premium, but it remains positive and significant for the VW premium. We note that one issue that could contribute to these somewhat weaker

Both the panel regressions and the country-by-country regressions reveal a considerable degree of commonality in liquidity risk premia. In the panel regressions in Panel A, the coefficients on both the U.S. and the global liquidity risk premium are statistically significant, for the EW as well as the VW premium. The degree of commonality is also significant from an economic perspective, with coefficients ranging from 0.2 to 0.4 and an R^2 of around 15%.

Panel B of Table 3 shows the results of similar time-series regressions for four individual countries (Canada, Japan, Malaysia, and Turkey – chosen for illustrative purposes to reflect both developed and emerging markets) as well as summary statistics across the individual regressions for all 41 non-U.S. markets. The results in Panel B confirm those in Panel A. Out of the eight reported individual regressions (both EW and VW for four countries), seven show a positive and significant coefficient for the U.S. liquidity risk premium and eight show a positive and significant coefficient for the global premium. Across all 41 country-by-country regressions, 35 of the coefficients on the U.S. premium are positive for both the EW and the VW regressions, of which 29 (EW) and 28 (VW) are significant. For the global liquidity risk premium, 35 out of 41 coefficients are positive and 17 significantly so for the EW regressions and 38 are positive and 14 significantly so for the VW regressions. Average R^2's across these regressions are above 20%.[6]

These results indicate that time-variation in the liquidity risk premium in many countries around the world is driven at least in part by one or more common global factors. The commonality in liquidity risk premia we document is of similar strength as the commonality in illiquidity premia reported by Amihud, Hameed, Kang, and Zhang (2015) and suggests that common economic forces may help to understand variation in the relative pricing of low and high liquidity risk stocks in stock markets around the world.

As an alternative way to gauge the degree of commonality in liquidity risk premia, Tables IA1 and IA2 and Figure IA1 of our internet appendix present the results of a principal component analysis of the

results could be the greater errors-in-variables issue in the estimates of the U.S. premium, relative to the global premium which is an average across 42 markets.

[6] We note that the average R^2 of the country-by-country regressions is higher than the R^2 of the panel regressions, likely at least in part because the panel regressions depress the R^2 by imposing that the coefficients are the same across countries.

liquidity risk premia in the 43 stock markets in our sample. The first principal component explains close to 20% of the total variation in the monthly liquidity risk premia, while the first seven principal components explain over 50% of the total variation. Almost all of the 43 liquidity risk premia time-series have a statistically reliable positive loading on the first principal component, and these loadings are highest for the NYSE and Nasdaq. Given the inherent noise in monthly stock returns, these findings are again suggestive of a significant degree of commonality in liquidity risk premia and of a potential special role of U.S. markets in guiding it.

In the next section, we turn to direct tests of our main hypothesis that U.S. monetary policy shifts could be one of those global underlying economic forces.

4. U.S. monetary policy and (common) variation in liquidity risk premia around the world.

In this section, we first develop our main hypothesis on how U.S. monetary policy shocks may be propagated to liquidity risk premia in stock markets around the world through a "bank channel" (Section 4.1). We then discuss our measure of U.S. monetary policy shocks and examine how it affects local liquidity risk premia in the 43 markets in our sample (Section 4.2). We proceed to introduce our empirical strategy to capture the bank channel and assess its relevance relative to the "portfolio channel" in driving the effect of U.S. monetary policy shocks on liquidity risk premia (Section 4.3).

4.1 Main hypothesis on U.S. monetary policy transmission and liquidity risk premia.

Low interest rates maintained by advanced economy central banks in the past decade have led to a lively debate on cross-border monetary spillovers and the possible transmission channels. Recall that our primary hypothesis relates monetary conditions, funding constraints, asset liquidity risk, and security returns and takes it to the global arena by proposing that policy actions of the U.S. Federal Reserve propagate around the world through the banking sector. The logical reasoning begins with a U.S. monetary policy tightening that results in decreasing local funding liquidity available for purchasing risky securities, including those with large exposures to liquidity risk. Stocks with greater liquidity risk exposure suffer the most from the decreased availability of funds; they experience the largest decrease in price and, as a result, the realized return spread between stocks with high liquidity risk relative to low liquidity risk stocks shrinks.

How might the policy actions of the Federal Reserve impact funding constraints and the pricing of liquidity risk around the world? Bruno and Shin (2015a, 2015b) build a theoretical framework in which the international banking system naturally represents the propagation mechanism. Their model builds on the so-called "leverage cycle" in which bank leverage builds up in booms and falls in busts. They define a "double-decker" model in which local banks borrow from global banks to lend to local borrowers, while global banks obtain funding from U.S. dollar-denominated money market funds. The Morris-Shin "bank channel" focuses on bank-to-bank credit as a key mechanism in propagating U.S monetary policy shocks. In their model, when a contractionary monetary shift by the Federal Reserve leads U.S. interest rates to rise, funding constraints for the global banks are tightened, and this shock has spillover effects on global financial conditions because they lead to reduced cross-border lending by the global banks and thus more restrictive funding liquidity in the target country of those claims.

To evaluate the relevance of the bank channel of Bruno and Shin for understanding variation in liquidity risk premia around the world, we need to accomplish two critical steps. The first is to devise a reliable proxy for unexpected shifts in Federal Reserve policy. The second step requires us to identify a bank channel through which global banks – which in our analysis will be U.S. banks with a global presence – might adjust their cross-border liabilities across different target countries in response to those policy shifts. The next two sub-sections focus on these two steps respectively.

4.2 Unexpected U.S. monetary policy shocks and liquidity risk premia.

In estimating the impact of the changes in U.S. monetary policy, it is important to distinguish the unexpected component of monetary policy changes from the expected component (Bernanke and Kuttner, 2005; Gertler and Karadi, 2015). As a proxy for U.S. monetary policy shocks, we therefore use changes in the prices of Federal Funds futures from the Chicago Board of Trade (CBOT) around meetings of the Federal Open Market Committee (FOMC). Federal Funds futures contracts are designed to manage the risks arising from variation in the overnight effective Federal Funds rate, and are commonly used in inter-bank transactions by banks in need of reserves. Changes in these futures prices around FOMC meetings measure the change in market expectations of the Federal Funds rate and thus the monetary policy stance (e.g., Kuttner, 2001; Bernanke and Kuttner, 2005). Since expected changes in the monetary policy stance should already have been priced in before the FOMC, our measure effectively captures unexpected shocks to U.S. monetary policy.

Using changes in the prices of Federal Funds futures to measure unexpected monetary policy shifts has two main advantages. First, it is a market-based measure that reflects changes in market participants' expectations about the U.S. monetary stance. Second, using Federal Funds futures price enables us to incorporate the impact of "forward guidance," a term that is used to describe the Federal Reserve's communication with market participants to guide their beliefs about the future path of short-term rates. Since the prevalence of forward guidance has been increasing over time (Gurkaynak, Sack, and Swanson, 2005), it is important to account for its role in steering market expectations about U.S. monetary policy shifts. As any information embodied in forward guidance can be expected to be quickly incorporated into the price of the Federal Funds futures, changes in the price of the futures contract around FOMC meetings also reflect the unexpected component of information contained in forward guidance.

The Federal Funds futures price has been shown to be the best short-term predictor of the target rate (Gurkaynak, Sack, and Swanson, 2007) and to provide efficient forecasts of Federal Funds rate changes (Krueger and Kuttner, 1996). It is also a popular measure in the literature. Using this measure, Kuttner (2001) and Bernanke and Kuttner (2005) investigate how U.S. monetary policy shocks affect, respectively, the term structure of interest rates and the stock market in the U.S. More recently, Gertler and Karadi (2015) rely on this measure to examine how U.S. monetary policy shocks are transmitted to the real U.S. economy through its impact on credit supply costs.

We obtain Federal Funds futures contract data from the QUANDL website.[7] The change in the Federal Funds futures rate (in %) is defined as the difference between implied rates from the settlement price of the futures on day *d*+1 and on day *d*-1 in month *t*. We compute the implied rate by subtracting the Federal Funds futures price from 100, since this futures price is defined as "100 – implied future interest rate." The dates *d*+1 and *d*-1 are one day before and after the FOMC meeting, respectively, in month *t*. If multiple FOMC meetings were held in a given month, the implied rate changes within the event windows around the different meetings are cumulated for that month. When no FOMC meeting is held in a given month, that month's change in the implied Federal Funds future rate is set to zero. We use the futures contract expiring one month after the FOMC meeting since the price of the current-month Federal Funds futures is determined as a combination of the realized effective Federal Funds rate and the expected effective rates, while the price of one-month ahead futures is fully determined by expected effective rates.[8] We refer to the resulting monthly measure of unexpected U.S. monetary policy shocks as the "FFF measure;" positive values for this measure indicate an unexpected tightening of the U.S. monetary policy stance in that month, while negative values indicate an unexpected loosening. We note that the FFF measure can have the opposite sign from the actual rate change. For example, the measure can be positive when the actual rate falls because the market expected the rate to fall further – indicating a perceived tightening in monetary policy.

Table 4 presents summary statistics of the FFF measure, and Figure 2 visualizes its time-series dynamics over our sample period 1995-2013. Its values range from -24.5 basis points to 21 basis points per month over this period, reflecting the notion that although the most common change in the Federal Funds rate is 25 basis points, actual changes announced at FOMC meetings tend to be in part anticipated by market participants. Over our sample period, we have 53 months of decreases and 54 months of increases in the implied Federal Funds futures rate around FOMC meetings, while for the other 121 months, no change is

---

[7] See https://www.quandl.com/collections/futures/cme-30-day-fed-funds-futures.

[8] The price on day *d* in month *t* of the *current*-month contract is set as a combination of realized daily rates from the first day up to day *d* in month *t* and the expected daily rates over the remaining days in the same month. That is, if day *d* is a far later date in a given month, the price of Federal Funds futures will be dominated by realized rates rather than by expected rates.

observed. The average change is -0.002%, with a standard deviation of 0.045%. Reflecting the stark changes in monetary policy around the global financial crisis and the policy rate being close to the zero-bound in more recent years, the FFF measure fluctuates widely in the period 2008-2009, but shows little fluctuation thereafter.

