5-14-2010

Essays on Stock Market Liquidity and Liquidity Risk Premium

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A Dissertation

Submitted to the Graduate Faculty of the
University of New Orleans
in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy
in
Financial Economics

by

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May, 2010

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Abstract

This dissertation addresses issues concerning liquidity and its volatility. It consists of two essays. The first essay, "*Liquidity, Macro Factors and the U.S. Equity Flows to Emerging Markets*", examines the role of liquidity on equity flows from the U.S. to fifteen emerging markets around the world. Since liquidity has many dimensions, an emphasis is placed on utilizing various measures of liquidity. Moreover, both static and dynamic analyses, as well as short and long-horizon regressions, are performed to investigate the research questions. The results suggest that a liquid market attracts flows, after controlling for market size, political openness, exchange rate and other macro factors. Additionally, evidence indicates that the importance of liquidity varies across regions. For instance in the Asian region, the relation between equity flows and volume-related liquidity is weak while that between flows and price impacts of trading is strong. Evidence also supports the relevance of macro factors such as a country's economic freedom.

The second essay, "*Liquidity Risk Premium Puzzle and Possible Explanations***",** attempts to resolve the liquidity risk puzzle: a negative relation between returns and liquidity risk, documented by Chordia, Subrahmanyam, and Anshuman (2001b), by employing alternative liquidity measures and by incorporating factors that might potentially affect the relation. The main findings are as follows. The relation between stock returns and volatility of liquidity depends on the measure of liquidity. When liquidity measures are based on trading volume, the results are largely mixed, but when liquidity is measured based on price impact of trading, the relation between returns and volatility of price impacts is positive, as expected. The results are sensitive to time periods examined. Moreover, during extreme down markets, the aversion to liquidity volatility is lower, suggesting behavioral bias might potentially address the puzzle. Empirical findings also suggest that liquidity risk premium tends to be greater for small stocks. Finally, when the VIX index is included as a proxy for investor sentiment, the results indicate that the relation between returns and liquidity risk is significantly positive in four out of five liquidity measures. In sum, the empirical analysis partially but not completely addresses the puzzle.

Keywords: Emerging Market, Equity Flows, Liquidity, Liquidity Risk Premium Puzzle, Market Conditions, Investor Sentiment

Chapter One: Introduction

This dissertation addresses issues concerning liquidity and its volatility. It consists of two essays. One of them examines the relation between U.S. equity flows to emerging markets and various macro factors, particularly the liquidity of emerging markets. The other paper attempts to resolve the liquidity risk puzzle: a negative relation between returns and liquidity risk.

The first essay, presented in Chapter Two, is "*Liquidity, Macro Factors and the U.S. Equity Flows to Emerging Markets*". Liquidity in emerging stock markets is typically low and may be a major concern to foreign investors. This essay examines the role of liquidity on equity flows from the U.S. to fifteen emerging markets around the world, for the period of 1995 to 2002. Since liquidity has many dimensions, an emphasis is placed on utilizing various measures of liquidity. Moreover, both static and dynamic analyses, as well as short and long-horizon regressions, are performed to investigate the research questions. The results suggest that a liquid market attracts flows, after controlling for market size, political openness, exchange rate and other macro factors. Additionally, evidence indicates that the importance of liquidity varies across regions. For instance in the Asian region, the relation between equity flows and volume-related liquidity is weak while that between flows and price impacts of trading is strong, reinforcing the notion that there are multiple dimensions in liquidity. Evidence also supports the relevance of macro factors such as a country's economic freedom.

The second essay is "*Liquidity Risk Premium Puzzle and Possible Explanations*"**.** This study attempts to resolve the liquidity risk puzzle: a negative relation between returns and liquidity risk, documented by Chordia, Subrahmanyam, and Anshuman (2001b), by employing alternative liquidity measures and by incorporating factors that might potentially affect the relation. The sample covers the period 1975 to 2008 and the total number of firm-month observations is 415,403. The main findings are as follows. The relation between stock returns and volatility of liquidity depends on the measure of liquidity. When liquidity measures are based on trading volume, the results are largely mixed, but when liquidity is measured based on price impact of trading, the relation between returns and volatility of price impacts is positive, as expected. Moreover, the results are sensitive to time periods examined. The second part of the study incorporates potential factors that might affect the relation between returns and liquidity volatility. The results indicate that during extreme down markets, the aversion to liquidity volatility is lower, suggesting behavioral bias might potentially address the puzzle. Empirical findings also suggest a firm size effect; specifically, liquidity risk premium tends to be greater for small stocks. Finally, when the VIX index is included as a proxy for investor sentiment, the results indicate that the relation between returns and liquidity risk is significantly positive in four out of five liquidity measures. In sum, the empirical analysis partially but not completely addresses the puzzle.

Chapter Two:
Liquidity, Macro Factors and the U.S. Equity Flows to Emerging Markets

I. Introduction

The financial crises during 1997-99 highlight the effects and importance of cross-border capital flows. Some studies attempt to examine factors that influence international equity investment flows. Aggarwal, Klapper, and Wysocki (2005) and Gelos and Wei (2005) find that equity flows and transparency are correlated, while Edison and Warnock (2003a) suggest that flows are affected by capital control and cross-border listing, controlling for macro factors such as relative stock performances. Kaminsky, Lyons, and Schmukler (2001) also provide an overview of mutual fund investments in emerging markets. They find that equity flows to emerging markets are volatile. Not emphasized in these studies is the potentially important role of liquidity on equity flows, which is somewhat surprising given that the literature on market microstructure generally indicates that liquidity has important effects on pricing, portfolio holdings, and trading[1]. Emerging markets are largely illiquid because of their limited access to world capital markets. Thus, market liquidity is likely to be important from the perspective of foreign investors, which motivates this research. Specifically, we are raising the question whether liquidity also influences equity flows.

Most of the extant empirical liquidity literature focuses on the U.S. market. With the increasing availability of data regarding trading on emerging markets in recent years, researchers are able to take a closer look at the liquidity of these markets, where liquidity may be a major concern. Indeed, Lesmond (2005) indicates that liquidity varies considerably across emerging markets. Bekaert, Harvey, and Lundblad (2007) point out that trading volume based liquidity proxy in emerging markets does not predict future returns but some other liquidity measures do, while Jun, Marathe, and Shawky (2003) find a positive correlation between returns and turnover in emerging markets. These findings reinforce the idea that liquidity has many dimensions, including trading costs, trading frequency, trading intensity, and price impacts. With this in mind, we employ several measures of liquidity to determine whether foreign investors desire liquidity; if so, it should be reflected by their investment flows to emerging markets. However,

[1] These include, among many other studies, the seminal work by Kyle (1985) and Amihud and Mendelson (1986). More recent papers such as Acharya and Pedersen (2005) decompose liquidity risk and further confirm that liquidity risk affects asset prices.

due to the unavailability of data on trading costs, our liquidity measures primarily capture trading frequency, trading intensity, and price impacts of trading. Essentially, this study also investigates whether or not the different dimensions of liquidity measures are consistently influencing equity flows.

