Global Liquidity Risk, Country Market Liquidity and Country Market Returns

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Abstract

The world economic has become global. World equity markets and assets have been becoming more sensitive to global systematic risks in addition to local risk factors. This study investigates whether the global liquidity risk - a global liquidity shock as a systematic risk factor is globally a state variable of asset pricing and whether countries' market illiquidity as a characteristic requires extra return. Using the liquidity measure of Pastor and Stambaugh (2003) and GMM estimation, we find that the global liquidity risk requires a positive pricing premium in the global equity market at the country level; and that the total country market indices with highest sensitivity to global liquidity risk have 13.7% annually higher average return than country total market indices with lowest sensitivity for the period from 1992 to 2001, adjusted for world market return and value factor. In addition, we find that country markets having lowest market liquidity demand 11.8% annually extra returns than those having highest market liquidity after adjusted for market and value factors. These findings are consisting with the international asset pricing theory. In contract to the US market, we do not find a linearly normal relationship between the global market liquidity risk and the country market returns since we do not find a significant pricing premium of global liquidity risk using Fama-MacBeth methodology which assumes a linearly normal distribution. In addition, we find that the relationship between the country market liquidity and the total country market returns' sensitivity to the global liquidity risk is non-linear.

Keywords: Liquidity risk, liquidity, sensitivity, asset pricing, Jensen's alpha, CAPM, multi-factor model, characteristic, risk

JEL Classification: G11, G12, G15

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Global Liquidity Risk, Country Market Liquidity and Total Market Index Return

Samuel Xin Liang

I. Introduction

The world economic have become global. Capital can freely flow among developed and open financial markets. Investors usually hold assets across the globe in order to enjoy the benefit of diversification and higher returns of other markets. One draw back of CAPM is the lack of getting the true market portfolio. World equity markets and assets have been becoming more sensitive to global systematic risk factors as well as local risk factors, which can be the exchange rate risk[1], the global liquidity risk and the global volatility risk[2]. Events such as the collapse of Long-Term Capital Management (LTCM), Asian Financial Crisis and the burst of internet bubble showed that global liquidity shocks would significantly affect other countries' stock market liquidity and their stock market returns. This paper studies both the global liquidity risk-liquidity shock as a factor and the country market liquidity as a characteristic in the global economic. We examine whether the global liquidity risk is globally an asset pricing state variable and, whether country market illiquidity requires extra return across countries. In addition, we also examine the relationship between country index sensitivity to the global liquidity risk or liquidity shock and the countries' market liquidity in the global economic. In standard asset pricing theory, expected stock returns are related to return's sensitivities to state variables[3]. There are studies that investigate common state variables in the global market,

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[1] See Baily, Warren, Y. Peter Chung (1995), Choi, Jongmoo Jay, Takato Hiraki, and Nobuya Takezawa (1998) and Pavlova, Anna and Roberto Rigobon (2004)
[2] See Liang, Samuel Xin (2004)
[3] See Fama, Eugene F., and Kenneth R. French (1992), (1993) and (1995), and Jegadeesh, N. and Titman, S. (1993)

which are also priced in the US market. Most of them focus on the international CAPM, multifactor model with value vs. growth by Fama and French (1998) and momentum strategies by Rouwenhorst (1998). There is no study examining whether the global liquidity risk is globally a state variable of asset pricing although Bekaert and Harvey (2003) finds the liquidity is a pricing factor in a two factor model across stocks in emerging markets. Investors normally concern about their assets' liquidity within their own country or market and how these assets are priced within their local market factors. However, investors also invest globally for the diversification purpose and would like to expose to the high economic growth of other countries. Therefore, once investors face liquidity limitation in one country, they will naturally liquidate their assets in other country or switch their funds into other countries that have higher liquidity if they concern about the illiquidity constraint in their own market. In the case that investors liquidate their assets in the countries whose markets are relatively more liquid, these countries' market liquidity will likely get more dried out; and investors who buy the liquidating assets in that country will require extra return for compensating the liquidity demand of the sellers. On the other hand, if the investors are switching their fund into other countries whose markets are more liquid, then the investors might not require extra returns from these countries' stocks. Furthermore, countries' markets normally or historically being illiquid should require higher expected return than those normally being more liquid according to asset pricing theory. Amihud, and Mendelson (1986), Brennan and Subrahmanyam (1996), Brennan, Chordia and Subbrahmanyam (1998), Datar, Naik and Radcliffe (1998) and Gervais, Kaniel and Mingelgrin (2001) use a variety of liquidity measures to examine the level of liquidity as a characteristic related to expected return; and generally find that illiquid stocks have higher average returns in the US market. Therefore, we expect illiquid markets demand higher return.

But, these markets may not be very sensitive to others countries' liquidity shocks or the global liquidity risk since these illiquid markets are normally small. They usually attract much less foreign investments and face much less liquidation from oversea investors or absorb much less foreign fund when other countries have illiquidity constraint in their own markets. On the other hand, the highly liquid country markets that usually demand less return are sensitive to the global liquidity risk and require higher return in this respect. Therefore, the country market liquidity as a characteristic and the global liquidity risk as a factor plays a two-dimensional role in determining the country market returns. All these suggest that countries' total market returns may not have simple relationship or linear sensitivity with global liquidity risk or shocks and that these sensitivities may not linearly related to the countries market liquidity.

Liquidity generally captures the notion of ability that investors can trade large quantities of assets quickly at low cost and without moving the price. Current literature has extensive theoretical and empirical studies on how various measures of liquidity as a characteristic and liquidity risk as a factor demand extra returns in the US market. Chordia, Subrahmanyam and Anshuman (2001) find a significant cross-sectional relationship between stock returns and the variability of trading volume- a measure for liquidity. Lee and Swaminathan (2000) find that momentum effects in monthly returns are stronger for stocks with high recent volume. Lustig (2004) develops a model in which investors demand higher excess returns for compensating additional liquidity risk. Holstrom and Tirol (2001)'s Liquidity-Based Asset Pricing Model (LAPM) suggests that assets' expected returns are related to aggregate liquidity. Pastor and Stambaugh (2003) examine the pricing of the aggregate market liquidity risk as a factor in US market, which is the market liquidity innovation- a measure of liquidity risk and find that the liquidity risk is linearly and positively priced after being adjusted for market, value, size and momentum factors. However, the pricing of the global liquidity risk in the global market has not yet been empirically examined. We are interested in the pricing of global liquidity risk in the level of the country total market index return because investors will firstly decide switch their funds or liquidate their assets in the country level prior to stock level selection. The country market portfolios are also locally diversified at country level. This will not only solicit the cross country listing effect but also capture the money flow between countries. The country market return and turnover by value in US dollar and/or country market liquidity will face exchange rate risk[4] and currency liquidity risk. We select developed countries in our study in order to isolate the currency liquidity risk since their currencies are freely exchangeable and they account for more than 90% of the world market. We convert both turnovers by value and market return into US dollar then construct the country market's liquidity measure so that the exchange rate risk can be separated. We use Pastor and Stambaugh (2003)'s liquidity measure to investigate whether the global liquidity risk as a factor is globally a state variable of asset pricing because we are interested in the money flow among countries and this liquidity measure captures the dimension associated with temporary price changes accompanying order flow or market turnover by value. Our focus on the money flow causing country market liquidity among countries is motivated by Chordia, Sarkar and Subrahmanyam's (2004) finding that there is a linkage between market liquidity and money flows in the US equity and bond markets. Using GMM, we find that the global liquidity risk has significant and positive pricing premium. However, the country market returns do not have a linearly normal relationship with the liquidity risk as we can not find the risk premium using Fama-MacBeth

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[4] See Baily, Warren, Y. Peter Chung (1995), Choi, Jongmoo Jay, Takato Hiraki, and Nobuya Takezawa (1998) and Pavlova, Anna and Roberto Rigobon (2004)

methodology which has a linearly normal assumption. In particular, portfolio of country market indices with highest predicted liquidity beta has significantly 13.7% annually higher return than those with lowest predicted liquidity beta controlled for market return and value factors during the period from January 1992 to December 2001. One the other hand, the portfolios of country market indices sorted on linearly estimated betas of liquidity risk do not exhibit a significantly abnormal return for both linear regressions and GMM estimation. Furthermore, we find that the illiquid country markets significantly require 11.8% higher annual returns than more liquid markets and that the relationship between the country market liquidity and country market sensitivity to global liquidity risk is non-linear.