We now turn to tests of the first part of our main hypothesis on the effect of unexpected U.S. monetary policy shocks on the liquidity risk premium in stock markets around the world. Table 5 shows the results of panel regressions of the local liquidity risk premium in the 43 in our sample on the FFF measure and control variables that are included to capture more general variation in local and global financial market conditions. Panel A presents the results when we use the EW and VW liquidity risk premium as the dependent variable. In Panels B and C, we use, respectively, the EW and VW returns of high liquidity risk stocks and the EW and VW returns of low liquidity risk stocks as the dependent variable. As control variables, we include local market returns, volatility, and illiquidity, as well as the global market SMB, HML, and WML factors from Ken French's website. All panel models include country fixed effects. Standard errors are clustered by country and month.

The key result in Panel A of Table 5 is the significantly negative coefficient on the FFF measure of -4.845 for the EW liquidity risk premium and of -4.142 for the VW liquidity risk premium. These numbers signify that a positive shock to the implied Federal Funds futures rate of 10 basis points is associated with a reduction in the equally-weighted (value-weighted) liquidity risk premium of 48 (41) basis points in the same month. These effects are economically substantial, given that shocks of 10 basis points to the implied Federal Funds rate are relatively common over our sample period and given that a realized return on a broad portfolio of stocks that is close to 50 basis points in a typical month represents a considerable repricing of these stocks that is likely to be material to many investors in these markets. This result supports our conjecture that a tightening of U.S. monetary policy is associated with more binding funding constraints and reduced risk-bearing capacity in these markets, thereby leading to a drop in the prices of high liquidity risk stocks relative to those of low liquidity risk stocks, and thus a reduction in the realized return spread between high and low liquidity risk stocks (the liquidity risk premium).

Panels B and C of Table 5 address the question whether this repricing stems primarily from the long leg of the long-short liquidity risk portfolio (high liquidity risk stocks) or from the short leg (low liquidity risk stocks). The answer is that the repricing effect is concentrated among the high liquidity risk stocks. For these stocks, Panel B shows that the coefficient on the FFF measure is significantly negative for both EW and VW returns, with magnitudes comparable to those in Panel A. For low liquidity risk stocks, Panel C shows that the coefficient on the FFF measure is positive – in line with the notion that low risk stocks increase in price when U.S. monetary policy tightens – but the coefficient is neither significant for EW nor for VW returns and its magnitude is considerable smaller than in Panels A and B. Thus, the evidence in Table 5 suggests that when U.S. monetary policy tightens, investors shun high liquidity risk stocks in many markets around the world, thereby depressing their prices. However, they may seek refuge in other safe havens than low liquidity risk stocks, as their prices do not move by much.

In the next subsection, we investigate the second part of our main hypothesis, which is that cross-border bank credit extended by U.S. banks to local banks is a key mechanism through which U.S. monetary policy shocks are transmitted to stock markets around the world.

4.3 Assessing a bank channel in U.S. monetary policy transmission.

Monetary policy affects bank lending behavior and thereby funding liquidity. U.S. monetary policy has been shown to affect U.S. commercial bank lending (Kashyap and Stein, 2000) as well as the credit supply by broker-dealers through its impact on their asset growth and leverage (Adrian and Shin, 2009, 2014). Globally active U.S. banks, which supply credit to their regional branches so that the regional banks, in turn, lend to local corporate borrowers, work as an important vehicle for global spillovers of economic shocks.[9] The role of this internal funding mechanism of global banks in the transmission of monetary policy has been highlighted in the literature because cross-border bank credit is significantly affected by balance sheet management and the global management of liquidity by the head office (Peek and Rosengren, 1997;

[9] Of course, regional banks in these target countries could be regional branches or subsidiaries of the global banks but also locally-owned banks.

Devereux and Yetman, 2010; Cetorelli and Goldberg, 2012a,b; Schnabl, 2012; Shin, 2012; Bruno and Shin, 2015a,b). We therefore expect that the impact of changes in U.S. monetary policy on the liquidity risk premium is greater for countries on which U.S. banks have larger claims. To investigate this hypothesis, we obtain quarterly data on the consolidated claims (in millions of US$), on an immediate borrower basis, of U.S. banks on each of the 41 other countries in our sample from Table B4 of the Bank for International Settlements (BIS) consolidated banking statistics.

Table 6 presents summary statistics of the U.S. cross-border bank claims for each of the countries in our sample, and Figure 3 illustrates the time-series dynamics of the total claims of U.S. banks (in US$ billions) aggregated over all countries in the sample over our sample period 1995-2013. U.S. banks are active lenders in all countries in the sample, but their lending activity exhibits substantial cross-country as well as time-series variation. Among the emerging markets, U.S. banks are particularly active in Brazil and Mexico, while among developed markets they have particularly significant cross-border bank claims on Germany, Japan, and the U.K. The standard deviation in the final column of Table 6 indicate that U.S. bank claims exhibit substantial variation over time for virtually all countries in the sample. Figure 3 shows that total U.S. cross-border bank claims start from as low as $171 billion in the second quarter of 1995, increase to a peak of $2,787 billion in the first quarter of 2013, and then decrease to $2,460 billion by the end of our sample period. Reflecting the reduced global bank flows during the global financial crisis period, the figure reveals a clear drop in cross-border bank claims from the second to the fourth quarters of 2008.

The strong upward trend in U.S. cross-border bank claims over our sample period (see Figure 3) necessitates a transformation of the raw country-by-country U.S. bank claims variable to prevent the inclusion of a non-stationary variable in our regressions. To this end, we de-trend the bank claims variable in country-by-country regressions of quarterly U.S. bank claims on the target country of interest on a quarterly time trend, and we match the residual of the most recent past quarter with the current month liquidity risk premium.[10]

[10] An additional advantage of this approach is that we effectively transform U.S. bank claims from a "stock" variable that measures outstanding bank claims at a given point in time to a "flow" variable that measures deviations of these claims from a long-run trend.

As an alternative to the “bank channel” of U.S. monetary policy transmission, we consider a “portfolio channel” in which liquidity risk premia in local stock markets are not affected through changes in local funding liquidity conditions, but rather through the trading activity of U.S. investors in those markets directly. Our empirical proxy for the portfolio channel is a monthly measure of equity portfolio flows from U.S. investors to the country of interest, obtained from Treasury International Capital (TIC).[11] In particular, we compute U.S. portfolio flows as the difference between gross sales of foreign stocks by foreigners to U.S. residents and gross purchases of foreign stocks by foreigners from U.S. residents, computed as a percentage of the sum of gross sales and purchases of foreign stocks by foreigners to/from U.S. residents. A positive (negative) U.S. portfolio flow indicates that U.S. residents are net buyers (sellers) of foreign stocks. The portfolio channel predicts that the impact of changes in U.S. monetary policy on the liquidity risk premium is greater when U.S. portfolio flows out of the country of interest are greater.

Panel B of Table 6 shows summary statistics of the U.S. portfolio flows for all non-U.S. countries in the sample. On average, most countries have been a net recipient of portfolio inflows from U.S. investors, but these portfolio flows vary widely across countries and over time – as reflected by the fact that the variable assumes both negative and positive values for all 40 countries over our sample period and by the substantial standard deviations in the final column of Panel B of Table 6.

Table 7 shows the results of panel regressions of the local liquidity risk premium in the 41 non-U.S. markets in our sample on the FFF measure as well as the FFF measure interacted with U.S. bank claims and with U.S. portfolio flows. The panel regressions include the same control variables as in Table 5, as well as country fixed effects. Like in Table 5, Panels A, B, and C of Table 7 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).

This transformation allows us to evaluate whether U.S. bank claims on a given country in a certain quarter are unusually high relative to the long-run trend for that country.

[11] These data only start in 2001 for Belgium and New Zealand and are not available for Sri Lanka.

The key result in Table 7 is that the coefficient on the interaction term of the FFF measure with U.S. bank claims is negative and significant for both the EW and the VW liquidity risk premium (see Panel A). This result indicates that, consistent with our main hypothesis, the association of a tightening of U.S. monetary policy with a smaller local liquidity risk premium is more acute when the foreign claims by U.S. banks on the country of interest are unusually high. The economic relevance of the bank channel is also considerable. The direct effect of the FFF measure on liquidity risk premia in Table 7 is greater than in Table 5, now indicating that a positive shock to the implied Federal Funds futures rate of 10 basis points is associated with a reduction in the EW (VW) liquidity risk premium of 61 (58) basis points in the same month. In addition, a one standard deviation (about U.S.$9.3 billion) upward shift in the foreign claims of U.S. banks on the target country (relative to its long-run trend) is associated with a further 20 (21) basis point reduction in the EW (VW) liquidity risk premium.

In contrast, we find no evidence that the portfolio channel is reliably associated with variation in liquidity risk premia around the world. The coefficients on the U.S. portfolio flows variable – and, more importantly, on its interaction with the FFF measure – are insignificant for both the EW and the VW liquidity risk premium. Hence, the global activity of U.S. banks rather than that of U.S. investors is the key channel through which U.S. monetary policy shocks are transmitted to stock markets around the world.

In Panels B and C of Table 7, we investigate whether the bank channel is at work for high liquidity risk stocks in particular, or also for low liquidity risk stocks. Like in Table 5, our evidence indicates that high liquidity risk stocks are affected the most. Again, the direct effects of the FFF measure are only significant for high liquidity risk stocks in Panel B. Panel B also shows that the interaction effect with U.S. bank claims is negative, statistically significant, and of considerable economic magnitude for these stocks. In Panel C of Table 7, the direct effects of the FFF measure on the returns of low liquidity risk stocks are now somewhat larger than in Panel C of Table 5, but still not statistically significant. We do observe a significantly positive interaction effect with U.S. bank claims on the VW returns of low liquidity risk stocks, suggesting that when U.S. monetary policy tightens these stocks exhibit a price increase in countries and during times of unusually high foreign claims by U.S. banks. However, this effect is considerably smaller than for high liquidity risk stocks and not significant for the EW returns of low liquidity risk stocks.

In sum, the results in this section highlight the importance of the bank channel in the transmission of U.S. monetary policy shocks to the pricing of high and low liquidity risk stocks in many countries. In particular, the tendency of selling stocks with large liquidity risk exposure disproportionately more than stocks with low liquidity risk exposure is indeed stronger for countries and during times in which U.S. banks have a larger amount of claims.

5. Further tests on the role of monetary policy for liquidity risk versus illiquidity premia.

In this section, we discuss the results of three further tests to assess the role of monetary policy in affecting both liquidity risk premia and illiquidity premia in international stock markets. In Section 5.1, we evaluate the robustness of our main results using panel model specifications that include a host of additional control variables. In Section 5.2, we address the question whether there is any evidence that European monetary policy plays a similar role in affecting the pricing of high and low liquidity risk stocks in stock markets in the Euro area as Federal Reserve policy does in stock markets around the role. In Section 5.3, we investigate the extent to which U.S. monetary policy shocks also affect the illiquidity premium (the realized return spread between illiquid and liquid stocks) around the world.