In addition to the relation between equity flows and liquidity, this study considers the correlations between equity flows and various macro factors including market size, prior market excess returns, country's economic freedom, capital control, changes in exchange rate, and trading restrictions. Most factors are shown by various papers to affect equity flows to emerging markets. In brief, this study is comprehensive in terms of the number of factors being considered. We expect that the above-mentioned factors, as well as liquidity, are correlated with the U.S. equity flows to emerging markets. The different measures of liquidity may result in different impacts on equity flows.

The remainder of the paper is organized as follows. The next section discusses the most related research, followed by a section describing the hypotheses. Following that, we describe the data, variables, and various measures of liquidity in Section IV. Methodology and empirical results are presented in Sections V. Section VI contains concluding remarks.

II. Related Literature

II. A. Possible Macro Factors Affecting Equity Flows

II. A. 1. Country Equity Market Return

Earlier studies on equity flows to emerging markets focus on the relevance of macroeconomic variables especially stock market returns. In an early study that covers both emerging and developed countries, Bohn and Tesar (1996) document no strong relation between stock returns and equity flows. Brennan and Cao (1997) theorize that, when foreign investors face an information disadvantage, they tend to chase foreign returns; that is, buy when foreign returns are high and sell when returns are low. Using data on several emerging markets in early 1990s,[2] they find evidence supportive of their model. Using daily flow data from one investment firm, Froot, O'Connel, and Seasholes (2001) present evidence also consistent with flows being affected by past returns. Additionally, they document that flows have predictive power for future returns. More recently, Griffin, Nardari, and Stulz (2002) provide an empirical investigation

[2] Generally, early 1990s is when data on emerging markets first became available.

using daily fund flow data, which they obtain directly from exchanges from nine emerging markets. They find that equity flows are positively correlated to past host country returns as well as home country returns. That is, the evidence suggests that equity flows are both pushed and pulled by related market returns; however, the effects are relatively short-lived—present only in daily data but not so with the use of weekly data. Overall, the evidence concerning the effects of market returns are not conclusive.

II. A. 2. Market Openness

Edison and Warnock (2003b) find that flows are related to the degree of capital control, as well as economic conditions proxied by interest rates. They point out that the intensity of capital control indicates the openness to foreign investment, which in turn measures a government's commitment to free market policies. Their evidence suggests that markets are more likely to be viable if they have less restriction imposed on foreign investors.

II. A. 3. Country Risk

Country risk, such as political risk, exchange rate movement, economic risk, etc, affects the investment climate within a country and the allocation of foreign investment. Extant literature explores various indicators for country risk and their impacts on international trading. Here we highlight country political risk, exchange rate movement, stock market transparency, investor protection, and economic freedom as components of country risk.

Erb, Harvey, and Viskanta (1996) find a link between cross-border investments and political risk and suggest that political stability is necessary to support free market development and attract and retain long-term sources of capital.

Blonigen (1997) states that exchange rates movements play an important role in influencing foreign direct investment. A country's exchange rate regime developed by Reinhart and Rogoff (2003) is used as an indicator of whether the exchange rate is pegged, managed float, or floating.

Gelos and Wei (2005) use the Global Competitiveness Report to measure transparency[3] and point out that fund inflows are on average greater in countries and in firms with a greater

[3] Financial transparency refers to investors' access to truthful, accurate and relevant information on the conditions in the countries and companies in which they are investing. Gelos and Wei (2005) develop a transparency index for each country and firm, based on several surveys conducted by International Monetary Fund and

degree of transparency. Moreover, some studies also use accounting standards[4] as another proxy for transparency. For example, Aggarwal et al. (2005) utilize both country-level and firm-level data on corporate governance including accounting standards. Based on U.S. fund holdings in 2002, they find that funds tend to invest more in countries with stronger accounting standards and shareholder protections.

Partly in response to the crisis in confidence regarding corporate governance, a few recent papers examine the role of corporate governance in equity flows across countries, starting with the seminal work of La Porta, Lopez-de-Silanes, and Shleifer (1997) that establishes a link between share holdings and shareholder protection.[5] Wurgler (2000) further finds that capital is more efficiently allocated in countries with better legal protection for minority investors and more firm-specific information in domestic stock returns.

Economic freedom measures country's economic performance and the consistency of its institutions and policies. Kim (2008) points out that greater economic freedom implies fewer barriers to economic activities and tends to generate more opportunities for people and create lasting prosperity.

II. A. 4. Trading Restrictions

Both trading restrictions and liquidity are important considerations for traders that place a high value on liquidity. We consider short-selling restrictions as another important aspect for the ease of trading. Bris, Goetzmann, and Zhu (2007) present evidence that short-selling constraints affect a market's degree of efficiency. They find that prices reflect negative information faster in countries where short-selling is practiced. In that paper, they carefully collect information about short-selling practices in various countries and construct a short-selling indicator, which we utilize here. Moreover, Ahearne, Griever, and Warnock (2004) find that the portion of a

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PricewaterhouseCoopers from late 1990s and early 2000s. Morck, Yeung and Yu (2000)[3] show that R^2 and other measures of stock market synchronicity, as alternative measures of transparency, are higher in countries with less developed financial systems and poorer corporate governance. They also point out that R^2 is inversely related to the degree of investor protection.

[4] Accounting standards indicate the extent to which publicly traded companies in the country utilize either US GAAP or IAS in financial reporting, and whether the country is a member of the International Accounting Standards Council.

[5] Daouk, Lee and Ng (2006) further show that good governance reduces cost of capital and increases liquidity and pricing efficiency.

country's market that has a public U.S. listing is a major determinant of a country's weight in U.S. investors' portfolio.

II. B. The Role of Liquidity

Some literature provides evidence that market liquidity has important effect on risk of emerging market investment and, therefore, on the future returns. As Bekaert et al. (2002) find, liquidity measure significantly predicts future returns and equity market liberalization significantly improves the level of liquidity. As a result, the increasing investment interest in emerging markets relative to developed markets yields spectacular returns, which are subject to increased risk and are significantly reduced by the increased illiquidity of trading stocks in emerging markets.