We do not control for momentum factor since Richards (1996), Ferson and Harvey (1996) and Rouwenhorst (1998) find the relatively weak momentum in country index returns. We use country total market index returns with another advantage that the country total market index is a portfolio of many stocks and represents a portfolio's exposure to risk factors and that its sensitivity to state variables such as global liquidity risk represents the portfolio sensitivity already. The following of the paper is organized into another six sections. Section II, describes the source of data and provides some descriptive statistics. Section III, discusses the construction of the country market liquidity measure and of global liquidity risk. Section IV, presents the estimation of the country markets' sensitivity (beta) to global liquidity risk. Section V, analyzes the nonlinear relationship among country markets' liquidity, countries market returns and their sensitivities to global liquidity risk; and how the country market illiquidity as a characteristic requires extra return. Section VI, presents the pricing of global liquidity risk as a factor; and Section VII finally concludes.

II. Data Sample

All daily country total market indices value in local currency, their daily turnover by value in local currency, their daily market values in local currency and countries' daily exchange rates are retrieved from DATASTREAM. The period having valid index value and market value is reasonable long, but the number of years that all countries have daily turnover by value is limited. Therefore, this paper can only use the data sample from January 1988 to December 2001. We also use eight global portfolio assets to mimic the global liquidity risk as they are not tradable asset when we use Fama-MacBeth methodology to estimate the factor premium. These eight assets are value weighted returns of global stocks in the categories of the top 30% of book-to-market (B/M) ratio, bottom 30% of B/M ratio, top 30% earning-to-price ratio (E/P), and bottom 30% E/P, the top 30% of high cash earning-to-price ratio(CE/P), the bottom 30% CE/P, the top 30% of Dividend yield (YLD), and bottom 30% YLD. We select twenty-three developed countries' markets which composite the MSCI world index since their currencies are freely exchangeable. The world market return of this paper is the value weighted index return using all 23 countries as long as there are valid data of country index and of market value. All country total market index return, market value and turnover by value are converted to US dollar unit before constructing world market index return and country market liquidity.

[Table 1 inserted here]

Table 1 presents the descriptive information of the firstly available data. There are only 14 countries having valid turnover by value in 1988, and the number of countries increases to 20 after 1990 and 22 after 1993; and there is valid turnover by value data for the Ireland country index only after January 2001. Accounting for over one third of the total average turnover by value around the world, the US market has the highest average turnover by value and is followed by Japan (in shorter length of period), United Kingdom (UK) and Germany. After converting into US dollar, turnover by value of country index in small countries such as Greece, Portugal, Belgium and Austria become small. In addition, we delete the data volume by value in US dollar if it is less than US$100,000 as sample errors since these turnovers are the trading value of countries' total market and these markets are developed and sufficiently big. Hence, we consider those data are outlier or typo in the data source.

III. Country Market Liquidity and Global Liquidity Risk

We use Pastor and Stambaugh's (2003) liquidity measure which focus on the liquidity dimension related with temporary price changes accompanying order flow. The global market liquidity measure in a given month is the simple average of the liquidity measures of individual country market. The liquidity of country i in month t is the coefficient $\gamma_{i,t}$ from ordinary-least-squares (OLS) in the following regression (1):

$$r^e_{i,d+1,t} = a_{i,t} + b_{i,t} * r_{i,d,t} + \gamma_{i,t} * \text{sign}(r^e_{i,d,t}) * v_{i,d,t} + \epsilon_{i,d+1,t}, \quad d= 1,\ldots.D, \qquad (1)$$

, where[5]

$r_{i,d,t}$: the US dollar return on country index i on day d in month t,

$r^e_{i,d1,t}$: $r_{i,d,t}$ - $r_{i,m,t}$: $r_{i,m,t}$ is the US dollar value weighted return of global market on day d in month t,

$v_{i,d,t}$: the volume in ten million US dollar (turn over by value) for country i on day d in month t.

This liquidity measures the dimension that the temporary price fluctuations are induced by money order flow, implying that lower liquidity corresponds to stronger volume-related return

[5] Note: All the country index excess returns, portfolio excess returns, returns, market excess return and value factor –HML returns in all regressions of this study are in percentage so that all coefficients of regressions are interpreted as monthly percentage. (All the results are the same if the returns are all in decimal and the liquidity in following section (equation (5)) will just divide by 100). This is convenient for interpreting the Jensen's alpha and the estimated liquidity risk premium and its contribution to the country index return in following tables.

reversal. Therefore, a reversed future return is expected when the country market liquidity is low, which is constructed by the signed volume. It is consistent with the reasoning of Campbell, Grossman and Wang's (1993) model and empirical evidence, who explain their finding with a model in which some investors are compensated for accommodating the liquidity demands of others. This means that the higher the reversal for a given dollar volume, the lower the country market liquidity is. We would expect negative $\gamma_{i,t}$ in general and larger in absolute magnitude when country market liquidity is lower. The equilibrium model of Campbell, Grossman and Wang (2003) can be used to illustrate the ability of the above $\gamma_{i,t}$ capturing the liquidity effect. The country total market index is a portfolio of all stocks in that country, hence each country market liquidity is represented by $\gamma_{i,t}$. Furthermore, the $\gamma_{m,t}$ of simple average in equation (2) will be representative since N_t is large, which can be viewed as actually N*M (where M is average number of stocks across country market indices, N is number countries).

$$\gamma_{m,t} = (1/N_t) \sum \gamma_{i,t} \qquad \text{for } i=1,.., N_t \qquad (2)$$

The constructed liquidity measure should reflect the cost of a trade whose size is relatively compensated with market size. We also multiply $\gamma_{m,t}$ by (m_t/m_1), where m_t is the total dollar value at the beginning of month t of country market included in the simple average in month t, and month 1 corresponds to the January 1988. We plot the monthly aggregate liquidity in both scaled global liquidity measure in figure 1.

[Figure 1 inserted here]

The scaling measure captures the global market value. After scaling, there is the lowest value in January 2001 when the internet bubble was burst and second lowest points during the Asian Crisis in 1997. It suggests that this global liquidity measure in the global market captures what actually happened. In order to construct the innovations of global liquidity, we scale the monthly difference in global liquidity then aggregate them across N_t countries with available data in both current and previous month as in equation (3).

$$\Delta\gamma_{m,t} = (m_t/m_1)^* (1/N_t)\sum(\gamma_{i,t} - \gamma_{i,t-1}) \qquad \text{for } i=1,.., N \qquad (3)$$

We regress $\Delta\gamma_{m,t}$ on its lag as well as the lagged value of the scaled level series:

$$\Delta\gamma_{m,t} = a + b^*\Delta\gamma_{m,t-1} + c^*(m_t/m_1)^*\gamma_{m,t-1} + \delta_t \qquad (4)$$

This regression allows the predicted change relies on the most recent changes at the same time on the deviation of the most recent level from its long run mean. This regression is a second-order auto-regression in the level series, and produces residuals that appear to be serially uncorrelated. Therefore, the innovation of liquidity, L_t is taken as the fitted residual divided by 10000 [6].

$$L_t = \delta_t /(100^*100); \qquad (5)$$

This global liquidity innovation can be viewed as the global liquidity risk or unexpected liquidity shock.

IV. Estimating the Liquidity Risk Beta or Sensitivity

Once the global liquidity risk is constructed, it is important to accurately estimate the country market's sensitivity to the global liquidity risk. One natural attempt is to get a linearly estimate liquidity risk beta or sensitivity using regression (6):

$$R_{i,t} = \beta^0_i + \beta^L_i L_t + \beta^M_i MKT_t + \beta^H_i HML_t + \epsilon_{i,t} \qquad i=1,..N \qquad (6)$$

[6] For reporting purpose in the following tables.