5.1 Robustness issues.

In Table IA3 of the internet appendix, we extend our analyses in Table 7 by including a host of additional control variables. One potential concern about our analyses thus far may be that U.S. monetary policy shocks may affect the U.S. stock market and, in turn, shocks to the U.S. stock markets may affect liquidity risk premia around the world, as opposed to U.S. monetary policy directly affecting liquidity risk premia around the world. Hence, we include the domestic U.S. market, SMB, HML, and WML factors from Ken French’s website in the regressions.

A large body of theoretical and empirical research has linked the overall degree of risk aversion to business cycle fluctuations. To preclude that our results are driven by broader proxies for the business cycle, we also include the U.S. default spread, the U.S. term spread, and changes in U.S. industrial production in the regressions. We further include the currency risk factors (both the dollar risk factor, or FX-RX, and the carry trade risk factor, FX-HML) from Lustig, Roussanov, and Verdelhan (2011) to make sure that our results do not purely stem from currency effects.

To distinguish the effect of U.S. monetary policy shocks from those of local monetary policy, we include the local interest rate for each country in the sample, defined as the base rate or target rate of the country. Our BIS variable for the global lending activity of U.S. banks could potentially pick up more general variation in openness or globalization across countries and over time. To examine this possibility, we include the overall capital restrictions index and the index for restrictions on equity flows from Fernández, Klein, Rebucci, Schindler, and Uribe (2015) as well as the U.S. portfolio flows variable from Table 7 and a measure of gross U.S. portfolio flows over GDP, which we compute as the sum of gross purchases and sales of foreign stocks by foreigners to/from US from TIC, divided by GDP.

Our main results survive the inclusion of all of these additional control variables. The coefficient on changes in the implied Federal Funds futures rate in the panel regressions to explain variation in the (EW and VW) local market liquidity risk premium is still economically large and reliably negative, supporting our main hypothesis. Consistent with our hypothesis on the bank channel of U.S. monetary policy transmission, the coefficient on the interaction of changes in the implied Federal Funds futures rate with cross-border U.S. bank claims is still significantly negative and of similar magnitude as in Table 7. The results in Table IA3 of the internet appendix do show that the results now stem from both the high and the low risk liquidity stocks, whereas the results in Table 7 are concentrated among high liquidity risk stocks. However, we note that a direct comparison between the results in Tables IA3 and 7 is hampered by the fact that the regressions in Table IA3 include several additional control variables that may absorb some of the effects of U.S. monetary policy shocks (such as the default and term spreads, and U.S. market returns) and because the number of observations in Table IA3 is about one third lower than in Table 7 due to the additional control variables.

5.2 ECB monetary policy shocks and liquidity risk premia in the Euro area.

The analyses thus far focus on the transmission of U.S. monetary policy shocks, but there may be a non-trivial impact of monetary policy shocks in other important economic regions in the world as well. Table 8 examines this possibility by reporting the results of similar regressions as in Table 7 but then with a proxy for ECB monetary policy shocks (the first difference of the ECB overnight deposit rates) as our key monetary policy variable. The sample for this analysis is based only on the Euro area countries in our sample (11 countries) and starts from 1999 with the introduction of the euro and a common European monetary policy. We also include the total claims of Euro area banks as the consolidated claims (in US$ billions), on an immediate borrower basis, of Euro area banks on individual countries from Table B4 of the BIS consolidated banking statistics. Like with our U.S. bank claims variable, we de-trend this variable and match its observations of the most recent past quarter with the current month liquidity risk premium.

We find some evidence that ECB monetary policy shocks affect liquidity risk premia in the Euro area, as the coefficient on changes in the ECB target rate have a significantly negative effect on the EW liquidity risk premia in these 11 countries (and in particular on the returns of high liquidity risk stocks). However, the effect on the VW liquidity risk premia is not significant and the magnitudes of the coefficients in Table 8 are considerably smaller than those in Table 7. Moreover, the effect of the interaction between Euro area monetary policy shocks and Euro area bank claims is not consistent and statistically weak. These results thus emphasize the key role of U.S. monetary policy shocks in particular in driving liquidity risk premia around the world.

5.3 U.S. monetary policy shocks and illiquidity premia around the world.

In Table 9, we revisit the findings of Jensen and Moorman (2010) that shocks to U.S. monetary policy affect the U.S. illiquidity premium in an international setting. The table reports regressions of the local market illiquidity premium in the 41 non-U.S. countries in our sample on measures of U.S. monetary policy shocks, U.S. bank claims, and their interaction terms (including the same control variables as in Table 7). We present results of these regressions based both on our FFF measure used so far and – to facilitate comparison with Jensen and Moorman (2010) – on their dummy variable for U.S. monetary policy expansions (defined to be equal to one from the month of a decrease in the U.S. Federal Funds rate until the month in which the rate increases, and zero otherwise). The illiquidity premium is the return difference between portfolios of stocks with high and low illiquidity, obtained from two-dimensional sorts based on size and illiquidity.

We find no evidence that U.S. monetary policy shocks have a significant effect on local market illiquidity premia around the world for either of the monetary policy measures. Both the coefficient on the monetary policy measure and on the interaction of this measure with U.S. bank claims is insignificant in the EW as well as VW specifications.[12] We conclude that U.S. monetary policy shocks primarily affect the overall risk-bearing capacity and thus the pricing of liquidity risk in stock markets around the world, and to a lesser extent the degree of market liquidity provision and the pricing of illiquidity in these markets.

6. Conclusion.

In this paper, we examine how U.S. monetary policy shocks influence liquidity risk premia across 43 developed and emerging markets around the world. We find that realized liquidity risk premia vary considerably over time and exhibit strong commonality across countries. We present evidence that the risk premia are significantly lower when U.S. monetary policy tightens. A positive shock to the Federal Funds futures rate of 10 basis points is associated with an average decline in the liquidity risk premium of 40-50 basis points in the typical target market. This effect is driven by price declines of high liquidity risk stocks. The effect is more acute in those target markets in which the claims of U.S. banks on the country of interest are unusually high. We interpret these new findings on how U.S. monetary policy shocks propagate to

[12] In unreported tests, we do confirm the baseline result of Jensen and Moorman (2010) for the U.S. markets in our sample.

influence the pricing of liquidity risk around the world as evidence in support of the "bank channel" in the transmission of these shocks in Bruno and Shin (2015a, 2015b).

Many new avenues for future research arise from our analysis. To now, our paper is silent on the potentially changing composition of investors – both institutional and retail alike – in response to these changing credit conditions and cross-border bank claims. It would be interesting to examine how the relation between the liquidity risk premia and monetary policy is affected by the characteristics of investors that hold stocks with high and low liquidity risk exposures. If investors are long-term investors, they may not be inclined to rebalance their portfolio frequently upon changes in U.S. monetary policy.

Our paper also does not identify the specific financial intermediaries and their uses of wholesale bank funding. Cross-border banks intermediate such funding differently than others and the composition of their liabilities can be expected to reflect on the funding constraints and liquidity risk premiums in the target markets in which they are a presence. Our data from the BIS to now does not allow us to disaggregate among the global banks that facilitate these flows and funding cycles.

Finally, our work focuses on policy shifts of the U.S. Federal Reserve and how they propagate around the world. While we rule out the European Central Bank having the same influence on cross-border banking flows and the repricing of liquidity risk in the Euro area, we do not give much weight to the role played by local monetary policy authorities. Whether they can mitigate the influence of U.S. monetary policy effected through the global bank channels represents an intriguing question for future research.

References

Acharya, V.V., Pedersen, L.H., 2005. Asset pricing with liquidity risk. *Journal of Financial Economics* 77, 375-410.

Adrian, T., Shin, H.S., 2009. Money, liquidity, and monetary policy. *American Economic Review* 99, 600-605.

Adrian, T., Shin, H.S., 2014. Procyclical leverage and value-at-risk. *Review of Financial Studies* 27, 373-403.

Amihud, Y., 2002, Illiquidity and stock returns: Cross-section and time-series effects. *Journal of Financial Markets* 5, 31-56.

Amihud, Y., Hameed, A., Kang, W., Zhang, H., 2015. The illiquidity premium: International evidence. *Journal of Financial Economics* 117, 350-368.

Amihud, Y. and Mendelson, H., 1986. Asset pricing and the bid-ask spread. *Journal of Financial Economics* 17, 223-249.

Ammer, J., Vega, C. Wongswan, J., 2010. International transmission of U.S. monetary policy shocks: Evidence from stock prices. *Journal of Money, Credit and Banking* 42, 179-198.

Bekaert, G., Hoerova, M., Lo Duca, M., 2013. Risk, uncertainty and monetary policy. *Journal of Monetary Economics* 60, 771-788.

Bernanke, B.S., Kuttner, K.N., 2005. What explains the stock market's reaction to Federal Reserve policy? *Journal of Finance* 60, 1221-1257.

Brennan, M.J. and Subrahmanyam, A., 1996. Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. *Journal of Financial Economics* 41, 441-464.

Borio, C., Zhu, H., 2012. Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? *Journal of Financial Stability* 8, 236-251.

Bruno, V., Shin, H.S., 2015a. Capital flows and the risk-taking channel of monetary policy. *Journal of Monetary Economics* 71, 119-132.

Bruno, V., Shin, H.S., 2015b. Cross-border banking and global liquidity. *Review of Economic Studies* 82, 535-564.

Cetorelli, N., Goldberg, L.S., 2012a. Banking globalization and monetary transmission. *Journal of Finance* 67, 1811-1843.

Cetorelli, N., Goldberg, L.S., 2012b. Liquidity management of U.S. global banks: Internal capital markets in the Great Recession. *Journal of International Economics* 88, 299-311.

Chari, A., Stedman, K.D., Lundblad, C., 2017. Taper tantrums: QE, its aftermath, and emerging market capital flows. NBER Working Paper No. 23474.

Devereux, M.B., Yetman, J., 2010. Leverage constraints and the international transmission of shocks. *Journal of Money, Credit and Banking* 42, 71-105.

Ehrmann, M. and Fratzscher, M., 2009. Global financial transmission of monetary policy shocks. *Oxford Bulletin of Economics and Statistics* 71, 739-759.

Elton, E.J., 1999. Presidential address: Expected return, realized return, and asset pricing tests. *Journal of Finance* 54, 1199-1220.