As mentioned in the introduction, studies such as Lesmond (2005) and Bekaert et al. (2007) suggest that liquidity has many dimensions. Lesmond (2005) indicates that liquidity varies considerably across emerging markets. He finds that price-based measures of liquidity are more correlated with transaction costs compared to those based on trading volume. Similarly, Bekaert et al. (2007) present evidence that trading volume based liquidity proxy in emerging markets does not predict future returns while some other liquidity measures do. In addition, Amihud (2002) measures market illiquidity as the daily ratio of absolute stock return to its dollar volume averaged over some period and points out that expected market illiquidity positively affects ex ante stock excess return, whereas Jun et al. (2003) document a positive correlation between returns and turnover in the markets for emerging countries, a puzzling result contrary to the existence of liquidity premium.

Literature indicates the multiple dimensions of liquidity measure: trading costs, trading frequency, trading intensity, and price impacts. While some studies on equity flows include share turnover as a control variable, there is no study that considers the possibility that one single liquidity measure might not completely capture a country's stock market liquidity. Consequently, we use three different measures of liquidity in this study, detailed in Section IV. In addition, some studies suggest that the size of market can be a proxy for liquidity, thus we also include market size as an alternative measure of liquidity. On the other hand, market size can also serve as a proxy for market visibility or transparency. Therefore, we consider the variable market size.

III. Our Major Hypothesis

If investors demand liquidity, then markets/stocks with greater liquidity likely will attract more attention and investments. Specifically, we hypothesize that

- *Emerging countries with more liquid equity market and less trading restrictions are likely to be associated with higher equity inflows from the U.S. investors. The results are expected to be robust with respect to multi-dimensions liquidity measures.*

Based on previous literature, we expect the relation between equity flows and prior country market excess returns[6] to be positive due to trading feedback. We also expect that capital control is negatively correlated with the U.S. equity flows into emerging markets. Also, higher equity flows from U.S. to emerging markets would be associated with higher local market capitalization, greater economic freedom, and favorable exchange rate movements.

IV. Data

IV. A. Data on U.S. Equity Flows

The primary data source for the U.S. equity flows to emerging markets is the U.S. Treasury International Capital (TIC) Reporting System, which reports portfolio equity flows from the U.S. to emerging countries. The flow data is available at the monthly frequency. In this study the U.S. equity flows to a given emerging market are the U.S. residents gross purchases of foreign stocks from residents of that country scaled by the country's GDP. Figure 1 present the U.S. equity inflows into our fifteen sample emerging countries. Obviously, equity flows vary considerably across countries. During the sample period the U.S. investors purchase a larger amount of equities from Latin America, specifically Brazil and Mexico, than from the other two regions, as shown in Figure 2.

IV. B. Data on Various Macro Factors

The data on various explanatory variables are collected from multiple sources. Table AI in Appendix provides details of data sources. Our sample[7] consists of fifteen emerging markets

[6] Edison and Warnock (2003a) find evidence that investors are chasing prospective returns, as proxied by dividend yields, but not past returns. Moreover, the evidence on past-returns-chasing behavior is mixed. Using monthly data, Bohn and Tesar (1996) find that investors chase past returns in 7 of 22 markets.

[7] We also analyze annual data. The empirical results are not reported.

for the period between January 1995 and December 2002. These emerging countries are classified into three subgroups based on regions: Latin America Argentina, Brazil, Chile, Mexico, and Peru, Europe, Africa, and Middle East Israel, Poland, South Africa, and Turkey, and Asia Indonesia, Malaysia, Philippines, Taiwan, Thailand, and South Korea. Due to data unavailability, data is incomplete for some variables under investigation.

The monthly data analysis includes the following control variables: country stock market size, the past excess country market return, countries' economic freedom, capital control, exchange rate movement, and short-selling restriction. These variables are selected based on the earlier discussions of literature and described as follows:

1) Market Size: It is measured by country equity market capitalization as a percentage of country's GDP, both denominated in current U.S. dollars. As mentioned earlier, market size can be a proxy for liquidity.

2) Prior Excess Local Stock Market Returns[8]: The excess return is computed by subtracting the value-weighted return on all NYSE, AMEX and NASDAQ stocks from the local stock market return. Table AII in Appendix contains the information regarding the local stock markets of the fifteen emerging countries.

3) Country's Economic Freedom[9]: The index of economic freedom is based on ten components of economic freedom which represents openness to the global commerce, transparency, and the rule of law, and rated on a scale of zero (least free) to 100 (most free). Also, a higher score implies a lower level of government interference in the marketplace. The natural logarithm of the index is used for regression analysis.

4) Capital Control[10]: It represents changes in foreign ownership restriction or the intensity of capital controls, which is presented by Edison and Warnock (2003b). The measure of capital control can vary from zero to one, with zero representing a completely open market with no restrictions, and a value of one indicating that the market is completely closed. However, their data only covers the period from January 1989 to December 2000.

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[8] Some studies use dividend yield to estimate prior equity market performance. We use it in our annual data analysis. Bekaert et al. (2002) use lagged excess returns (excess of the foreign market over the U.S. market) in their study.

[9] Our study excludes the measure of transparency because the data on transparency is fairly limited and seldom undated in emerging markets. Because currently the International Accounting Standards are undergoing significant revisions, we do not analyze the impact of accounting standard either.

[10] Because the data used to compute capital control is propriety data which is not accessible to the general public, we take the data from Edison and Warnock (2003b).

5) Changes in Exchange Rate[11]: Presumably exchange rate movements affect U.S. capital flows; therefore, we compute the changes in the exchange rates relative to the U.S. dollar over the past month by taking natural logarithm of the current exchange rate over the past rate, where exchange rate is stated as the number of foreign currencies per U.S. dollar.

6) Trading Restriction[12]: The dummy variable used here takes on the value of one when short-selling is practiced in country and zero otherwise (either short sales are not allowed or not practiced).

IV. C. Measurements of Liquidity

To account for various liquidity dimensions, three alternative measures of liquidity are taken into account:

1) Trading Frequency[13]: It is denoted by market turnover, *TURNOVER*, which is the ratio of the value of shares traded to the value of shares outstanding.

2) Trading Dollar Volume: We use two ways to calculate trading volume: taking natural logarithm of the value of share traded[14], denoted by *TRADVOL*_1; the share trading value as a percentage of country's GDP, denoted by *TRADVOL*_2[15].