Since Fama-French (1998) found that the factors of global market are the market factor and HML factor. Following empirical asset pricing methodology, we sort countries into 10 portfolios based on the linearly estimated betas ranking from 1 to 10 (the portfolio 1 having the lowest beta and portfolio 10 having the highest beta) in order to see if there is a increasing Jensen's alpha for both CAPM and Fama-French 2-factors models.

[Table 2 inserted here]

The portfolio 10-1 is based on longing portfolio 10 and shorting portfolio 1. We can not see an increasing pattern of the Jensen's alpha for both models as well as the raw returns. In addition, the alpha for portfolio 10-1 is marginally significant for CAPM conditioned on one-tail test, but not for Fama-French two factors model. We can infer that the linearly estimated beta may not be a good estimated sensitivity of country market returns to global liquidity risk. A further test and analysis will be followed in later section.

Predicting the Liquidity Beta or Sensitivity

We therefore use seven characteristics of country market index to estimate its true sensitivity to the global liquidity risk. They are 1) the linearly beta estimated using equation (6) with all data available from months t-36 through t-1 2) the natural log of country index value in US dollar, 3) the natural log of market value of country index in million US dollar, 4) the average value of $\gamma_{i,t}$ from month t-6 to t-1, 5) the natural log of average turnover by value in thousand US dollar from month t-6 to t-1, 6) the accumulative country index return in US dollar, 7) the monthly standard deviation of the monthly return[7], The predicted liquidity beta is a linear function of these seven elements specified in the following equation (7).

$$\beta^L_{i,t-1} = \psi_{1,i} + \psi_{2,i} C^1_{i,t-1} + \psi_{3,i} C^2_{i,t-1} + \psi_{4,i} C^3_{i,t-1} + \psi_{5,i} C^4_{i,t-1} + \psi_{6,i} C^5_{i,t-1} + \psi_{7,i} C^6_{i,t-1} + \psi_{8,i} C^7_{i,t-1} \quad (7)$$

In order to get the accurate value of $\psi_{j,i,}$ we use a two stage OLS regression method. We can get equation (8) by substituting the right-hand side of (7) in (6).

$$R_{i,t} = \beta^0_i + \beta^M_i MKT_t + \beta^H_i HML_t + (\psi_{1,i} + \psi'_{k,i} C_{i,t-1})L_t + \epsilon_{i,t} \qquad i=1,..N \qquad (8)$$

, where, $\psi'_{k,i,}$ is a 1x7 vector containing $\psi'_{j,i,}$ j=1, .. 7
$C_{i,t-1}$ is a 7x 1 vector containing seven elements,

The above regression for country i contains 10 independent variables, and 7 of which are cross product of the elements of $C_{i,t-1}$ with L_t . We restrict the coefficients $\psi_{1,i}$ and $\psi'_{k,i}$ in equation (7) to be the same for all country index and estimate them using the whole panel of country market index returns. At first, we estimate β^M_i and β^H_i using regression (6) for each country i; and then we construct the historical series by the following equation (9):

$$e_{i,t} = R_{i,t} - \beta^M_i MKT_t + \beta^H_i HML_t \qquad i=1,..N \qquad (9)$$

We use the historical $e_{i,t}$ to run a pooled time-series, cross-sectional regression (10) of $e_{i,t}$ on the seven elements.

$$e_{i,t} = \psi_{0,i} + (\psi_{1,i} + \psi'_{2,i} C_{i,t-1})L_t + \upsilon_{i,t} \qquad i=1,..N \qquad (10)$$

The first month being considered is January 1991 as we would like to include a good number of major markets[8]. Table 3 reports the all eight ψj value (j=0, 1,.., 7). In addition, we perform a

[7] They are firstly produced with decimal return then converted to percentage matching other returns in the regressions
[8] Japan, being the second biggest market, has valid data from Datastream starting from 1990.

constraint regression for (10) with restricting $\psi_{0,I}$ and use GMM to estimate the true coefficients of these variables since they are highly correlated and may not linearly related to the predicted beta.

[Table 3 inserted here]

The linearly estimated beta is negatively related to the predicted beta and its significance is diminished once GMM is used. The large marginal contributions are come from the market size, turnover by value, and liquidity although the liquidity is not significant but positive. The signs of the coefficients of market value and turnover by value are opposite so that the country index's sensitivity is positively related to its turnover and negatively to market value. An opposite sign of log turnover by value and log market value gives a nice property that is log (turnover/market value) which can nicely capture country market liquidity in this dimension. The predicted beta being positively and significantly related to accumulative returns is a good property so that the higher sensitivity to the liquidity risk will require higher accumulative return since international investors or global fund managers would be attracted to invest foreign country equity market by the past accumulated return at cross country level. In particular, investors will look at those market with relatively higher liquidity and good performance country market when there is a global liquidity shock. The linearly estimated betas are negatively related to the predicted beta as opposite to the finding of Pastor and Stambaugh (2003) in the US market. We will examine this matter in the following section.

V. The Non-linear relationship

The negative correlation between predicted beta and linearly estimated beta suggests that the country market return may not linearly related to global liquidity risk. As the first step, we form 10 portfolios based the predicted betas and examine the properties and Jensen's alpha of these portfolios and of the 10-1 spread portfolio[9]. Furthermore, we also construct 10 portfolios based on the country market liquidity and the 1-10 spread portfolio[10] in order to examine whether the country market's illiquidity as a characteristic demands a higher return premium. In addition, we use Fama-Macbeth methodology to test whether the global liquidity risk as a factor has a linear pricing premium.

The Portfolios Sorted On Predicted Betas

Countries are sorted by their predicted liquidity betas and assigned to 10 portfolios at the end of each month, the next month return will be used (therefore, the first month of return in the portfolio is January 1992 as explained later). The predicted beta for each country is constructed from equation (7), the month end value of the country's characteristics along with the seven ψ estimated using data through the current year. The period of forming portfolios is starting from the end of December 1991 since countries are included if they have valid data for at least one year. Table 3 reports the properties as well as the Jensen's alphas of both CAPM and Fama-French two factor models.

[Table 3 inserted here]

The Jensen's alphas of both CAPM and Fama-French two factors model do not have a increasingly monotonic trend, but the highest sensitive portfolios have the highest Jensen's alphas. In particular, the portfolios 2 and 3 which having the low sensitivity exhibit high non-significant alpha for both equally weighted and value weighted. These portfolios' liquidity is also very low while the market size is also being very small. This suggests that some of the extra returns are demanded from the illiquid nature of the country markets as a characteristic.

[9] Longing the portfolio having highest sensitivity or predicted beta and shorting portfolio having lowest predicted beta.
[10] Longing the most illiquid portfolio and shorting the most liquid portfolio.

This pattern is align with our economic explanation that illiquid markets required additional returns to compensate the illiquidity and meanwhile they are not sensitive to the global liquidity shock or risk due to their nature of being small and non-liquid. These characteristic nature of the country market usually have low attractive to investors across the global. In particular, foreign investors normally do not invest large amount of their fund into these markets when there is no illiquidity constraint across the globe or when there are globally liquidity shocks. When they invest in these markets at normal time, they will require additional expected return for compensating the illiquidity of the markets. On the other hand, investors will not normally switch their fund into or liquidate their assets in these illiquid markets[11] while they face global liquidity shocks in their local market or other markets. These suggest that the country market liquidity as a characteristic does not have linear relationship with country markets' sensitivity to global liquidity risk as a factor. The non-monotone upward trend of the country market liquidity within these ten portfolios actually illustrates this non-linear relationship. We will examine how the country market liquidity effects country market returns in following section since illiquid stocks were shown to have higher returns in the US market according to empirical asset pricing evidences[12]. However, the Jensen's alphas of both equally weighted and value weighted 10-1 portfolios are significantly positive for both CAPM and Fama-French two factors models. This suggests that the global liquidity risk as a factor demand a positive pricing premium.