Fernández, A., Klein, M.W., Rebucci, A., Schindler, M., Uribe, M., 2015. Capital control measures: A new dataset. NBER Working paper No. 20970.

Gertler, M., Karadi, P., 2015. Monetary policy surprises, credit costs, and economic activity. *American Economic Journal: Macroeconomics* 7, 44-76.

Griffin, J.M., Kelly, P.J., Nardari, F., 2010. Do market efficiency measures yield correct inferences? A comparison of developed and emerging markets. *Review of Financial Studies* 23, 3225-3277.

Goyenko, R., Holden, C.W., Trzcinka, C.A., 2009. Do liquidity measures measure liquidity? *Journal of Financial Economics* 92, 153-181.

Gürkaynak, R.S., Sack, B., Swanson, E.T., 2005. Do actions speak louder than words? The response of asset prices to monetary policy actions and statements. *International Journal of Central Banking* 1, 55-93.

Gürkaynak, R.S., Sack, B.P., Swanson, E.T., 2007. Market-based measures of monetary policy expectations. *Journal of Business & Economic Statistics* 25, 201-212.

Hasbrouck, J., 2009. Trading costs and returns for U.S. equities: Estimating effective costs from daily data, *Journal of Finance* 64, 1445-1477.

Ince, O., Porter, R.B. 2006. Individual equity return data from Thomson Datastream: Handle with care. *Journal of Financial Research* 29, 463-479.

Jensen, G.R., Moorman, T., 2010. Inter-temporal variation in the illiquidity premium. *Journal of Financial Economics* 98, 338-358.

Karolyi, G.A., Lee, K.-H., van Dijk, M.A., 2012. Understanding commonality in liquidity around the world. *Journal of Financial Economics* 105, 82-112.

Karolyi, G.A., McLaren, K.J., 2017. Racing to the exits: International transmissions of funding shocks during the Federal Reserve's taper experiment. *Emerging Markets Review* 32, 96-115.

Kashyap, A.K., Stein, J.C., 2000. What do a million observations on banks say about the transmission of monetary policy? *American Economic Review* 90, 407-428.

Krueger, J.T., Kuttner, K.N., 1996. The Fed Funds Futures rate as a predictor of Federal Reserve policy. *Journal of Futures Markets* 16, 865-879.

Kuttner, K.N., 2001. Monetary policy surprises and interest rates: Evidence from the Fed Funds futures market. *Journal of Monetary Economics* 47, 523-544.

Lee, K.H., 2011. The world price of liquidity risk. *Journal of Financial Economics* 99, 136-161.

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

Pástor, L., Stambaugh, R.F., 2003. Liquidity risk and expected stock returns, *Journal of Political Economy* 111, 642-685.

Peek, J., Rosengren, E.S., 1997. The international transmission of financial shocks: The case of Japan. *American Economic Review* 87, 495-505.

Schnabl, P., 2012. The international transmission of bank liquidity shocks: Evidence from an emerging market. *Journal of Finance* 67, 897-932.

Shin, H.S., 2012. Global banking glut and loan risk premium. *IMF Economic Review* 60, 155-192.

Watanabe, A., Watanabe, M. 2008, Time-varying liquidity risk and the cross-section of stock returns, *Review of Financial Studies* 21, 2449-2486.

Table 1. Summary statistics of liquidity, returns, and volatility.

This table reports summary statistics for 43 stock markets in 42 countries (17 emerging markets in Panel A and 26 developed markets in Panel B) over the period 1995:01-2013:12. The first four columns show the first month in the sample, the number of unique stocks, the average number of stocks per month, and the number of stock-month observations. The next three columns show the time-series averages (over the period from the first month in the sample to 2013:12) of the market-wide (value-weighted average across individual stocks) Amihud illiquidity measure and stock return (in US$ and in % per month), and the market-wide volatility (monthly standard deviation of the value-weighted market return). The final three columns show the medians across stocks of the average stock-level Amihud illiquidity, return, and volatility over the sample period. We refer to Section 2 for data screens and variable descriptions.

Panel A. Emerging markets

	first month	# unique stocks	average # stocks	# stock-month obs.	average illiquidity	average return	market volatility	median of stock mean illiquidity	median of stock mean return	median of stock return volatility
Argentina	1998:01	74	35.8	6,871	13.24	7.68	34.53	30.57	14.60	51.01
Brazil	2005:01	262	122.0	13,178	2.97	18.85	30.88	2.51	15.22	41.85
Chile	1995:01	118	52.5	11,964	5.91	11.13	23.20	13.94	13.32	35.91
China	1998:01	1,450	747.3	143,477	0.24	13.66	30.58	0.11	19.29	48.73
India	1999:01	2,193	1,020.7	183,725	13.67	19.79	33.50	195.47	13.62	61.72
Indonesia	1996:01	142	43.7	7,870	7.95	17.00	41.19	19.91	13.17	48.07
Israel	1998:01	372	160.0	30,717	5.02	12.29	23.90	58.26	22.09	47.80
Malaysia	1995:01	848	428.9	97,799	7.09	10.44	33.16	49.60	14.23	48.52
Mexico	1998:01	87	35.8	6,866	4.43	16.17	27.62	9.22	17.55	45.95
Pakistan	1998:01	153	84.9	16,045	30.36	22.52	34.83	67.50	27.19	50.80
Peru	2008:01	44	28.3	2,039	9.41	14.54	28.28	15.35	17.08	42.51
Philippines	1997:01	135	53.4	10,901	26.25	11.88	35.35	112.03	15.44	54.67
Poland	2001:01	342	135.9	21,203	6.29	14.27	32.77	43.45	20.44	54.46
South Africa	1995:01	415	141.0	32,141	5.51	10.63	27.41	45.17	14.58	46.44
Sri Lanka	1999:01	139	67.8	12,211	129.46	17.25	28.90	277.93	23.77	48.37
Thailand	1995:01	525	207.1	47,230	11.21	8.19	37.39	45.18	19.29	52.08
Turkey	2000:01	307	225.0	37,805	0.84	15.94	47.57	2.07	20.79	62.23

Table 1. Summary statistics of liquidity, returns, and volatility– continued.

Panel B. Developed markets										
	first month	# unique stocks	average # stocks	# stock-month obs.	average illiquidity	average return	market volatility	median of stock mean illiquidity	median of stock mean return	median of stock return volatility
Australia	1995:01	1,698	531.2	121,120	2.52	12.41	22.06	56.48	14.97	66.55
Austria	1995:01	107	36.1	8,233	1.22	9.00	22.73	5.01	8.62	33.68
Belgium	1998:01	133	67.0	12,858	0.50	4.68	23.64	4.96	10.72	33.41
Canada	1995:01	2,680	979.9	223,423	3.98	13.95	19.95	139.63	16.63	75.71
Denmark	1995:01	204	84.4	19,252	1.25	13.45	18.62	9.69	11.55	38.24
Finland	1999:01	136	77.9	14,028	0.94	13.60	28.93	8.30	14.80	34.98
France	1996:01	873	357.4	77,191	0.72	11.60	21.38	9.98	15.32	38.38
Germany	2003:01	723	407.5	53,790	2.19	16.15	23.68	49.81	18.23	44.88
Greece	1995:01	340	158.3	36,086	7.03	12.09	36.27	47.69	10.33	61.39
Hong Kong	1995:01	835	379.9	86,627	1.45	13.75	24.26	18.47	19.53	63.47
Ireland	2005:01	47	26.8	2,898	4.04	5.58	33.53	10.99	18.13	48.68
Italy	1997:01	364	166.8	34,022	0.20	10.16	25.30	1.97	11.24	38.80
Japan	1995:01	3,931	2,388.4	544,545	0.58	1.48	18.25	4.75	7.65	38.63
Netherlands	1995:01	193	97.7	22,285	0.35	11.36	23.78	2.43	14.08	36.30
New Zealand	1995:01	127	51.2	11,664	5.95	11.75	21.54	22.43	16.91	36.43
Norway	1995:01	243	74.0	16,877	1.84	13.71	26.08	11.22	17.78	45.36
Portugal	1997:01	85	35.1	7,156	2.11	8.62	23.21	21.65	10.61	36.54
Singapore	1995:01	490	188.9	43,075	4.29	11.19	25.53	35.58	16.07	49.72
South Korea	1995:01	1,684	775.4	176,796	0.84	11.15	37.64	1.96	19.63	61.65
Spain	1995:01	178	86.9	19,812	0.18	9.76	24.09	1.17	14.17	34.69
Sweden	1995:01	516	181.3	41,339	0.98	15.89	27.54	17.57	17.86	45.21
Switzerland	1995:01	260	132.2	30,146	0.12	12.49	17.28	1.25	14.91	31.74
Taiwan	1996:01	1,418	644.3	139,167	0.57	7.83	28.30	1.47	15.00	46.95
U.K.	1995:01	875	223.4	50,945	0.02	10.47	16.83	0.04	16.15	45.04
U.S.: NYSE	1990:01	2,635	1,081.4	311,440	0.03	10.66	14.54	0.07	15.22	38.46
U.S.: Nasdaq	1990:01	7,008	1,894.7	545,667	2.56	12.15	22.94	8.08	18.66	56.25
Total emerging		7,606	3,590.2	682,042	16.45	13.88	32.96			
Total developed		27,783	11,128.2	2,650,442	1.75	11.03	24.39			
Grand total		35,389	14,718.4	3,332,484	6.98	12.60	28.25			

Table 2. Summary statistics of liquidity risk premia.