3) Price Impact: It represents the absolute monthly price change per dollar of monthly trading volume, or say, the monthly price impact of the order flow, which serves as a rough measure of price impact and reflects stock illiquidity. Following Amihud (2002), we calculate the monthly price impact for each emerging country market by dividing the absolute value of monthly stock market price changes by the dollar value traded for that month. It can be written as: $Price\ Impact_{i,t} = \frac{|\,ln(p_{i,t}/p_{i,t-1})\,|}{Dollar\ Traded_{i,t}}$, where *i* denotes individual country and *t* denotes month.

We use three different price indexes to calculate price impact:

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[11] Data on exchange rate regime developed by Reinhart and Rogoff (2003) is not accessible to the public.

[12] The number of ADR or ADR issuance can be another proxy of trading restriction, since firms in emerging countries may be more inclined to choose to issue ADRs or GDRs. According to Aggarwal et al. (2005), we can calculate the percentage of market value of firms that issue ADRs relative to the total market value of all listed firms, or the percentage of listed firms that issue ADRs. This is left for further research if the data is accessible.

[13] It can also be measured by the ratio of the number of shares traded to shares outstanding. However, we do not obtain monthly data on these two variables.

[14] Share trading value is the total number of shares traded multiplied by their respective prices.

[15] This measure is on an economy-wide basis since it gauges the positive effects of liquidity as a share of national output.

PRIIMPACT_1 $_{\mathbf{i,t}}$ is the absolute value of the International Finance Corporation's Global (IFCG) price change over dollar value traded on month *t*, where IFCG index captures the return of mostly large firms, specifically it covers all publicly listed equities with float-adjusted market values of US $100 million or more and annual dollar value traded of at least US $50 million;

PRIIMPACT_2 $_{\mathbf{i,t}}$ is the absolute value of the International Finance Corporation's Investable (IFCI) return over dollar value traded on month *t*, where IFCI represent the investable index available to foreign investors[16]; The difference between *PRIIMPACT*_1 and 2 is the number of restricted shares (restricted from foreign investors).

PRIIMPACT_3 $_{\mathbf{i,t}}$ is the absolute value of return of the value-weighted composite (including all stocks) market index over dollar value traded on month *t*. The difference between this and measures 1 and 2 is the representation of smaller firms' stocks.

The graphs on our measures of three dimensions of liquidity by regions are presented in Figures 3 - 5. The figures show that Asia has the highest *TURNOVER* and Latin America has the lowest among the three regions during our sample period. Furthermore, Latin America has larger *PRIIMPACT* than the other two across the sample period. These results point out that Asian market is more liquid than Latin America and Europe, Africa, and Middle East markets.

As hypothesized, the coefficients of *TURNOVER*, *TRADVOL*_1, and *TRADVOL*_2 are expected to be positive, and the coefficients of *PRIIMPACT*_1 $_{i,t}$, *PRIIMPACT*_2 $_{i,t}$, and *PRIIMPACT*_3 $_{i,t}$ expected to be negative.

IV. D. Summary Statistics

Table I Panel A reports descriptive statistics for equity flows, various control variables, and six measures of liquidity employed by this study. The average gross equity flow from the U.S. investors to the sample emerging markets is $286.87 million and the median flow is substantially lower at $114 million, suggesting that the distribution of equity flows is positively skewed. The average equity flow is 0.108 percent of country's GDP. The mean values of one-month ahead and the average twelve-month-ahead equity flows are 0.109 percent and 0.115 percent of GDP, respectively. The average market size scaled by GDP is 0.562. Panel B of Table

[16] Edison and Warnock (2003b) suggest that for a given country the IFCG index is designed to represent the overall market portfolio, while the IFCI index represent a portfolio available to foreign investors. The latter excludes from the IFCG those stocks not available to foreigners due to either legal restrictions or low liquidity.

1 reports the average U.S equity flows and market capitalizations by country and regions. Although Asia has the largest market size, the U.S. investors prefer Latin American market.

The average local stock market return, the U.S. value-weighted market return on NYSE/AMES/NASDAQ, and the excess return are 1.4 percent, 0.9 percent, and 0.5 percent, respectively. The distribution of the excess return is positively skewed, and the middle 80 percent of the excess return lie between -10.2 percent and 10.3 percent, representing a spread of 20.5 percent during January 1995 and December 2002. Regarding the liquidity measures, the mean, median, and 10th and 90th percentiles are of similar magnitude for all measures of liquidity except *TRADVOL*_1.

The correlations[17] among the variables are shown in Panel C of Table 1. Most correlation coefficients confirm our expectations: the U.S. equity flows are positively correlated with market size, country stock market excess return, deregulations of short-selling restriction, turnover, and trading volumes; and negatively correlated with capital control, changes in exchange rate, and price impact. Panel D presents the correlations among the alternative measures of liquidity. As expected, *TURNOVER* and *TRADVOL*_1 and *TRADVOL*_2 are highly correlated but far from perfect, and these three are negatively related with *PRICEIMPACT*_1, *PRICEIMPACT*_2, and *PRICEIMPACT*_3.

[17] The correlation tables for each region are also made but not reported. With few exceptions, the correlations are of similar magnitude.

Table I. Summary Statistics for Various Variables, Jan. 1995 – Dec. 2002

EQUITYFLOWS ($ millions) is the gross equity flows from U.S. investors to foreign markets. $EQUITYFLOW_t$, $EQUITYFLOW_{(t+1)/1}$, and $EQUITYFLOW_{(t+12)/12}$ are the gross equity flows scaled by country's GDP in a specific month *t*, one month ahead, and the average twelve-month ahead, respectively. SIZE is the market capitalization as a percentage of GDP. *RETURN*, *VWUSRET*, and *EXCESSRET* are country local stock market return, value-weight U.S. market return on NYSE/AMEX/NASDAQ, and the excess return of local stock market, respectively. *ECONFREE* is the natural logarithm of the index of country economic freedom. *CAPLCONS* is the intensity of capital controls. *EXCHG* is the change in exchange rate. SSDUMMY is short-selling restriction dummy variable. *TURNOVER* is the ratio of the value of share traded to market capitalization. *TRADVOL*_1 is the natural logarithm of the value of share traded. *TRADVOL*_2 is the value of share traded as a percentage of GDP. *PRIIMPACT*_1 is the absolute value of the IFCG price change over dollar value traded. *PRIIMPACT*_2 is the absolute value of the IFCI price change over dollar value traded. *PRIIMPACT*_3 is the absolute value of local stock market price change over dollar value traded.