The Portfolios Sorted On Country Market Liquidity

[11] It will be also more difficult to liquidate assets in these illiquid and small markets when there is global liquidity shock

[12] See Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), Brennan, Chordia and Subbrahmanyam (1998), Datar, Naik and Radcliffe (1998) and Gervais, Kaniel and Mingelgrin (2001)

Our liquidity measure captures the country total market index changes induced by the money "order flow" that are flowing in or out of the market. Therefore, the country market liquidity represents the overall cash movement of the markets or how easily the assets within these markets can be liquidated without moving the market. Therefore, global investors will demand a higher return for illiquid markets. We form 10 portfolios based on the country market liquidity such that portfolio 1 having the lowest market liquidity and portfolio 10 having the highest market liquidity; and 1-10 spread portfolio. The Jensen's alphas and properties of these portfolios are shown in the following table 5.

[Table 5 inserted here]

The Jensen's alphas of equally weighted portfolio returns show a clear decreasing trend although it is not strictly a monotone. Furthermore, the most illiquid portfolio has 0.98% monthly or 11.8% annually higher return than the most liquid portfolio after adjusted for market and value factors, which is significant at 10% two tail test and 5% one tail test. The value weighted 1-10 spread portfolio also generates monthly 1.02% abnormal return controlled for market and value factors at 10% one tail test (t=1.60 and t=1.53 respectively for CAPM and FF-two factor models). This confirms that the country market liquidity as a characteristic requires additional market returns. However, relationship the country market liquidity and market size is not linear and has a concave U-shape[13]. These support our previous economic explanation for the non-monotonic Jensen's alpha of portfolios sorted on predicted betas and for the non-linear relationship between market return sensitivities to global liquidity risk as a factor and country market liquidity as a characteristic. The remaining question is whether the global liquidity risk has pricing premium and how is priced.

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[13] Chordia, Subrahanyam and Anshuman (2001) finds a non-linear relationship between size and returns at stock level in the US market.

The Relationship between Global Liquidity Risk and Country Market Returns

The above tests suggest that the relationship between the country market return and the global liquidity risk is not linearly normal. In order to estimate if there is a linearly normal liquidity risk premium, we use eight tradable assets to mimic the global liquidity risk as it is not tradable asset, which are the high/low book-to-market ratio (B/M) portfolios, high/low earning-to-price ratio (E/P) portfolios, high/low cash earning-to-price ratio (CE/P) portfolios, and high/low dividend yield (YLD) portfolios. The high/low means the top/bottom 30% within the specific criteria. Using these portfolios, we use Lamont (2001) economic tracking regression (11) to mimic the liquidity risk.

$$\text{Model I:} \qquad Liqrisk_t = \beta^0 + \beta'_F MF_t + \epsilon_t \qquad (11)$$

We call $Mliq_t$ for this $\beta'_F MF_t$., then use Fama-Macbeth (1973) regressions (12) and (13) to examine if the pricing relationship is linearly normal.

$$R_{i,\tau} = \beta^0_i + \beta^{Mliq}_{i,t-1} * Mliq_\tau + \beta^M_{i,t-1} * MKT_\tau + \beta^H_{i,t-1} * HML_\tau + \epsilon_{i,\tau} \quad \tau = 1,..,t-1 \qquad (12)$$

$$R_{i,t} = \psi^0_t + \psi_t^{Mliq} * \beta^{Mliq}_{i,t-1} + \psi_t^M * \beta^M_{i,t-1} + \psi_t^H * \beta^H_{i,t-1} + \epsilon_{i,t} \qquad (13)$$

The $\beta^F_{i,t-1}$ is using time series data from January 1988 to t-1 for regression (12). The factor premium is reported in table 6.

[Table 6 inserted here]

The mimicked liquidity risk factor premium is not significant although it is positive. The only significant factor is the value factor in these tests. We infer that the relationship between the country market returns and the global liquidity risk is not linearly normal since Fama-Macbeth (1973) methodology has this assumption. This is not surprising since Chordia, Subrahanyam and Anshuman (2001) find a non-linear relation between turnover-a liquidity proxy and returns at the stock level in the US Market. In addition, Cooper, Gutierrez and Hameed (2004) find that the relationship between the stock returns and momentum factor is not linear. However, we can not conclude that the liquidity risk does not have a pricing premium since we find the abnormal higher returns of markets having different sensitivities to the global liquidity risk as a factor.

VI. The Pricing of Global Liquidity Risk

We employ Generalized Method of Moments (GMM) method to estimate the liquidity risk premium and its contribution to the market returns. We define the multivariate regressions (13) and (14),

$$R_{i,t} = \beta^0{}_i + \beta^L{}_i\, L_t + \beta^M{}_i\, MKT_t + \beta^H{}_i\, HML_t + e_{i,t} \qquad i=1..,10 \qquad (13)$$

The equation in matrix form,

$$R_t = \beta^0 + \beta^L\, L_t + \beta^F\, F_t + e_{t,} \qquad (14)$$

, where R_t is a 10x1 vector containing the excess returns on the 10 (i=1,..,10) portfolios sorted on predicted betas. The β^0 and β^L are 10x 1 vectors, F_t is 2 x 1 vector containing realizations of "traded" factors MKT and HML, and β^F is 10x2 matrix. Assuming the 10 portfolios are priced by the returns sensitivities to the traded factors and the non-traded liquidity risk factor, we have:

$$E\,(R_i) = \beta^L{}_i\, \lambda_L + \beta^M{}_i\, \lambda_M + \beta^H{}_i\, \lambda_H \qquad i=1..,10 \qquad (15)$$

In vector and/or matrix form,

$$E\,(R) = \beta^L\, \lambda_L + \beta^F\, \lambda_F \qquad (16)$$

, where E(.) denotes the unconditional expectation; and λ_L and λ_M ,λ_H,(vector λ_F) are the true expectations of respected variables. After taking expectation of both sides of (13) and substituting to equation (15), we have

$$\beta^0_i = \beta^L_i [\lambda_L - E(L_t)], \qquad i=1,..,10 \qquad (17)$$

In vector form,

$$\beta^0 = \beta^L [\lambda_L - E(L_t)], \qquad (18)$$

, because the vector premium on the traded factors λ_F, is equal to $E(F_t)$. The liquidity factor L_t is not the payoff on a traded position, so in general the liquidity risk premium λ_L is not equal to $E(L_t)$. In order to find the true risk premium for the non-tradable liquidity, we use Generalized Method of Moments (GMM) of Hansen (1982) Estimation to estimate the λ_L. Let θ denote the set of parameters: λ_L, β^L, β^F and $E(L_t)$ The GMM estimator of θ minimizes $g(\theta)'Wg(\theta)$, where $g(\theta) = (1/T) \sum f_t(\theta)$, t=1,.. T,

$$f_t(\theta) = \begin{pmatrix} h_t \otimes e_t \\ L_t - E(L_t) \end{pmatrix} \qquad (19)$$

$$h'_t = (1 \; F'_t \; L_t) \qquad (20)$$

$$e_t = R_t - \beta^L [\lambda_L - E(L_t)] - \beta^L L_t - \beta^F F_t \qquad (21)$$

, and W is a consistent estimator of the optimal weighting matrix[14]. Table 6 reports the estimation of the liquidity risk premium λ and its contribution $(\beta_{10}^L - \beta_1^L)^* \lambda$ from both 10 equally weighted portfolios and 10 value weighted portfolios.

[Table 6 inserted here]

[14] See the Pastor and Stambaugh (2003).