This table reports the average liquidity risk and average returns of portfolios sorted on liquidity risk, and the average liquidity risk premia for 43 stock markets in 42 countries (17 emerging markets in Panel A and 26 developed markets in Panel B) over the period 1995:01-2013:12. The first column shows the number of size - liquidity risk portfolios used for the double sorts to create the low and high liquidity risk portfolios (either 2×3 or 2×5). The next two columns show the time-series averages of the liquidity risk of the high and low liquidity risk portfolios (that is, the equally-weighted average liquidity beta across all stocks within the portfolio). The liquidity risk of individual stocks is estimated in 60-month rolling window regressions of individual stock excess returns on innovations (that is, residuals from rolling AR(2) regressions) in market-wide (that is, value-weighted average) Amihud illiquidity. Since we use an illiquidity measure rather than a liquidity measure, a large negative liquidity beta indicates a “high” degree of liquidity risk, while a small negative liquidity beta indicates a “low” degree of liquidity risk. The next four columns show the average equally-weighted (EW) portfolio returns (in US$ and in % per month) for the low risk and high risk portfolios as well as the EW liquidity risk premium (high-low), and the time-series standard deviation of the EW liquidity risk premium, respectively. The final four columns show the average value-weighted (VW) portfolio returns (in US$ and in % per month) for the low risk and high portfolios as well as the VW liquidity risk premium (high-low), and the time-series standard deviation of the VW liquidity risk premium, respectively. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

		Liquidity risk		*EW portfolio returns*				*VW portfolio returns*			
	# Portfolios	Low risk	High risk	Low risk	High risk	High-Low (H-L)	St.dev. (H-L)	Low risk	High risk	High-Low (H-L)	St.dev. (H-L)
Panel A. Emerging markets											
Argentina	2×3	-0.008	-0.203	0.657	0.990	0.334	6.727	0.460	0.899	0.439	7.133
Brazil	2×5	-0.008	-0.290	1.673**	1.616*	-0.057	4.607	2.027**	1.309	-0.718	5.980
Chile	2×3	0.000	-0.005	1.067**	1.018**	-0.048	3.296	0.842*	0.864*	0.022	3.288
China	2×5	-0.007	-0.026	1.471**	1.828**	0.357	4.513	1.295**	1.501**	0.205	3.647
India	2×5	-0.031	-0.160	2.215***	2.481**	0.266	5.290	1.945***	2.073*	0.128	6.873
Indonesia	2×3	0.000	-0.001	1.621**	0.908	-0.723*	5.614	1.170	1.046	-0.122	5.470
Israel	2×5	-0.024	-0.275	2.117***	1.406**	-0.711**	4.444	1.756***	1.162*	-0.595	5.097
Malaysia	2×5	-0.049	-0.383	0.939	0.935	-0.003	7.343	0.872	0.929	0.057	7.504
Mexico	2×3	0.075	-0.149	1.183*	2.023***	0.840**	5.829	0.808	1.651**	0.842**	5.564
Pakistan	2×3	-0.017	-0.089	2.570***	2.426***	-0.145	5.095	2.312***	2.340***	0.027	5.738
Peru	2×3	-0.023	-0.248	1.486	1.170	-0.333	5.077	1.018	0.869	-0.170	5.337
Philippines	2×3	0.023	-0.147	1.595*	1.772*	0.214	9.087	1.903**	1.775*	-0.092	9.799
Poland	2×3	-0.053	-0.250	1.674**	2.044**	0.370	4.579	1.433*	1.849**	0.416	5.102
South Africa	2×5	0.060	-0.253	1.550***	0.903	-0.646**	4.719	1.421***	0.719	-0.702*	5.409
Sri Lanka	2×3	-0.090	-0.245	1.985***	1.789**	-0.173	5.111	2.077***	1.704**	-0.355	5.287
Thailand	2×5	0.000	-0.079	1.665**	1.460	-0.205	8.346	1.306**	1.227	-0.079	8.524
Turkey	2×5	-0.061	-0.184	1.417	1.551	0.134	3.677	1.236	1.313	0.077	4.639

Table 2 – continued.

	# Portfolios	*Liquidity risk* Low risk	High risk	*EW portfolio returns* Low risk	High risk	High-Low (H-L)	St.dev. (H-L)	*VW portfolio returns* Low risk	High risk	High-Low (H-L)	St.dev. (H-L)
Panel B. Developed markets											
Australia	2×5	0.074	-0.720	1.360***	0.845	-0.515	5.584	1.079**	0.301	-0.778*	6.161
Austria	2×3	0.017	-0.157	0.831**	0.689	-0.140	4.311	0.667	0.986**	0.335	4.495
Belgium	2×3	-0.019	-0.143	0.431	1.130**	0.699**	3.926	0.630	1.077*	0.447	5.389
Canada	2×5	0.055	-0.900	1.734***	1.271*	-0.463	4.966	1.405***	0.793	-0.612	6.459
Denmark	2×5	-0.016	-0.132	1.165***	0.975**	-0.190	4.848	1.195***	0.951*	-0.244	5.522
Finland	2×3	-0.018	-0.153	1.199***	1.052*	-0.147	3.617	1.277**	0.978*	-0.298	4.901
France	2×5	0.027	-0.234	1.045***	1.271**	0.225	3.565	0.971**	1.275**	0.304	4.084
Germany	2×5	0.020	-0.394	1.589***	1.351*	-0.238	3.599	1.293**	1.476**	0.183	3.938
Greece	2×3	-0.059	-0.207	1.249*	1.270	0.021	5.454	1.193*	0.861	-0.333	6.816
Hong Kong	2×5	-0.011	-0.129	1.777***	1.466*	-0.312	7.301	1.577***	1.046	-0.530	8.372
Ireland	2×3	0.028	-0.220	0.060	1.246	1.186	9.020	-0.060	0.623	0.683	10.683
Italy	2×5	-0.008	-0.071	1.035**	0.978	-0.058	3.931	0.807*	0.659	-0.149	4.778
Japan	2×5	0.000	-0.003	0.237	0.771	0.534*	4.095	0.098	0.535	0.437	4.867
Netherlands	2×5	-0.006	-0.159	0.894**	0.865	-0.029	5.084	0.873**	0.872	-0.001	5.910
New Zealand	2×3	0.019	-0.221	1.236***	1.208**	-0.029	3.741	1.116***	1.206***	0.090	3.527
Norway	2×3	-0.024	-0.112	1.668***	1.155*	-0.513	4.768	1.495***	1.131**	-0.365	4.639
Portugal	2×3	0.048	-0.169	0.775	0.671	-0.105	5.221	0.621	0.490	-0.130	5.164
Singapore	2×5	-0.077	-0.446	1.247**	1.044	-0.203	6.268	0.973**	0.767	-0.205	6.505
South Korea	2×5	0.000	-0.001	1.460**	1.340	-0.120	4.062	1.133	1.226	0.092	4.964
Spain	2×5	0.001	-0.052	1.072***	0.972*	-0.099	4.671	0.925**	0.697	-0.228	5.543
Sweden	2×5	0.000	-0.055	1.351***	0.981	-0.370	5.491	1.363***	1.292**	-0.071	6.093
Switzerland	2×5	-0.007	-0.080	1.294***	1.045**	-0.249	5.288	1.174***	1.035*	-0.139	6.502
Taiwan	2×5	-0.001	-0.009	0.800	1.099	0.298	6.192	0.680	0.821	0.140	6.336
U.K.	2×5	0.008	-0.050	1.047***	1.192**	0.145	4.180	1.009***	1.037**	0.028	4.851
U.S.: NYSE	2×5	-0.018	-0.110	1.015***	1.399***	0.384	4.301	0.915***	1.336***	0.421	4.674
U.S.: Nasdaq	2×5	0.032	-0.331	1.392***	1.594***	0.202	5.591	1.263***	1.363**	0.100	5.486

Table 3. Commonality in liquidity risk premia.

This table reports the results of regressions to assess the degree of co-movement in the liquidity risk premia in local stock markets with the U.S. liquidity risk premium and the global liquidity risk premium (or "commonality in liquidity risk premia") over the period 1995:01-2013:12. The dependent variable is the monthly local market liquidity risk premium in each of the 41 non-U.S. markets in the sample, 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). Independent variables are the NYSE liquidity risk premium, the global liquidity risk premium (the residuals of a time series-regression of the equally-weighted average liquidity risk premium across all 42 countries in our sample excluding the country of interest on the NYSE liquidity risk premium), and the local market return, volatility, and illiquidity (see Table 1). Panel A reports the results of panel regressions (coefficients, *t*-statistics based on standard errors that are clustered by country and by month in italics below the coefficients, R^2, and number of observations) and Panel B reports the results of country-by-country regressions for select countries as well as summary statistics – the number of (significantly; at the 10% level) negative and positive coefficients and the average R^2 taken from the 41 country-by-country regressions with the same specification. Panel A and Panel B each report the results based on both the equally-weighted (EW) and the value-weighted (VW) average liquidity risk premia. Intercepts are suppressed to conserve space. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Panel regressions

	U.S. liquidity risk premium	Global liquidity risk premium	Local market return	Local market volatility	Local market illiquidity	R^2 (%)	# Obs.
Panel of 41 countries							
EW	0.195***	0.393***	0.183***	0.004	0.490**	15.6	8,208
	6.12	*5.58*	*5.55*	*0.01*	*2.15*		
VW	0.229***	0.411***	0.183***	-0.260	0.451*	15.5	8,208
	6.78	*6.88*	*5.47*	*-0.90*	*1.80*		

Panel B: Country-by-country regressions (select countries and summary across 41 countries)

	U.S. liquidity risk premium	Global liquidity risk premium	Local market return	Local market volatility	Local market illiquidity	R^2 (%)	# Obs.
Canada							
EW	0.271***	0.442*	0.234***	0.820	-1.133	23.2	228
	2.86	*1.87*	*2.96*	*1.17*	*-0.39*		
VW	0.560***	0.406	0.244**	1.111	-0.834	34.8	228
	5.25	*1.60*	*2.50*	*1.32*	*-0.24*		
Japan							
EW	0.293***	0.535***	0.308***	-1.030*	485.166	45.4	228
	5.76	*3.27*	*7.08*	*-1.78*	*0.60*		
VW	0.314***	0.334*	0.406***	-0.652	783.432	44.8	228
	5.68	*1.91*	*7.84*	*-0.94*	*0.82*		
Malaysia							
EW	0.304***	0.957***	0.505***	2.821***	-0.394	53.0	228
	3.73	*3.38*	*11.55*	*5.02*	*-0.12*		
VW	0.317***	0.717***	0.509***	2.831***	-0.858	52.3	228
	4.15	*2.70*	*11.18*	*4.90*	*-0.26*		
Turkey							
EW	0.127**	0.393*	0.099***	1.146	-1.372	24.9	168
	2.15	*1.82*	*4.37*	*1.65*	*-0.27*		
VW	-0.025	0.538*	0.087	0.312	5.681	8.9	168
	-0.33	*1.94*	*2.74*	*0.32*	*0.80*		
Summary across 41 countries							
# coefficients < 0 (# significantly < 0)						*avg R^2*	*avg #obs.*
EW	6 (0)	6 (1)	5 (0)	16 (4)	21 (4)	22.1	200.2
VW	6 (0)	3 (0)	3 (1)	12 (2)	23 (3)	21.8	200.2
# coefficients > 0 (# significantly > 0)							
EW	35 (29)	35 (17)	36 (26)	25 (8)	20 (4)		
VW	35 (28)	38 (14)	38 (26)	29 (6)	18 (3)		

Table 4. Summary statistics of Federal Funds futures rate changes.