Table I. Panel A reports the descriptive statistics for U.S. equity flows, various control variables, and liquidity measures. The sample period is from January 1995 to December 2002.

Panel A. Descriptive Statistics					
	Obs	**Mean**	**Median**	**10^{th} Percentile**	**90^{th} Percentile**
EQUITYFLOWS	1440	286.87	114	21.10	794.80
$EQUITYFLOW_t$	1440	0.108	0.080	0.016	0.227
$EQUITYFLOW_{(t+1)/1}$	1440	0.109	0.080	0.016	0.227
$EQUITYFLOW_{(t+12)/12}$	1440	0.115	0.088	0.023	0.221
SIZE	1403	0.562	0.329	0.138	1.377
RETURN	1404	0.014	0.002	-0.104	0.122
VWUSRET	1404	0.009	0.019	-0.059	0.066
EXCESSRET	1404	0.005	-0.006	-0.102	0.103
ECONFREE	1440	4.164	4.156	4.038	4.291
CAPLCONS	1008	0.252	0.149	-0.012	0.656
EXCHG	1389	0.010	0.002	-0.022	0.047
SSDUMMY	1440	0.531	1	0	1
LIQUIDITY					
TURNOVER	1403	0.061	0.034	0.011	0.166
TRADVOL_1	1404	7.825	7.802	5.845	10.105
TRADVOL_2	1404	0.034	0.012	0.003	0.087
PRIIMPACT_1	1082	0.099	0.025	0.002	0.225
PRIIMPACT_2	1082	0.103	0.026	0.002	0.239
PRIIMPACT_3	1404	0.075	0.020	0.001	0.153

Sources: Data sources are reported in Table A1 of Appendix.

Table I. Panel B presents the average U.S. equity flows in millions of dollars to each emerging market and region, and the average market capitalization in millions of dollars of each country and region during January 1995 and December 2002

Panel B. U.S. Equity Flows *vs*. Country Market Cap.		
Country	U.S. Equity Outflows ($ millions)	Market Capitalization ($ millions)
Latin America	**474**	**90,177**
Argentina	287	42,389
Brazil	1,188	192,780
Chile	81	64,112
Mexico	768	119,946
Peru	45	11,788
Europe, Africa, Middle East	**137**	**83,555**
Israel	257	48,024
Poland	23	18,199
South Africa	115	219,854
Turkey	155	48,144
Asia, Pacific	**231**	**128,963**
Indonesia	84	45,651
Malaysia	164	162,340
Philippine	63	40,584
South Korea	566	172,121
Taiwan	445	277,668
Thailand	62	64,367

Sources: Data sources are reported in Table A1 of Appendix.

Table I. Panel C reports the panel data correlation coefficients between equity flows and the various explanatory variables.

Panel C. Correlations									
	$EQUITYFLOW_t$	$EQUITYFLOW_{(t+12)/12}$	$EQUITYFLOW_{(t+1)/1}$	SIZE	EXCESSRET	ECONFREE	CAPLCONS	EXCHG	SSDUMMY
$EQUITYFLOW_{(t+12)/12}$	0.53								
$EQUITYFLOW_{(t+1)/1}$	0.58	0.60							
SIZE	0.24	0.26	0.25						
EXCESSRET	0.02	0.09	0.05	-0.01					
ECONFREE	-0.04	-0.03	-0.03	0.27	-0.07				
CAPLCONS	-0.16	-0.10	-0.15	-0.11	-0.01	-0.01			
EXCHG	-0.02	-0.06	-0.04	-0.04	-0.01	-0.05	-0.01		
SSDUMMY	0.19	0.24	0.21	0.04	0.08	-0.42	-0.10	0.01	
TURNOVER	0.06	0.12	0.04	0.08	0.02	0.23	0.43	-0.03	-0.28
TRADVOL_1	0.30	0.38	0.29	0.33	0.05	-0.05	0.44	-0.05	0.02
TRADVOL_2	0.17	0.23	0.16	0.40	0.03	0.29	0.33	-0.04	-0.23
PRIIMPACT_1	-0.21	-0.26	-0.19	-0.23	-0.04	0.09	-0.20	0.15	-0.14
PRIIMPACT_2	-0.21	-0.25	-0.19	-0.23	-0.03	0.09	-0.21	0.14	-0.14
PRIIMPACT_3	-0.19	-0.22	-0.17	-0.21	0.05	0.08	-0.21	0.05	-0.14

Sources: Data sources are reported in Table A1 of Appendix.

Table I. Panel D reports the correlation coefficients among the alternative measures of liquidity.

Panel D. Correlation among Liquidity Measures						
	TURNOVER	TRADVOL_1	TRADVOL_2	PRIIMPACT_1	PRIIMPACT_2	PRIIMPACT_3
TURNOVER	1					
TRADVOL_1	0.73	1				
TRADVOL_2	0.90	0.70	1			
PRIIMPACT_1	-0.18	-0.49	-0.17	1		
PRIIMPACT_2	-0.18	-0.50	-0.17	1.00	1	
PRIIMPACT_3	-0.17	-0.48	-0.16	0.75	0.75	1

Sources: Data sources are reported in Table A1 of Appendix.

V. Methodology and Empirical Results

V. A. Time-Series Cross-Section Data Analysis

V. A. 1. The Model

As mentioned earlier, this study focuses on the impact of various macro factors, especially liquidity, on the U.S. equity flows into emerging markets. We conduct a time series-cross section data[18] framework which allows us to analyze time series properties of the data and identify individual country effects. The country effect model that we estimate is of the following type:

$$y_{it} = \alpha + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

where

- y_{it} denotes the U.S. equity flows of country *i* at time *t*; *i*=1, 2, … *N* is a country index; *t*=1,2,…,*T* is a time index.
- $X_{k,it}$ denotes the explanatory variables including control variables of country *i* at time *t*; *k* = 1, 2, …*M* the number of explanatory variables.