The risk premium of λ estimated from equally weighted portfolios is 18.9 with t-statistic 1.97; and its contribution to return $(\beta_{10}^{L} - \beta_{1}^{L})^{*} \lambda$ is 13.72 with t-statistic 2.21. The risk premium of λ estimated from the value weighted portfolios is 19.2 with t-statistic 1.32; its contribution to return $(\beta_{10}^{L} - \beta_{1}^{L})^{*} \lambda$ is 12.08 with t-statistic 2.15. Although the t-statistic of λ estimated from value weighted portfolios is only 1.32 which is not significant at 10% in two tail test, but significant at a 10% one tail test. All these results are consistent with the our previous empirical tests on the Jensen's alpha for both 10 portfolios using both equally weighted and value weighted returns; and the finding that the value weighted return generate lesser significance. The significant result of λ –risk premium shows that the liquidity risk is globally priced in country market level. The magnitude of risk premium contribution $(\beta_{10}^{L} - \beta_{1}^{L})^{*} \lambda$ is multiply by 12 so that it will be normalized to annual percentage return of compensating the liquidity risk. We also perform the same estimation excluding additional outliers[15] from the sample when we construct the global market liquidity and form the 10 portfolios and the 10-1 spread portfolio. Reported in Panel C and D report, the result are similar to the previous estimation while the t-statistics of risk premium λ and of its contributions become significant for both equally- and value-weighted portfolios. Our estimation is in a weaker condition than if the data sample were using longer period since GMM favor larger sample size. Hence, Our result is relatively strong. We also use the 10 portfolios sorted on linearly estimated betas for our GMM estimation in order to examine the non-linear relationship between market returns and the global liquidity risk. The relationship might still be linear but not normal. The panel E and F show that both equally weighted and value weighted portfolios do not generate a

[15] In addition, we delete the data that the turnover is below 0.2% of the mean of the country since it is outside of the range of three standard deviations from the mean and we consider them outliers. One example is that the one-day turnover is only 19 millions in the total US market and the average is 32.8 billions for the period from January 1988 to March 2004. The previous results are very similar except the average country liquidity within the 10 portfolios and the relatively higher alphas and t-statistics of high-low zero cost portfolios in table 4 and table 5.

significant risk premium and contributions. This confirms that the global liquidity risk does not have a normally distributed linear relationship with country total market index return.

VII. Conclusion

We find that global liquidity risk as a factor is globally an asset pricing state variable. The expected country market index returns are related to their sensitivities to the global liquidity risk. Countries having higher sensitivity to global liquidity risk have substantially higher expected return after adjusted for exposures to the market returns and value factor. We find that the market turnover by value is a good predictor for countries' sensitivity to the global liquidity risk and positively relate to it. In addition, market value is negatively related to the predicted liquidity sensitivity of the country index. We also find that illiquid country market demands higher expected returns than liquid markets. These findings are consistent with the empirical evidences in the US market. However, using Fama-MacBeth methodoloty, we do not find a linearly normal relationship between country total market return and global liquidity risk. A potential explanation is that the sample contains only cross-section twenty-three countries, which may not have enough portfolios at a given time t. We also find that country market liquidity does not linearly relate to market returns' sensitivity to the global liquidity risk at the country level. This is different from Pastor and Stambaugh (2003)'s finding in the US market. We explain that country level return is sensitive to both country market illiquidity and global liquidity risk. Illiquid markets require additional return while they are non sensitive to global liquidity risk at the same time due the low attractive characteristics to investors by being small markets and illiquid.

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Table 1: Data of first observation in the sample period January 1988-December 2001

This table provides the first observation in the sample data from DataStream source with valid turnover by value, return in US dollar and market value in US dollar. All returns are in decimal unit. There are 14 countries having valid data from DataStream in 1988.

Country	Date	Exchange rate return	Market index return in local currency	Market index return in US dollar	Exchange rate 1US$=	Turnover by Value in $10 million	Value Weighted Global Market Return
Australia	4/1/1988	-0.00136	-0.02405	-0.02538	1.382196	23.15735	0.009379
Germany	13/06/1988	0.002676	0.001411	0.00409	1.72447	254.074	0.002673
Belgium	5/1/1988	0.022678	0.037563	0.061093	34.09836	0.183147	0.031318
Canada	4/1/1988	-0.00153	0.023689	0.022118	1.299307	80.96085	0.009379
Demark	18/04/1988	0.000297	-0.00525	-0.00495	6.38189	0.184742	-0.0055
Spain	5/2/1990	-0.00661	0.016618	0.0099	108.0236	0.333418	-3.3E-05
Finland	28/03/1988	-0.00988	-0.0077	-0.0175	3.9922	0.328891	-0.01079
France	1/6/1988	0.000884	0.020119	0.021022	5.82511	0.291153	0.013453
Greece	2/7/1990	-0.01182	0.027122	0.014986	161.3269	0.105711	-0.00179
Hong Kong	1/6/1988	-0.00176	0.008102	0.006332	7.821436	63.6378	0.013453
Ireland	12/1/2001	0.001253	-0.00036	0.000888	0.830144	45.70653	0.001402
Italy	16/07/1993	-0.00313	0.00657	0.00342	1590.94	0.137373	0.000226
Japan	4/1/1990	-0.01648	-0.00357	-0.01999	143.2515	10.10488	-0.01509
Netherlands	5/1/1988	0.025903	0.051533	0.07877	1.829235	131.9399	0.031318
Norway	4/1/1988	-0.00038	0.00752	0.007138	6.22468	2.4141	0.009379
New Zealand	3/1/1990	0.00032	0.044548	0.044882	1.684472	2.987286	0.003178
Portugal	24/11/1993	0.001225	-0.00119	3.4E-05	173.7231	0.105536	-0.00469
Sweden	4/1/1988	0.002024	-0.00942	-0.00742	5.796908	6.618873	0.009379
Singapore	4/1/1988	0.002883	0.009654	0.012565	1.999627	5.246479	0.009379
Switzerland	16/01/1989	0.014092	0.00111	0.015218	1.583807	2.987107	0.009258
United Kingdom	4/1/1988	0.001333	0.018568	0.019925	0.533049	445.944	0.009379
United States	4/1/1988	0	0.035534	0.035534	1	4458.432	0.009379

Figure1: Global market average liquidity plot

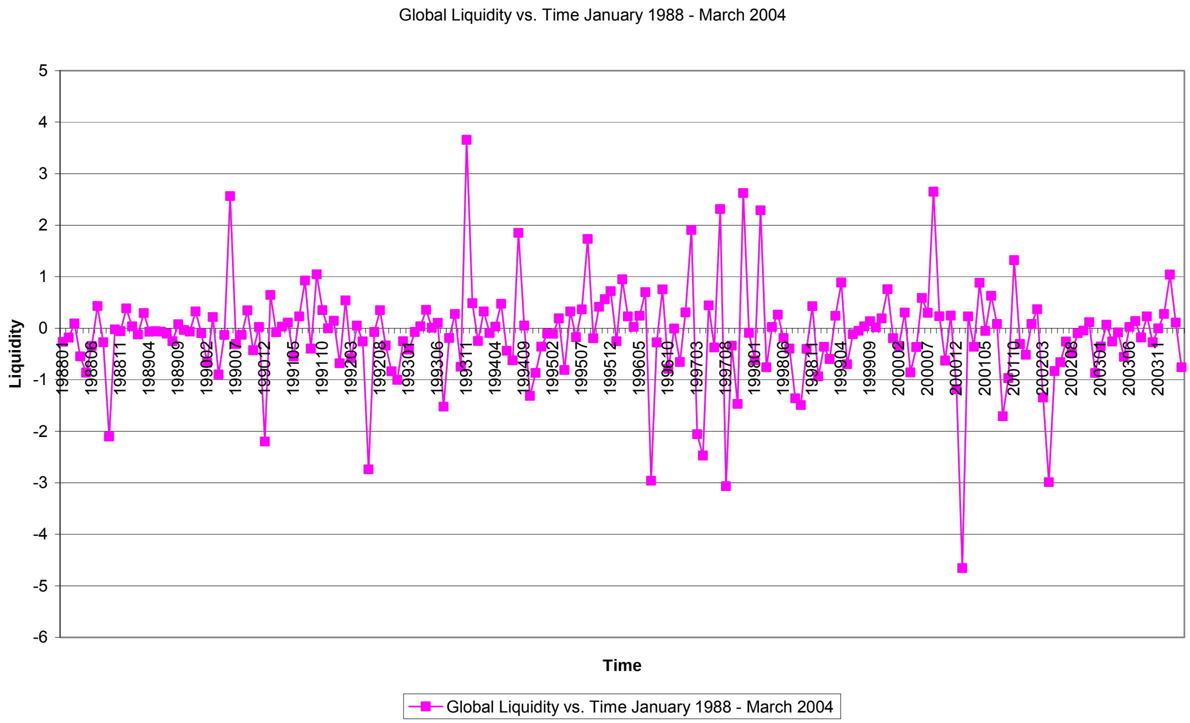

Figure 1, the global market average liquidity is constructed by averaging each country's measure for the month and then multiplies by (m_t/m_1), where m_t is the total dollar value at the end month t-1 of the country market value included in the average in the month t, and month 1 corresponds to January 1988. A country's index measure for a given month is a regression (1)'s slope coefficient estimated using daily index return in US dollar and volume data in ten million within that month. The returns are in percentage so that it can be interpreted as percentage; and the figure can present a clear movement of the world wide liquidity.