The table reports summary statistics (mean, minimum, median, maximum, and standard deviation) of monthly changes in Federal Funds futures rate over the period 1995:01-2013:12. Changes in the Federal Funds futures rate (in %) are defined as the difference between implied rate on day *d*+1 and implied rate on day *d*-1 in month *t*, where implied rate is obtained by "100-Federal Funds futures price" since the Federal Funds futures price is defined as "100-implied future interest rate". The dates *d*+1 and *d*-1 are one day before and after the FOMC meeting, respectively, in month *t*. If multiple FOMC meetings were held in a given month, the daily changes are cumulated for that month. The final row of the table reports the number of months over the period 1995:01-2013:12 in which the Federal Funds futures rate decreases (monetary expansion), increases (monetary contraction), or stays the same. These numbers sum to the total number of months in the sample period.

	Mean	Min	Median	Max	St.dev.
ΔFFF (in %)	-0.002	-0.245	0.000	0.210	0.045
	ΔFFF<0	ΔFFF>0	ΔFFF=0	Total	
# months	53	54	121	228	

Table 5. U.S. monetary policy shocks and local market liquidity risk premia.

This table shows the results of panel regressions of the liquidity risk premium in 43 stock markets on U.S. monetary policy shocks 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 43 markets in the sample, 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). 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). All panel models further include the following control variables: the local market return, volatility, and illiquidity (see Table 1) and the global market (MKT-Rf), size (SMB), value (HML) and momentum (WML) factors from Ken French's website. 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.

	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 %)	-4.845**	-4.142**	-4.381**	-3.691**	0.463	0.451
	-2.54	*-2.15*	*-2.29*	*-2.32*	*0.19*	*0.21*
Local market return	0.213***	0.211***	0.993***	1.016***	0.780***	0.805***
	5.74	*5.33*	*17.65*	*17.55*	*22.13*	*20.91*
Local volatility	0.341	0.380	0.020	0.120	-0.321	-0.259*
	1.26	*1.23*	*0.05*	*0.32*	*-1.58*	*-1.68*
Local illiquidity	-0.334	-0.460	-0.902	-0.938	-0.568	-0.477
	-0.74	*-0.71*	*-1.07*	*-1.05*	*-0.92*	*-0.89*
Global MKT-Rf	0.059	0.107***	0.124***	0.140***	0.066*	0.033
	1.64	*2.73*	*2.76*	*3.20*	*1.94*	*0.93*
Global SMB	0.254***	0.284***	0.674***	0.562***	0.420***	0.278***
	4.06	*4.45*	*7.26*	*7.19*	*8.01*	*7.84*
Global HML	-0.111**	-0.122**	0.066	0.034	0.177***	0.156***
	-2.11	*-2.03*	*1.00*	*0.55*	*3.54*	*3.35*
Global WML	-0.157***	-0.171***	-0.229***	-0.209***	-0.073***	-0.038**
	-4.44	*-4.43*	*-6.58*	*-6.71*	*-3.57*	*-2.10*
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2 (%)	16.0	15.4	66.6	70.3	66.8	71.1
# Obs.	8,663	8,663	8,663	8,663	8,663	8,663
# Countries	43	43	43	43	43	43

Table 6. Summary statistics of U.S. bank claims and U.S. portfolio flows.

The table shows summary statistics (mean, minimum, median, maximum, and standard deviation) of the total claim of U.S. banks on each country (Panel A) and the equity portfolio flows from U.S. investors into each country (Panel B) over the period 1995-2013. The total claim of U.S. banks on each country (in US$ billions) is defined as the consolidated claims, on immediate borrower basis, of U.S. banks on individual countries, obtained from Table B4 of the Bank for International Settlements (BIS). U.S. portfolio flows, obtained from Treasury International Capital (TIC), are computed as the difference between gross sales of foreign stocks by foreigners to U.S. residents and gross purchases of foreign stocks by foreigners from U.S. residents computed as a percentage of the sum of gross sales and purchases of foreign stocks by foreigners to/from U.S. residents. A positive (negative) U.S. portfolio flow indicates that U.S. residents are net buyers (sellers) of foreign stocks in that country.

Panel A: Summary statistics of U.S. bank claims

	Mean	Min	Median	Max	St.dev.
Emerging markets					
Argentina	10.94	5.05	6.82	26.86	7.43
Brazil	45.40	17.73	31.80	115.58	27.81
Chile	8.85	5.71	8.40	14.26	1.94
China	28.23	1.18	14.29	82.96	29.25
India	30.55	4.05	20.45	74.90	24.64
Indonesia	7.87	2.64	5.33	19.28	5.16
Israel	2.01	0.52	1.49	5.96	1.42
Malaysia	11.78	4.94	11.49	20.95	4.61
Mexico	70.50	18.57	74.94	120.33	32.18
Pakistan	1.42	0.77	1.36	2.50	0.41
Peru	2.81	0.57	2.42	6.38	1.41
Philippines	5.67	3.81	4.91	11.24	1.73
Poland	8.93	1.04	8.00	19.52	4.46
South Africa	6.46	1.67	5.46	11.13	2.86
Sri Lanka	0.29	0.03	0.23	0.73	0.19
Thailand	7.05	3.95	6.33	14.72	2.91
Turkey	11.12	1.77	6.73	27.16	8.05
Developed markets					
Australia	51.88	18.07	32.27	117.07	34.17
Austria	7.57	2.39	6.79	14.71	3.16
Belgium	20.94	9.85	20.09	44.15	9.04
Canada	66.32	23.36	54.44	125.89	35.35
Denmark	13.90	4.29	13.77	28.68	6.46
Finland	4.81	1.18	3.33	11.41	3.01
France	88.31	22.63	52.15	236.95	69.81
Germany	113.56	51.78	96.87	222.30	46.77
Greece	7.09	2.93	6.67	19.36	2.97
Hong Kong	31.57	18.53	24.34	69.28	15.28
Ireland	31.37	3.70	20.11	81.60	26.06
Italy	33.83	21.66	30.44	69.27	10.21
Japan	155.77	42.00	79.87	358.03	115.44
Netherlands	62.51	15.58	54.69	120.71	32.94
New Zealand	3.04	1.41	2.67	5.81	1.26
Norway	10.53	2.69	8.65	31.59	6.04
Portugal	2.97	0.92	2.53	6.77	1.54
Singapore	29.28	11.29	21.29	67.81	18.05
South Korea	52.21	12.54	56.24	101.22	32.39
Spain	31.24	9.74	29.93	63.72	17.17
Sweden	13.29	4.86	10.69	29.45	7.73
Switzerland	28.79	8.05	17.60	85.63	22.32
Taiwan	21.99	9.27	17.40	50.06	11.23
U.K.	312.06	103.63	257.40	648.32	189.55

Table 6 – continued.

Panel B: Summary statistics of U.S. portfolio flows					
	Mean	Min	Median	Max	St.dev.
Emerging markets					
Argentina	-0.88	-90.62	-2.63	150.84	30.30
Brazil	16.48	-87.23	13.16	104.80	24.45
Chile	1.41	-82.93	-1.77	147.95	36.25
China	16.91	-127.27	7.13	178.16	63.14
India	24.46	-90.20	17.64	180.65	46.86
Indonesia	10.91	-98.59	12.02	144.48	42.58
Israel	12.11	-110.63	6.37	125.93	39.24
Malaysia	6.25	-175.14	8.03	126.67	42.83
Mexico	-2.63	-78.20	-2.63	63.94	23.81
Pakistan	10.21	-200.00	0.00	200.00	110.92
Peru	11.84	-174.50	11.94	188.44	59.27
Philippines	10.08	-137.78	6.73	136.36	43.82
Poland	21.45	-152.94	23.83	200.00	66.57
South Africa	22.01	-156.38	17.38	164.76	51.18
Sri Lanka	NA	NA	NA	NA	NA
Thailand	7.59	-133.33	10.91	125.00	38.76
Turkey	12.45	-159.07	12.41	186.31	61.50
Developed markets					
Australia	4.83	-40.22	3.47	55.99	15.32
Austria	-0.21	-139.00	0.00	152.14	42.05
Belgium	-3.01	-77.10	-3.37	104.28	32.23
Canada	1.58	-29.30	1.91	35.57	10.72
Denmark	2.27	-107.59	4.01	110.83	36.64
Finland	6.71	-161.95	6.72	143.43	47.31
France	5.15	-47.23	3.15	83.82	17.30
Germany	0.87	-94.08	-0.99	73.21	22.64
Greece	8.26	-138.17	4.66	160.61	56.14
Hong Kong	3.23	-59.54	1.79	56.21	14.49
Ireland	2.60	-74.20	1.83	88.18	23.02
Italy	6.40	-54.63	3.74	112.87	24.87
Japan	8.14	-29.57	4.72	66.32	17.40
Netherlands	-3.54	-49.54	-4.56	63.09	19.42
New Zealand	-0.02	-120.00	-5.10	127.07	40.08
Norway	-4.99	-101.62	-8.21	135.18	38.00
Portugal	9.63	-162.57	7.10	181.91	59.60
Singapore	0.02	-74.93	0.05	90.79	24.30
South Korea	19.85	-73.58	16.06	147.65	37.80
Spain	1.29	-143.93	1.98	119.80	31.99
Sweden	3.44	-70.38	0.94	109.68	30.82
Switzerland	0.67	-48.70	0.25	65.29	19.45
Taiwan	15.29	-167.12	13.14	137.86	42.77
U.K.	2.42	-17.55	2.43	29.66	7.16

Table 7. U.S. monetary policy shocks, local market liquidity risk premia and channels of influence.

This table shows the results of panel regressions of the liquidity risk premium in 41 stock markets (excluding NYSE and Nasdaq) on U.S. monetary policy shocks interacted with excess claims of U.S. banks on the country of interest and interacted with net % equity portfolio flows from the U.S. into 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). 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). 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$ billions; see Table 6). 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. As the interaction variable to assess the "portfolio channel," we use U.S. portfolio flows, defined as the difference between gross sales of foreign stocks by foreigners to U.S. residents and gross purchases of foreign stocks by foreigners from U.S. residents, obtained from Treasury International Capital (TIC). A positive (negative) U.S. portfolio flow indicates that U.S. residents are net buyers (sellers) of foreign stocks. All panel models further include the following control variables: the local market return, volatility, and illiquidity (see Table 1) and the global market (MKT-Rf), size (SMB), value (HML) and momentum (WML) factors from Ken French's website. 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.