The control variables include various macro factors: market size $SIZE_{i,\ t}$, prior foreign stock market excess returns $EXCESSRET_{i,\ t-1}$, country economic freedom $ECONFREE_{i,t}$, capital control $CAPLCONS_{i,\ t}$, change of exchange rate $EXCHG_{i,\ t}$, and the dummy variable on short-selling restriction $SSDUMMY_{i,\ t}$

- $LIQUID_{it}$ denotes the alternative measures of liquidity of country *i* at time *t*;

Alternative measures of liquidity are trading frequency $TURNOVER_{i,t}$, dollar trading volume $TRADVOL\_1_{i,t}$ and $TRADVOL\_2_{i,t}$, and price impact $PRIIMPACT\_1_{i,t}$, $PRIIMPACT\_2_{i,t}$, and $PRIIMPACT\_3_{i,t}$

- β_k and γ denote the coefficients of $X_{k,it}$ and $LIQUID_{it}$, respectively. We assume that β_k and γ are the same from one country to the next.
- α is the intercept
- ε_{it} is the combined time series and cross-country error component, or the observation-specific errors.

[18] Our panel data is unbalanced (some countries do not have data for one or more months, or not all countries have data for all months)

- μ_i is an unobserved variable and varies across countries but not over time. The country-specific effects can be treated as fixed or as random. With the fixed-effect model, μ_i is assumed to be correlated with the regressors and represents the country-specific characteristics[19], and $\alpha + \mu_i$ is the intercept specific for each country. With the random-effect model, μ_i is assumed to be uncorrelated with the regressors and represents the country-specific error component i.e., differences across countries are captured through the disturbance term, and $\mu_i + \varepsilon_{it}$ is the error term, where $\mu_i \sim IID(0, \sigma_\mu^2)$ and $\varepsilon_{it} \sim IID(0, \sigma_v^2)$.

Since each country has its own individual characteristics that may influence or bias some or all the explanatory variables and/or the predicted equity inflows, the pooled OLS regression model may yield biased coefficients because it does not account for those unobservable time-invariant[20] country-specific characteristics. We use a Fixed-Effect (FE) estimation[21] approach to verify whether the inclusion of country-specific characteristics in the model is valid. *F*-tests of the presence of country-specific effects reject the null hypothesis that all $\mu_i = \mu$ shown in Table II. Therefore, the time series-cross section data are not poolable with respect to country.

To decide which estimation, fixed or random effects, is superior to the other, we further perform a Hausman test[22]. The results are reported in Table II, indicating that the fixed-effect is an appropriate estimator for all regression models in the full sample and Latin America, the models (1) and (7) in Europe, Africa, and Middle East sample, and the models (1) – (4) and (7) in Asia samples. Thus, we use random-effect estimation for the other models. However, we use the OLS estimation for the models (5) and (6) in Europe, Africa, and Middle East sample, because the data on the liquidity measures of *PRIIMPACT*_1 and *PRIIMPACT*_2 are only

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[19] Time-invariant country characteristics (fixed effects), such as culture, language, geography and demographics, may be correlated with the explanatory variables. National policies, federal regulations, and international agreements, may change over time but not across countries.

[20] We assume that the country-specific characteristics are time-invariant.

[21] It is equivalent to the least square dummy variable (LSDV) estimation, where the test associated with individual group is the test that all of the dummy variables are zero

[22] Hausman test: the null hypothesis is that the preferred model is random effects and the alternative is the fixed effects (Greene, 2000) or the unique errors (u_i) are correlated with the regressors. If the null is rejected, then the RE estimators are biased. Random-Effect is usually preferred when the panel has large number of entities.

available for one country. We also test if cross-sectional variances[23] equal to zero for those models estimated by random-effects. The *p*-values reject the null for models (5) and (6) in Asia sample, meaning that there are country-specific error component. The *p*-values are not rejected for models (2) to (4) in Europe, Africa, and Middle East sample, indicating that there is no individual effect for these three models and the pooled regression model is appropriate.

Modified Wald test for groupwise heteroskedasticity[24] in the residuals of the fixed-effect model is also performed reported in Table II. The null hypothesis is constant variance for all countries. The rejected null indicates that the error variances are specific to the individual country. Therefore, we need to control for the effects of the unobserved heteroskedasticity for both fixed and random-effects by adjusting the regression standard errors for clustering on country.

In addition, we perform Wooldridge test[25] for autocorrelation in our time series-cross sectional data. The null hypothesis of no serial correlation for models is rejected in the full sample and Latin America sample, as well as models (3), (4), and (7) in Europe, Africa, and Middle East sample and models (5) and (6) in Asia sample at the 5 percent significant level. The *p*-value is reported in Table II where we can see that with very few exceptions, most test statistics are not highly significant. Basically, there is no serial correlation in models (1) and (2) for Europe, Africa, and Middle East sample. For Asia sample, there is no serial correlation for all models except models (5) and (6). The serial correlation test indicates that for some of the sample countries the errors within countries are correlated across time. Therefore, we also compute Newey-West (1987) standard errors to control for both heteroskedasticity and serial correlation. The results indicate that there is a very slight difference between the robust standard errors mentioned earlier and the Newey-West standard errors, and the difference does not affect the statistical significance of each coefficient; consequently we only report robust standard errors in Table II.

[23] The Breusch-Pagan Lagrange multipliers test helps us on the selection of the appropriate model (pooled vs. individual effects). If the null of cross-sectional variance of μ_i equals to zero: $\sigma_\mu^2 = 0$ is not rejected, the pooled regression model is appropriate. We also test if the variance components for time are zero. The null is rejected at 5 to 10 percent significance levels.

[24] The modified Wald test allows for unbalanced panels (as ours).

[25] It is a test for serial correlation in linear panel data models. The null hypothesis is the residuals from the regression of the first-differenced variables should have an autocorrelation of -0.5.

V. A. 2. Results on Control Variables

Table II four panels shows, separately, the regression results for full sample, Latin America sample, Europe, Africa, and Middle East sample, and Asia sample. For each individual panel, we perform seven regression models, each with a different measure of liquidity except for model (1) which only includes control variables.

The coefficient of *SIZE* is significantly positive in all models except models (3) and (4) in the Latin America sample. It is consistent with the notion that a larger market likely attracts more investors. As mentioned earlier, *SIZE* may proxy for liquidity to some extent, since larger markets also tend to be more liquid. To the extent this argument is true, the results on *SIZE* is in agreement with the hypothesis that a more liquid market attracts more equity flows.