Table 2: Properties and Alphas of Portfolios Sorted on Linearly Estimated Liquidity Betas

At the end of each month between December 1991 and December 2001, countries are sorted into 10 portfolios according to historical liquidity betas. The betas are estimated as the slope coefficients on the aggregated liquidity innovation in regressions of excess return on that innovation and two Fama-French factors (regression (6)). The regressions are estimated using all past years data up to one month before the current month (t-1). Panel A, reports the Jensen's alpha and coefficients of CAPM and Fama-French two factors model for equally weighted portfolios and Panel B reports the value weighted portfolios. Market value or size is average of countries size across time and across country, which is in billion US dollar, and liquidity is firstly the time value weighted slop coefficient $\gamma_{i,t}$ from regression (1), then is equally weighted in equally weighted portfolios and value weighted in value weighted portfolios.

A. Equally Weighted Portfolios January 1977- December 2001

β^{liq}	1 (low)	2	3	4	5	6	7	8	9	10 (High)	10-1
CAPM											
Alpha	0.02	0.23	0.77	0.41	0.86	0.66	0.73	0.07	0.75	1.07	1.05
	(0.05)	(0.60)	(2.15)	(1.25)	(2.25)	(1.75)	(2.10)	(0.25)	(1.66)	(2.40)	(1.74)
MKT	1.45	0.86	0.89	0.96	1.02	1.07	0.91	0.97	1.11	1.04	-0.41
	(11.3)	(9.19)	(10.1)	(11.8)	(10.8)	(11.4)	(10.60	(13.6)	(9.96)	(9.42)	(-2.74)
Fama-French 2-Factors											
Alpha	0.05	0.24	0.68	0.34	0.78	0.55	0.77	0.13	0.85	0.98	0.94
	(0.09)	(0.63)	(1.86)	(1.03)	(2.02)	(1.44)	(2.17)	(0.44)	(1.85)	(2.16)	(1.53)
MKT	1.45	0.86	0.90	0.96	1.02	1.07	0.91	0.97	1.11	1.04	-0.40
	(11.25)	(9.14)	(10.2)	(11.8)	(10.8)	(11.5)	(10.5)	(13.6)	(9.93)	(9.46)	(-2.70)
HML	-0.04	-0.03	0.17	0.12	0.14	0.20	-0.073	-0.10	-0.18	0.16	0.20
	(-0.22)	(-0.23)	(1.40)	(1.05)	(1.05)	(1.56)	(-0.6)	(-1.01)	(-1.2)	(1.04)	(0.96)
Properties											
Return	1.15	1.07	0.84	1.25	1.11	1.06	1.03	0.78	0.73	1.11	0.88
	(1.82)	(2.00)	(1.85)	(2.42)	(2.36)	(2.32)	(2.28)	(1.86)	(1.42)	(2.10)	(1.66)
log(MV)	6.44	6.24	6.50	6.88	6.66	6.53	6.34	6.70	5.67	5.06	
Size	624	515	665	977	779	687	568	811	289	158	
Liquidity	-6.23	-1.36	-4.89	-6.14	3.17	2.01	-4.76	-1.05	0.49	-0.83	

Table 2 continued: Properties and Alphas of Portfolios Sorted on Linearly Estimated Liquidity Betas

B. Value Weighted Portfolios January 1977- December 2001

β^{liq}	1 (low)	2	3	4	5	6	7	8	9	10 (High)	10-1
						CAPM					
Alpha	0.17	0.13	0.66	0.52	0.65	0.21	0.59	-0.21	0.34	0.94	0.77
	(0.28)	(0.37)	(1.72)	(1.45)	(1.78)	(0.57)	(1.58)	(-0.69)	(0.720	(1.89)	(0.95)
MKT	1.61	0.90	0.82	1.02	0.98	1.04	0.94	0.83	1.19	1.00	-0.61
	(10.45)	(10.07)	(8.68)	(11.7)	(10.9)	(11.2)	(10.2)	(11.12)	(10.03)	(8.08)	(-3.05)
						Fama-French 2-Factors					
Alpha	0.27	0.17	0.55	0.41	0.58	0.23	0.54	-0.15	0.50	0.81	0.54
	(0.43)	(0.45)	(1.42)	(1.13)	(1.56)	(0.61)	(1.43)	(-0.49)	(1.03)	(1.61)	(0.66)
MKT	1.61	0.90	0.83	1.03	0.99	1.04	0.94	0.83	1.18	1.00	-0.60
	(10.40)	(10.02)	(8.77)	(11.80)	(10.96)	(11.12)	(10.19)	(11.08)	(10.04)	(8.15)	(-3.01)
HML	-0.18	-0.61	0.20	0.20	0.13	-0.04	0.082	-0.10	-0.29	0.23	0.42
	(-0.85)	(-0.49)	(1.53)	(1.67)	(1.02)	(-0.28)	(0.64)	(-0.99)	(-1.76)	(1.37)	(1.50)
						Properties					
Return	0.69	0.52	1.05	1.13	1.09	0.70	1.16	0.23	0.76	1.38	0.68
	(0.90)	(1.13)	(2.32)	(2.43)	(2.30)	(1.47)	(2.60)	(0.60)	(1.35)	(2.41)	(0.93)
log(MV)	6.44	6.24	6.50	6.88	6.66	6.53	6.34	6.70	5.67	5.06	
Size	624	515	665	977	779	687	568	811	289	158	
Liquidity	-0.254	-0.11	-0.52	-0.46	0.69	-0.44	-2.62	0.27	-1.42	-0.36	

Table 3: Determinant of Predicted Liquidity Betas
January 1988 – December 2001

Each column is the results of estimating a linear relation between a country's liquidity beta and the seven characteristics listed (in addition to the intercept). A pool regression (10) : $e_{i,t} = \psi_{0,i} + (\psi_{1,i} + \psi'_{2,i} C_{i,t-1})L_t + \upsilon_{i,t}$, where $e_{i,t} = R_{i,t} - \beta^{M}_{i}$ $MKT_t + \beta^{H}_{i}$ HML_t and i=1 to 23, is used to estimate the coefficients. Where price is the natural log of index, market value is the natural log of the market value; liquidity is the average liquidity from t-6 to t-1, turnover is the natural log of average of turnover (in thousand US dollars unit) from t-6 to t-1, accumulative return is the accumulative index return from t-6 to t-1 and return volatility is the standard deviation from t-6 to t-1. Country index accumulative returns and its volatility are firstly computed using decimal and then convert to percentage. Market values are in million US dollars unit. The parenthesis is the t-statistic.