Panel A. Liquidity risk premium (High – Low liquidity risk portfolio returns)

	EW	VW	EW	VW
ΔFFF (in %)	-6.098***	-5.762**	-4.531**	-3.806*
	-2.73	*-2.50*	*-2.39*	*-1.94*
U.S. bank claims	-0.006	-0.009**		
	-1.54	*-2.28*		
ΔFFF × U.S. bank claims	-0.217***	-0.230**		
	-3.45	*-2.43*		
U.S. portfolio flows			0.001	0.003
			0.32	*1.64*
ΔFFF × U.S. portfolio flows			0.004	0.029
			0.16	*0.84*
Local market return	0.217***	0.214***	0.214***	0.210***
	5.68	*5.23*	*5.49*	*5.06*
Local market volatility	0.437	0.468	0.389	0.414
	1.39	*1.31*	*1.26*	*1.18*
Local market illiquidity	-0.351	-0.518	-0.297	-0.454
	-0.75	*-0.77*	*-0.63*	*-0.66*
Global MKT-Rf	0.040	0.092**	0.040	0.090**
	1.22	*2.47*	*1.21*	*2.33*
Global SMB	0.233***	0.267***	0.230***	0.265***
	3.85	*4.36*	*3.73*	*4.12*
Global HML	-0.088*	-0.099*	-0.076	-0.086
	-1.91	*-1.76*	*-1.56*	*-1.45*
Global WML	-0.151***	-0.166***	-0.152***	-0.166***
	-4.45	*-4.38*	*-4.27*	*-4.21*
Country FE	Yes	Yes	Yes	Yes
Adj. R^2 (%)	15.6	15.1	15.0	14.3
# Obs.	7,511	7,511	7,891	7,891
# Countries	41	41	40	40

Table 7 – continued

	Panel B. High liquidity risk portfolio return				Panel C. Low liquidity risk portfolio return			
	EW	VW	EW	VW	EW	VW	EW	VW
ΔFFF (in %)	-5.389**	-4.681***	-3.922*	-3.175*	0.708	1.079	0.609	0.631
	-2.45	*-2.59*	*-1.95*	*-1.89*	*0.25*	*0.44*	*0.24*	*0.28*
U.S. bank claims	-0.005	-0.006*			0.001	0.003		
	-1.24	*-1.79*			*0.28*	*0.95*		
ΔFFF × U.S. bank claims	-0.190***	-0.167**			0.027	0.063**		
	-3.10	*-2.16*			*0.93*	*2.36*		
U.S. portfolio flows			-0.002	-0.001			-0.002	-0.004***
			-0.63	*-0.48*			*-1.24*	*-3.13*
ΔFFF × U.S. portfolio flows			0.023	0.028			0.019	-0.001
			0.64	*0.82*			*0.44*	*-0.02*
Local market return	0.994***	1.018***	0.984***	1.009***	0.778***	0.804***	0.771***	0.799***
	17.11	*16.98*	*16.81*	*16.62*	*21.17*	*20.11*	*20.99*	*19.70*
Local market volatility	0.061	0.166	0.011	0.114	-0.376	-0.301*	-0.378*	-0.301*
	0.13	*0.38*	*0.02*	*0.26*	*-1.62*	*-1.69*	*-1.69*	*-1.81*
Local market illiquidity	-0.883	-0.977	-0.802	-0.908	-0.530	-0.458	-0.505	-0.454
	-1.09	*-1.12*	*-0.98*	*-1.01*	*-0.95*	*-0.89*	*-0.89*	*-0.88*
Global MKT-Rf	0.116***	0.131***	0.117***	0.131***	0.076**	0.038	0.077**	0.041
	2.65	*3.08*	*2.76*	*3.08*	*2.13*	*1.04*	*2.20*	*1.10*
Global SMB	0.628***	0.528***	0.651***	0.543***	0.395***	0.261***	0.421***	0.279***
	6.83	*6.96*	*7.23*	*7.12*	*7.09*	*7.04*	*7.81*	*7.76*
Global HML	0.075	0.051	0.087	0.061	0.163***	0.150***	0.163***	0.147***
	1.19	*0.89*	*1.36*	*1.02*	*3.09*	*3.09*	*3.05*	*2.99*
Global WML	-0.219***	-0.202***	-0.229***	-0.209***	-0.068***	-0.036*	-0.076***	-0.043**
	-5.98	*-6.20*	*-6.31*	*-6.48*	*-3.05*	*-1.88*	*-3.42*	*-2.20*
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2 (%)	66.9	70.7	66.3	70.0	66.8	71.2	66.5	71.0
# Obs.	7,511	7,511	7,891	7,891	7,511	7,511	7,891	7,891
# Countries	41	41	40	40	41	41	40	40

Table 8. ECB monetary policy shocks and local market liquidity risk premia in the Euro area.

This table shows the results of panel regressions of the liquidity risk premium in 11 Euro area stock markets on ECB monetary policy shocks interacted with excess claims of Euro area 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 11 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). 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 to proxy for changes in the monetary policy of the Euro area is the first difference in the European Central Bank (ECB) overnight deposit rate (in %). The interaction variable to assess the "bank channel" is the excess claims of Euro area banks on the country of interest, defined as the consolidated claims, on immediate borrower basis, of Euro area banks on each country, obtained from Table B4 of the Bank for International Settlements (in US$ billions; see Table 6). 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) and the global market (MKT-Rf), size (SMB), value (HML) and momentum (WML) factors from Ken French's website. 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.

	Panel A. Liquidity risk premium		Panel B. High liquidity risk portfolio return		Panel C. Low liquidity risk portfolio return	
	EW	VW	EW	VW	EW	VW
ΔECB target rate (in %)	-1.980 *	-0.916	-2.482 ***	-1.159 *	-0.503	0.096
	-1.92	-0.91	-4.45	-1.95	-0.45	0.10
Euro area bank claims	0.001 *	0.002	0.000	0.001	-0.001	-0.001
	1.94	1.53	0.31	1.15	-1.33	-1.04
ΔECB target rate	-0.006	-0.018 **	-0.002	-0.009	0.004	0.008
× Euro area bank claims	-1.00	-2.48	-0.18	-0.88	0.56	1.35
Local market return	0.165 ***	0.163 **	0.810 ***	0.891 ***	0.646 ***	0.728 ***
	3.06	2.30	5.41	6.36	4.89	5.11
Local market volatility	0.226	-0.110	0.333	0.117	0.108	0.227
	0.77	-0.24	0.74	0.25	0.30	0.64
Local market illiquidity	-0.411	-0.246	-0.842	-0.743	-0.431	-0.497
	-0.68	-0.43	-0.96	-0.76	-1.42	-1.36
Global MKT-Rf	0.093	0.111	0.289 *	0.258 *	0.196	0.147
	1.34	1.03	1.73	1.75	1.32	0.90
Global SMB	0.249 **	0.249 **	0.737 ***	0.591 ***	0.488 ***	0.342 ***
	2.60	2.46	7.11	6.61	4.47	3.84
Global HML	0.039	0.098	0.339 **	0.328 ***	0.300 **	0.230
	0.51	0.99	2.57	2.78	2.44	1.47
Global WML	-0.180 ***	-0.205 ***	-0.256 ***	-0.233 ***	-0.076 ***	-0.028
	-3.00	-2.73	-4.00	-3.67	-2.85	-1.23
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2 (%)	15.9	14.1	69.2	73.0	65.2	68.6
# Obs.	1,815	1,815	1,815	1,815	1,815	1,815
# Countries	11	11	11	11	11	11

Table 9. U.S. monetary policy shocks and local market illiquidity premia.

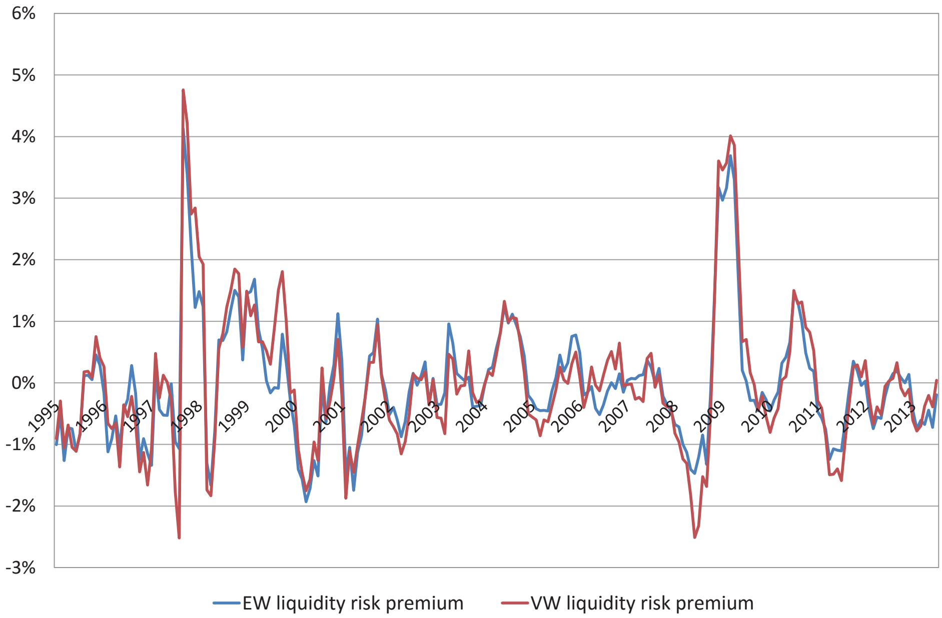
This table shows the results of panel regressions of the illiquidity premium in 41 stock markets on U.S. monetary policy shocks over the period 1995:01-2013:12. The dependent variable is the monthly local market illiquidity premium in each of the 41 markets in the sample, defined as the difference in returns of the portfolios of stocks with high and low illiquidity, obtained from the two-dimensional sorting based on size and illiquidity. In Panel A, the proxy for U.S. monetary policy shocks as key independent variable is the contemporaneous monthly change in the Federal Funds futures rate, defined as the cumulative change in the implied Federal Funds futures (FFF) rates around FOMC meetings held within the month (in %; see Table 4). In Panel B, the monetary policy proxy is a dummy variable indicating months with U.S. monetary policy expansions, defined following Jensen and Moorman (2010) to be equal to one from the month of a decrease in the U.S. Federal Fund rate until the month in which an increase in the rate is made, and zero otherwise. 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 the Table B4 of the Bank for International Settlements (in US$ billions; see Table 6). All panel models further include the following control variables: the local market return, volatility, and illiquidity (see Table 1) and the global market (MKT-Rf), size (SMB), value (HML) and momentum (WML) factors from Ken French's website. Panels A and B each report the following results based on both the equally-weighted (EW) and the value-weighted (VW) average illiquidity premia: 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.