Based on the result on $EXCESSRET_{t-1}$, there appears to be no evidence supporting return chasing behavior: among all four samples, only six models in Asia sample indicate a positive but insignificant coefficient. Interestingly, the coefficient of $EXCESSRET_{t-1}$ is negative and statistically significant in all models of the full sample and Latin America sample, as well as in models (3) and (4) of Europe, Africa, and Middle East sample. Also, the coefficients are remarkably close across samples. $EXCESSRET_{t-1}$[26] here is the past excess country stock market return over the U.S. value-weighted stock market return. The empirical evidence indicates that a decrease in the past excess return of emerging stock market, especially in Latin America market, leads to an increase in immediate purchases of foreign equities by the U.S. investors. This suggests that some investors behave more like contrarians than momentum chasers. While this appears to be inconsistent with previous studies, investors' strategies might depend on the time horizon since Griffin et al. (2002) indicate that return-chasing behavior is short-lived. It should be noted that the standard deviation, skewness, and kurtosis[27] of *EXCESSRET* for Latin America sample are much larger than those for the other two regions. Also, we suspect that some unobserved variables, such as geographic preference, may correlate with one or some of explanatory variables, e.g., *EXCESSRET*.

The impact of country market economic freedom, *ECONFREE*, on equity flows is positive and statistically significant in all models of the full sample and both Latin America and

[26] Analysis was also performed in sub-periods, but not reported. Except the coefficients on excess return, others remain largely unchanged for sub-periods.
[27] Not reported.

Europe, Africa, and Middle East samples. This result is consistent with our expectation that equity flows are larger for the country with more economic freedom. However, for the Asian sample, the coefficient of *ECONFREE* is negative but insignificant. We check the correlations between *ECONFREE* and other explanatory variables for the Asian sample and do not see any correlation more than 0.3. Thus, the counter-intuitive result on *ECONFREE* in the Asian market is unlikely to be caused by multicollinearity. Overall, economic freedom of emerging countries, particularly those in Latin America and Europe, Africa, and Middle East, plays a significant role in attracting foreign equity inflows.

As for *CAPLCONS*, its coefficient is significantly negative in all models for the full sample, Latin America, and Asia samples, which is consistent with our expectation. However, in models (1) to (4) and (7) of Europe, Africa, and Middle East sample, the coefficient of *CAPLCONS* has a positive and statistically significant value. It should be noted that the region of Europe, Africa, and Middle East includes relatively fewer countries and some data is lacking for a couple of countries there. These may affect the estimates for *CAPLCONS* in that region. With the exception of this region, our evidence in general indicates that a loosening of foreign ownership restriction expands the investment opportunity and leads to an increased purchases of foreign equity by U.S. investors.

If the value of U.S. dollar is increasing (decreasing) then the U.S. investors can afford to invest more (less). However, if the trend is fairly predictable, an increasing (decreasing) dollar would encourage the U.S. investors to purchase less (more) foreign securities. Consequently, we make no specific prediction regarding the coefficient of the variable representing exchange rate movements. Indeed, the results are mixed concerning exchange rate movements: all models in the full sample and the Asian sample, and models (1) and (5) to (7) in Europe, Africa, and Middle East sample show a positive impact. In Latin America, the impact is negative but not statistically significant. Moreover, the results indicate a positive and statistically significant impact in models (2) to (4) for Europe, Africa, and Middle East sample. On the other hand, the empirical results in the next section show that there is statistically significant and negative relation between the changes in exchange rates and the long-horizon equity flows in the full sample and most models in Latin America sample. We elaborate on this issue further in next section.

As mentioned earlier, foreign investors should prefer an emerging market where short selling is allowed; hence a positive relation between short selling dummy and equity flows is expected. Our evidence indicates that the impact of short-selling practice varies across regions: the coefficient for *SSDUMMY* is positive for all models in the full sample and Latin America, and is statistically significant in Latin America sample. For both Europe, Africa, and Middle East sample and the Asian sample, the impact is negative and statistically significant for some models. Since the data on short-selling is very limited, we should not surprise for the mixed results.

V. A. 3. The Impact of Liquidity on Equity Flows

We now turn to the focus of our paper, the relation between liquidity and equity flows in emerging markets.

As a measure of trading frequency, *TURNOVER* in model (2) has a positive sign in both full sample and three regional samples, and its coefficients are statistically significant at 1 percent level, except in Asia sample. As an illustration, with every 1 percent increase in *TURNOVER*, the equities purchased by the U.S. investors increased about 12.85 percent of a country's GDP in Latin America and 3.49 percent in Europe, Africa, and Middle East during January 1995 and December 2000. Figure 3 also displays that except South Korea and Taiwan, other sample countries maintain a steady *TURNOVER* ratio across the sample time. Intuitively, a higher *TURNOVER* ratio signals lower transactions costs of the local equity market. That is, U.S. investors prefer a more stable, cheaper, and easier market.

Models (3) and (4) use dollar trading volume as the liquidity measure. *TRADVOL*_1 is the natural logarithm of the value of share traded and *TRADVOL*_2 is the ratio of the value of share traded over a country's GDP. Our empirical results indicate that the coefficients on *TRADVOL*_1 are positive and statistically significant for all models and in all four samples, which is consistent with our hypothesis. The coefficients on *TRADVOL*_2 are also positive for all samples and are statistically significant for all except the Asian sample. A country's stock market with a higher dollar volume of trading indicates an active market, most likely associated with lower spreads, and that a high number of investors participate in that market. It might also reflect investors' confidence on that market. If so, the evidence suggests that U.S. investors prefer an active emerging stock market and would purchase foreign equities from a market that they have confidence in.

Models (5), (6), and (7) use price impact to measure liquidity. We calculate *PRIIMPACT*_1, *PRIIMPACT*_2, and *PRIIMPACT*_3 based on three different price indexes to measure the absolute price change per dollar of monthly trading volume. The coefficients on *PRIIMPACT*_1 and *PRIIMPACT*_2 are negative for all but the Latin America sample. They are statistically significant for both full sample and the Asian sample, as we hypothesize that investors desire deeper markets with lower degree of price impacts, or the market with lower price change in terms of one dollar of trading volume. The exception is in Latin America sample where the coefficients are positive but insignificant. The descriptive statistics[28] of *PRIIMPACT*_1 and *PRIIMPACT*_2 across countries indicate that Argentina and Peru have very volatile price impact over the sample period. Thus, the individual country characteristics may affect the estimation. As for *PRIIMPACT_3*, its coefficient is negative, which is consistent with our expectation, for all four samples, but not statistically significantly.

As a summary, the overall evidence regarding the effects of liquidity supports our hypotheses. The importance of different dimensions of liquidity varies across regions. For example in the Asian region, the relation between equity flows and volume-related liquidity is weak while that between flows and price impacts of trading is quite strong. This reinforces the notion that there are multiple dimensions in liquidity.