Determinants	symbol	Non restricted	Restricted (ψ_0 =0)	GMM with restriction
Intercept:	ψ1	-153.5 (-1.02)	-146.98 (-0.97)	-167.82 (-1.36)
Linearly beta:	ψ2	-0.185 (-1.63)	-0.19 (-1.65)	-0.15 (-1.40)
Index value:	ψ3	0.21 (0.02)	-0.38 (-0.03)	-0.49 (-0.05)
Size/index value:	ψ4	-42.36 (-1.11)	-39.31 (-1.02)	-33.11 (-1.10)
Liquidity:	ψ5	63.05 (0.54)	61.97 (0.53)	27.42 (0.26)
Turnover:	ψ6	41.34 (1.2)	38.92 (1.13)	34.12 (1.28)
accumulative return:	ψ7	1.69 (1.62)	2.12 (2.04)	2.21 (2.11)
return volatility:	ψ8	-3.57 (-0.37)	-5.24 (-0.55)	-0.88 (-0.09)

Table 4: Properties and Alphas of Portfolios Sorted on Predicted Liquidity Betas

At of each month between December 1991 and December 2001, country index returns are sorted into 10 portfolios according to predicted liquidity betas. The betas are constructed from equation (7) that seven country index characteristics multiply the timely regression coefficients from the pool regression (10). Panel A, reports the equally weighted portfolios' properties and Jensen's alphas for both CAPM and Fama-French two factor model. Market value MV or size is average of countries size across time and across country, which is in billion US dollar, and liquidity is the value weighted slop coefficient $\gamma_{i,t}$*100 from regression(1) $r^e_{i,d+1,t}=a_{i,t}+b_{i,t}*r_{i,d,t}+\gamma_{i,t}*sign(r^e_{i,d,t})*v_{i,d,t}+\epsilon_{i,d+1,t}$, d= 1,….D, across country. The parenthesis is the t-statistic.

Decile Portfolios Sorted on Predicted Betas January 1992- December 2001

A. Equally Weighted Portfolios

β^{predit}	1 (low)	2	3	4	5	6	7	8	9	10 (High)	10-1
CAPM											
Alpha	-0.54	0.73	0.78	0.65	-0.05	0.47	0.31	0.33	1.18	0.97	1.51
	(-1.20)	(1.70)	(1.68)	(1.90)	(-0.14)	(1.41)	(0.87)	(0.97)	(2.73)	(2.25)	(2.31)
MKT	1.06	1.16	1.06	0.94	1.02	0.90	0.99	0.94	1.06	1.07	0.02
	(9.43)	(10.97)	(9.13)	(10.9)	(11.6)	(10.7)	(11.0)	(11.13)	(9.79)	(9.95)	(0.09)
Fama-French 2-Factors											
Alpha	-0.45	0.75	0.73	0.56	-0.21	0.54	0.32	0.30	1.05	0.99	1.44
	(-0.99)	(1.70)	(1.55)	(1.59)	(-0.59)	(1.58)	(0.86)	(0.86)	(2.87)	(2.240	(2.15)
MKT	1.05	1.16	1.06	0.95	1.04	0.90	0.99	0.94	1.05	1.07	0.021
	(9.31)	(10.7)	(9.10)	(11.0)	(11.96)	(10.59)	(10.9)	(11.09)	(9.66)	(9.85)	(0.13)
HML	-0.14	-0.03	0.07	0.16	0.25	-0.11	-0.01	0.05	-0.14	-0.04	0.11
	(-0.93)	(-0.190	(0.42)	(0.12)	(2.19)	(-1.00)	(-0.03)	(0.41)	(-0.97)	(-0.24)	(0.48)
Properties											
Return	0.27	1.59	1.59	1.42	0.75	1.22	1.09	1.09	1.99	17.85	1.51
	(0.46)	(2.65)	(2.66)	(2.93)	(1.47)	(2.61)	(2.17)	(2.29)	(3.46)	(3.1)	(2.34)
logMV	6.22	5.97	5.65	5.22	5.61	5.59	5.26	6.03	6.82	8.24	
Size	502	391	284	185	273	267	192	416	919	3793	
Liquidity	-0.035	-0.091	-0.429	-0.234	0.031	-0.393	-0.223	-0.153	0.035	-0.0027	

Table 4 continued: Properties and Alphas of Portfolios Sorted on Predicted Liquidity Betas

Decile Portfolios Sorted on Predicted Betas January 1992- December 2001

B. Value Weighted Portfolios

β^{predit}	1 (low)	2	3	4	5	6	7	8	9	10 (High)	10-1
CAPM											
Alpha	-0.73	0.65	0.95	0.11	-0.06	0.21	0.34	0.44	0.70	0.83	1.56
	(-1.33)	(1.37)	(1.70)	(0.29)	(-0.15)	(0.62)	(0.83)	(1.16)	(1.66)	(2.41)	(2.21)
MKT	0.88	1.25	1.16	1.01	1.06	0.96	1.02	0.91	0.96	1.01	0.14
	(6.32)	(10.38)	(8.31)	(10.65)	(10.53)	(11.42)	(9.85)	(9.52)	(9.02)	(11.77)	(0.79)
Fama-French 2-Factors											
Alpha	-0.68	0.67	0.86	0.10	-0.13	0.31	0.35	0.34	0.82	0.78	1.46
	(-1.20)	(1.36)	(1.50)	(0.27)	(-0.32)	(0.91)	(0.82)	(0.87)	(1.88)	(2.22)	(2.02)
MKT	0.87	1.24	1.17	1.01	1.07	0.95	1.02	0.92	0.95	1.02	0.15
	(6.24)	(10.29)	(8.33)	(10.57)	(10.54)	(11.31)	(9.77)	(9.62)	(8.90)	(11.75)	(0.84)
HML	-0.08	-0.02	0.15	0.01	0.11	-0.17	-0.010	0.16	-0.18	0.07	0.16
	(-0.45)	(-0.13)	(0.79)	(0.06)	(0.82)	(-1.50)	(-0.06)	(1.29)	(-1.24)	(0.63)	(0.66)
Properties											
Return	0.0026	1.5439	1.8021	0.8981	0.7509	0.9741	1.1390	1.1853	1.4762	1.6202	1.6176
	(0.004)	(2.359)	(2.598)	(1.718)	(1.358)	(2.03)	(2.07)	(2.38)	(2.70)	(3.24)	(2.31)
log(MV)	6.22	5.97	5.65	5.22	5.61	5.59	5.26	6.03	6.82	8.24	
Size	502	391	284	185	273	267	192	416	919	3793	
Liquidity	-0.019	-0.091	-0.429	-0.234	0.031	-0.393	-0.223	-0.153	0.035	-0.0027	

Table 5: Properties and Portfolio Alphas Sorted on Country Market Liquidity

At of each month between December 1991 and December 2001, country index returns are sorted into 10 portfolios according to country market liquidity $\gamma_{i,t}$. The country liquidity is the slop coefficient $\gamma_{i,t}$ from regression (1) $r^e_{i,d+1,t} = a_{i,t} + b_{i,t} * r_{i,d,t} + \gamma_{i,t} * sign(r^e_{i,d,t}) * v_{i,d,t} + \epsilon_{i,d+1,t}$, d= 1,….D, across country and time. The parenthesis is the t-statistic; and logMV is the natural log of average market value or size of the portfolio. Portfolio 1-10 is the portfolio that long the most illiquid (lowest liquidity) countries' market and sort the most liquid (highest liquidity) countries' market. The size is in billions US dollar and the logMV is natural log of millions. The valued liquidity is the country liquidity values weighted across country and time then multiply by 100.

Decile Portfolios Sorted on Country Market liquidity January 1992- December 2001

A. Equally Weighted Portfolios

Liquidity	1 (low)	2	3	4	5	6	7	8	9	10 (high)	1-10
					CAPM						
Alpha	1.06	0.89	0.54	0.54	0.53	0.52	0.02	0.14	0.60	0.08	0.98
	(2.24)	(2.00)	(1.38)	(1.65)	(1.47)	(1.95)	(0.07)	(0.36)	(1.50)	(0.16)	(1.84)
MKT	1.20	1.05	1.31	1.02	0.79	0.97	0.92	1.02	0.94	0.97	0.23
	(10.09)	(9.39)	(13.26)	(12.34)	(8.75)	(14.41)	(10.98)	(10.62)	(9.43)	(7.51)	(1.71)
Alpha	1.11	0.92	0.48	0.49	0.57	0.56	-0.10	0.11	0.60	0.12	0.98
	(2.28)	(2.02)	(1.18)	(1.45)	(1.53)	(2.03)	(-0.29)	(0.28)	(1.46)	(0.23)	(1.80)
MKT	1.19	1.04	1.31	1.03	0.79	0.97	0.93	1.02	0.94	0.96	0.23
	(9.98)	(9.29)	(13.25)	(12.35)	(8.65)	(14.27)	(11.18)	(10.58)	(9.35)	(7.42)	(1.69)
HML	-0.07	(-0.05)	0.10	0.09	-0.06	-0.06	0.19	0.05	0.00	-0.06	-0.01
	(-0.45)	(-0.32)	(0.79)	(0.78)	(-0.45)	(-0.63)	(1.73)	(0.39)	(0.01)	(-0.36)	(-0.05)
					Properties						
Return	1.94	1.70	1.46	1.34	1.231	1.300	0.77	0.933	1.36	0.86	1.07
	(3.02)	(2.92)	(2.38)	(2.71)	(2.68)	(2.94)	(1.65)	(1.77)	(2.60)	(1.38)	(2.01)
logMV	8.99	10.91	12.63	13.5	13.91	14.17	14.29	13.78	12.95	11.34	
Size	8	55	308	730	1097	1432	1604	967	419	84	
Liquidity	-0.503	-0.061	-0.008	-0.002	-0.0004	-0.00004	0.0004	0.0031	0.0286	0.3611	