	Panel A. Illiquidity premium & ΔFFF monetary policy proxy		**Panel B. Illiquidity premium & JM monetary policy proxy**	
	EW	VW	EW	VW
Monetary policy proxy	-1.220	-1.928	0.181	0.151
	-0.72	*-1.17*	*1.08*	*0.88*
U.S. bank claims	-0.000	-0.001	0.004	0.005
	-0.43	*-0.48*	*1.00*	*0.91*
Monetary policy proxy	0.009	0.000	-0.010	-0.013 *
× U.S. bank claims	*0.35*	*0.01*	*-1.64*	*-1.92*
Local market return	-0.194 ***	-0.206 ***	-0.194 ***	-0.206 ***
	-5.04	*-5.60*	*-5.03*	*-5.59*
Local market volatility	-0.934 ***	-0.847 ***	-0.956 ***	-0.859 ***
	-4.55	*-4.26*	*-4.62*	*-4.29*
Local market illiquidity	-0.804 ***	-1.063 **	-0.818 ***	-1.072 **
	-2.55	*-2.23*	*-2.63*	*-2.23*
Global MKT-Rf	-0.007	0.015	-0.007	0.015
	-0.20	*0.42*	*-0.18*	*0.41*
Global SMB	0.210 ***	0.214 ***	0.203 ***	0.206 ***
	4.01	*4.14*	*3.97*	*4.17*
Global HML	0.078 *	0.123	0.077	0.123 **
	1.72	*2.55*	*1.71*	*2.54*
Global WML	0.065 ***	0.041	0.064 ***	0.041
	2.80	*1.50*	*2.75*	*1.46*
Country FE	Yes	Yes	Yes	Yes
Adj. R^2 (%)	10.4	9.7	10.5	9.7
# Obs.	7,506	7,506	7,506	7,506
# Countries	41	41	41	41

Figure 1. Dynamics of liquidity risk premia.

This figure shows the dynamics of the liquidity risk premium in emerging markets (Panel A), developed markets (Panel B), and for the NYSE (Panel C) over the period 1995:01-2013:12. The local market liquidity risk premium depicted in this figure is the six-month moving average of the difference in the monthly returns of portfolios of stocks with high and low liquidity risk (in US$ and in % per month; see Table 2). Panels A and B show the average of this six-month moving average local market liquidity risk premium across, respectively, the 17 emerging markets and the 26 developed markets in our sample. Each panel shows both the equally-weighted (EW) and the value-weighted (VW) liquidity risk premium.

Panel A: Emerging markets



Panel B: Developed markets

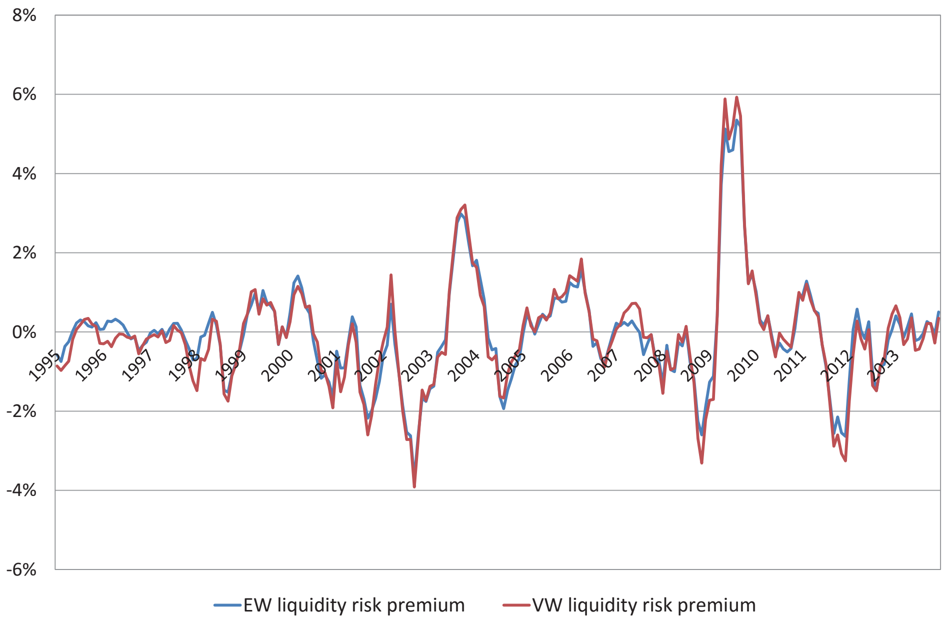


Figure 1 – continued.

Panel C: NYSE

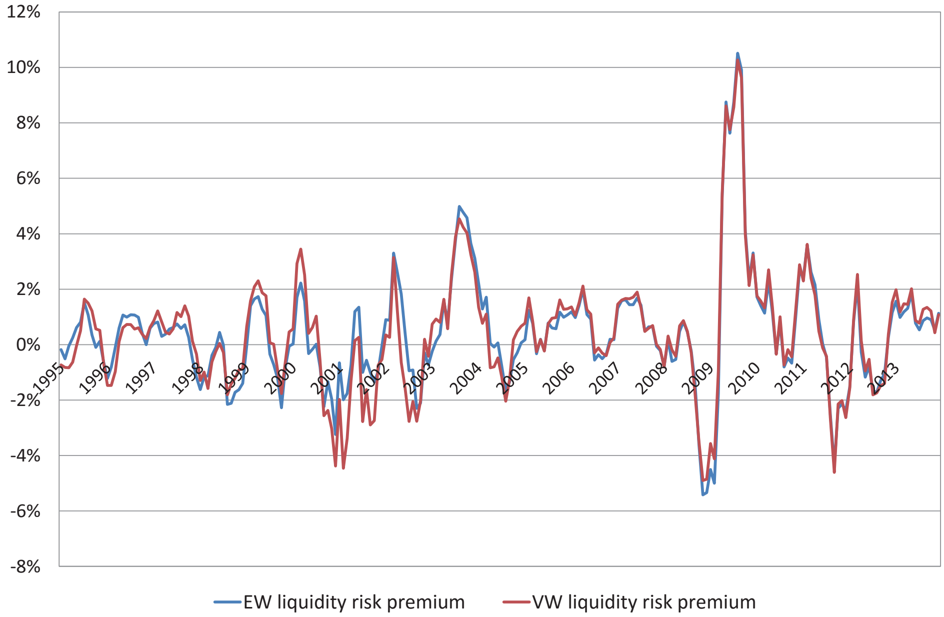


Figure 2. Changes in the Federal Funds futures rate (%) around FOMC meetings.

The figure shows the dynamics of our key proxy for U.S. monetary policy shocks: monthly changes in the Federal Funds futures rate over the period 1995:01-2013:12. Changes in the Federal Funds futures rate (in %) are defined as the difference between implied rate on day *d*+1 and implied rate on day *d*-1 in month *t*, where implied rate is obtained by "100-Federal Funds futures price" since Federal Funds futures price is "100-implied future interest rate". The dates *d*+1 and *d*-1 are one day before and after the FOMC meeting, respectively, in month *t*. If multiple FOMC meetings were held in a given month, the daily changes are cumulated for that month.

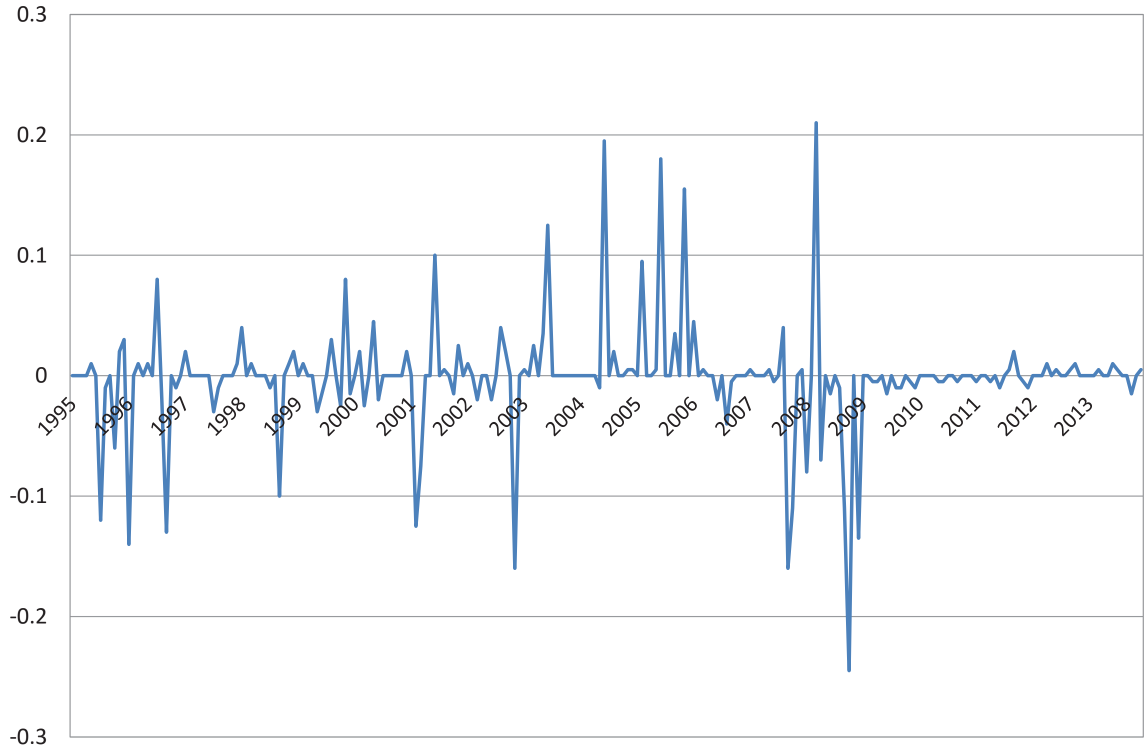


Figure 3. Aggregate claims of U.S. banks on all countries.

The figure shows the dynamics of our key variable to assess the "bank channel" of U.S. monetary policy transmission: aggregate claims of U.S. banks on all 41 countries in our sample over the period 1995:Q1-2013:Q4, 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$ billions; see Table 6), aggregated across all 41 countries besides the U.S. that are included in our sample.