Table 5 continued: Properties and Alphas of Portfolios Sorted on Country Market Liquidity

Decile Portfolios Sorted on Country Market Liquidity January 1992- December 2001

B. Value Weighted Portfolios

Liquidity	1 (low)	2	3	4	5	6	7	8	9	10 (high)	1-10
						CAPM					
Alpha	0.873	1.34	0.61	0.22	0.59	0.39	-0.17	0.06	0.49	-0.16	1.02
	(1.84)	(2.22)	(1.43)	(0.61)	(1.49)	(1.45)	(-0.55)	(0.16)	(1.12)	(-0.25)	(1.60)
MKT	1.22	1.09	1.27	1.00	0.78	0.93	0.93	1.10	0.89	0.99	0.24
	(10.31)	(7.21)	(11.93)	(11.31)	(7.78)	(13.75)	(10.35)	(11.07)	(8.14)	(6.81)	(1.50)
						Fama-French 2-Factors					
Alpha	0.89	1.37	0.54	0.21	0.62	0.42	-0.37	0.06	0.50	-0.11	1.00
	(1.83)	(2.22)	(1.24)	(0.57)	(1.53)	(1.53)	(-1.04)	(0.14)	(1.13)	(-0.18)	(1.53)
MKT	1.22	1.09	1.27	1.00	0.78	0.92	0.95	1.10	0.88	0.98	0.24
	(10.21)	(7.14)	(11.93)	(11.23)	(7.78)	(13.61)	(10.73)	(10.98)	(8.06)	(6.73)	(1.50)
HML	-0.03	-0.06	0.11	0.01	-0.05	-0.05	0.28	0.01	-0.03	-0.06	0.03
	(-0.19)	(-0.27)	(0.78)	(0.1)	(-0.37)	(-0.55)	(2.42)	(0.06)	(-0.19)	(-0.33)	(0.16)

Properties

Return	1.75	2.16	1.51	1.00	1.29	1.15	0.56	0.90	1.22	0.63	1.12
	(2.72)	(3.02)	(2.42)	(1.99)	(2.65)	(2.67)	(1.14)	(1.59)	(2.28)	(0.94)	(1.76)
log(MV)	8.99	10.91	12.63	13.5	13.91	14.17	14.29	13.78	12.95	11.34	
Size	8	55	308	730	1097	1432	1604	967	419	84	
Liquidity	-0.503	-0.061	-0.008	-0.002	-0.0004	-0.00004	0.0004	0.0031	0.0286	0.3611	
Valued Liquidity	-3.05	-0.45	-0.073	-0.023	-0.007	-0.002	0.002	0.017	0.042	0.254	

Table 5: Risk Premium Estimation using Fama-MacBath Methodology

This table reports the factor premium using Fama-MacBeth two stage regressions to estimate the factor premium for market return, HML (high minus low book-to-market) return and mimicking factors of global liquidity risk (Mliq). The first regression (12): $R_{i,t} = \beta^0_i + \beta^{Mimck}_{i,t-1}\, Mliq_t + \beta^M_{i,t-1}\, MKT_t + \beta^H_{i,t-1}\, HML_t + \epsilon_{i,t}$ and second stage regression (13): $R_{i,t} = \psi^0_t + \psi_t^{Mliq} * \beta^{Mliq}_{i,t-1} + \psi_t^{M} * \beta^M_{i,t-1} + \psi_t^{H} * \beta^H_{i,t-1} + \epsilon_{i,t}$ where $R_{i,t}$ is the excess return of country total market return. The parenthesis is the t-statistic of the factor premium. The timely betas are retained from a regression (12)$R_{i,t} = \beta^0_i + \beta^{Mimck}_i\, Mliq_t + \beta^M_i\, MKT_t + \beta^H_i\, HML_t + \epsilon_{i,t}$: using data from January 1988 to t-1. The parenthesis is the t-statistic.

Factor	MKT	HML	Mliq
Premium	-0.72	0.659	1.63
	(-1.25)	(1.85)	(0.85)

Table 6: Liquidity Risk Premium and Its Contribution to Expected Country Index Return Using GMM Estimation

The table reports the estimate of the risk premium associated with the liquidity factor, as well as the contribution of liquidity risk to the expected return on the "10-1"(high minus low) spread. For panel A and panel B, countries are sorted into 10 portfolios by their predicted liquidity betas at end of each month. The premium λ is estimated using post ranking returns on all 10 portfolios. The 10-1 spread portfolios are equally weighted in Panel A and value weighted in Panel B. The premium is multiplied by 12*100, adjusted for the division of 10000, so that the reported premium can be interpreted as the annual percentage return. The 10-1 spread is the return using long portfolio 10 with high liquidity beta β_{10}^L, and short portfolio 1, with low liquidity beta β_1^L. The contribution of liquidity risk to the portfolio's expected return $(\beta_{10}^L - \beta_1^L) * \lambda$, is also expressed in annual percentage (multiply by 12). The asymptotic t-statistics are in parentheses. Panel C and D, perform the same estimation as A and B when portfolios excludes additional outliers[16]. Countries are sorted on the linearly estimated betas using regression: $R_{i,t} = \beta^0_i + \beta^L_i L_t + \beta^M_i MKT_t + \beta^H_i HML_t + e_{i,t}$ in Panel E and F

January 1992- December 2001

A. Equally Weighted Portfolios Sorted on Predicted Betas	
Romda (λ)	18.9 (t= 1.97)
Excess Return $(\beta_{10}^L - \beta_1^L) * \lambda$	13.72 (t= 2.21)
B. Value Weighted Portfolios Sorted on Predicted Betas	
Romda (λ)	19.2 (t= 1.32)
Excess Return $(\beta_{10}^L - \beta_1^L) * \lambda$	12.08 (t= 2.15)

Excluding additional outliers from the sample

C. Equally Weighted Portfolios Sorted on Predicted Betas	
Romda (λ)	17.18 (t= 2.01)
Excess Return $(\beta_{10}^L - \beta_1^L) * \lambda$	14.61 (t= 2.36)
D. Value Weighted Portfolios Sorted on Predicted Betas	
Romda (λ)	11.63 (t= 1.91)
Excess Return $(\beta_{10}^L - \beta_1^L) * \lambda$	10.59 (t= 2.09)

The linearly normal relationship

E. Equally Weighted Portfolios Sorted on Linearly Estimated Betas	
Romda (λ)	31.6 (t= 1.26)
Excess Return $(\beta_{10}^L - \beta_1^L) * \lambda$	4.35 (t= 0.58)
F. Value Weighted Portfolios Sorted on Linearly Estimated Betas	
Romda (λ)	-1.30 (t= -0.78)
Excess Return $(\beta_{10}^L - \beta_1^L) * \lambda$	3.96 (t= 0.76)

[16] We delete the data that the turnover is below 0.2% of the mean of the country market turnover since it is over three standard deviations below the mean and we consider it is outlier. One example is that the one-day turnover is only 19 millions in the total US market and the average is 32.8 billions for the period from January 1988 to March 2004. The linearly estimated beta is obtained from all past data up to t-1.