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[28] Not reported here.

Table II. The Impacts of Control Variables and Liquidity on U.S. Equity Flows

Table II includes four Panels A – D presenting estimation results for full sample, Latin America sample, Europe, Africa, and Middle East sample, and Asia sample, respectively. For each panel, seven regression models [1] – [7] are estimated, each with a different measure of liquidity except for model [1] which only includes control variables. In regressions [2] to [7], liquidity is measured by *TURNOVER*, *TRADVOL*_1, *TRADVOL*_2, *PRIIMPACT*_1, *PRIIMPACT*_2, and *PRIIMPACT*_3, respectively. All regressions are estimated over the period from January 1995 to December 2002.

The dependent variable, y_{it}, in fixed country effect estimation is the U.S. equity inflow into country *i* at month *t* scaled by country *i*'s GDP:

$$y_{it} = \alpha + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{it} + \mu_i + \varepsilon_{it}$$

$X_{k,it}$ denotes the control variables including *SIZE*, $EXCESSRET_{t-1}$, *ECONFREE*, *CAPLCONS*, *EXCHG*, and *SSDUMMY*. All explanatory variables are at month *t*, except *EXCESSRET*, the excess return of country equity market of a period *t*-1. *SIZE* is market size. *ECONFREE* is the natural logarithm of the index of economic freedom. *CAPLCONS* is the capital control. *EXCHG* is the change in exchange rate. *SSDUMMY* is the dummy equal to 1 if shorting-selling is allowed in stock market.

$LIQUID_{it}$ denotes the alternative liquidity measure: *TURNOVER* is the ratio of value of share traded over market capitalization; *TRADVOL*_1 is the natural logarithm of the value of share traded; *TRADVOL*_2 is the value of share traded as a percentage of GDP; *PRIIMPACT*_1 is the absolute value of the IFCG price change over dollar value traded; *PRIIMPACT*_2 is the absolute value of the IFCI price change over dollar value traded; *PRIIMPACT*_3 is the absolute value of local stock market price change over dollar value traded.

Constants and the country-specific intercepts are included but not reported. Enclosed in parenthesis are the *p*-values which are computed using robust standard errors, allowing for clustering by country. Statistical significance at the 1%, 5% and 10% level are denoted by ***, **, and *, respectively. The *p*-values of F-test for country-specific effect, Hausman test for an appropriate estimator (FE or RE), Breusch-Pagan LM test for cross-sectional variance = 0, Modified Wald test for Heteroskedasticity, and Wooldridge test for autocorrelation are in bracket.

Table II. Panel A. Full Sample

	U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.126***	1.086***	0.712***	0.949***	0.991***	0.991***	1.113***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	-0.133***	-0.149***	-0.153***	-0.144***	-0.135***	-0.136***	-0.133***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ECONFREE	2.400***	2.610***	2.182***	2.623***	2.671***	2.668***	2.383***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAPLCONS	-1.244***	-1.022***	-1.160***	-1.126***	-1.341***	-1.342***	-1.249***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	0.094	0.119	0.252	0.109	0.264	0.260	0.108
	(0.798)	(0.747)	(0.459)	(0.768)	(0.525)	(0.531)	(0.767)
SSDUMMY	0.036	0.054	0.116*	0.029	0.090	0.090	0.037
	(0.595)	(0.420)	(0.090)	(0.668)	(0.254)	(0.253)	(0.581)
TURNOVER		2.053***					
		(0.001)					
TRADVOL_1			0.268***				
			(0.000)				
TRADVOL_2				2.165***			
				(0.008)			
PRIIMPACT_1					-0.359**		
					(0.012)		
PRIIMPACT_2						-0.358***	
						(0.009)	
PRIIMPACT_3							-0.163
							(0.161)
Number of Observations.	957	956	957	957	744	744	957
Number of Groups	14	14	14	14	11	11	14
Adj R^2	0.5304	0.5363	0.5539	0.5369	0.5018	0.5018	0.5302
Country effects *F* test that all $u_i = 0$	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Hausman χ^2	[0.000]	[0.000]	[0.005]	[0.000]	[0.000]	[0.000]	[0.000]
Estimation	FE	FE	FE	FE	FE	FE	FE
Heteroskedasticity	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Wooldridge for Autocorrelation	[0.012]	[0.035]	[0.029]	[0.026]	[0.000]	[0.000]	[0.011]

Table II. Panel B. Latin America

	U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	2.246***	2.265***	0.795	0.903	2.261***	2.263***	2.222***
	(0.000)	(0.000)	(0.206)	(0.179)	(0.001)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	-0.114***	-0.108***	-0.113***	-0.107***	-0.115***	-0.115***	-0.114***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ECONFREE	2.947***	2.911***	3.913***	3.012***	2.946***	2.947***	2.946***
	(0.001)	(0.001)	(0.000)	(0.000)	(0.002)	(0.002)	(0.002)
CAPLCONS	-2.530**	-2.696***	-2.307**	-2.464***	-2.521**	-2.521**	-2.540**
	(0.014)	(0.004)	(0.014)	(0.008)	(0.014)	(0.014)	(0.014)
EXCHG	-0.451	-0.402	-0.182	-0.243	-0.453	-0.453	-0.447
	(0.430)	(0.462)	(0.741)	(0.644)	(0.427)	(0.427)	(0.436)
SSDUMMY	0.3442**	0.634***	0.699***	0.523***	0.344**	0.344**	0.345**
	(0.017)	(0.000)	(0.000)	(0.001)	(0.017)	(0.017)	(0.017)
TURNOVER		12.845***					
		(0.000)					
TRADVOL_1			0.526***				
			(0.000)				
TRADVOL_2				53.440***			
				(0.000)			
PRIIMPACT_1					0.024		
					(0.903)		
PRIIMPACT_2						0.025	
						(0.892)	
PRIIMPACT_3							-0.046
							(0.777)
Number of Observations.	330	329	330	330	330	330	330
Number of Groups	5	5	5	5	5	5	5
Adj R^2	0.3592	0.3945	0.4184	0.4087	0.3572	0.3572	0.3573
Country effects *F* test that all $u_i = 0$	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Hausman χ^2	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Estimation	FE	FE	FE	FE	FE	FE	FE
Heteroskedasticity	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Wooldridge for Autocorrelation	[0.026]	[0.016]	[0.022]	[0.019]	[0.019]	[0.019]	[0.021]

Table II. Panel C. Europe, Africa, and Middle East							
	U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	0.684***	1.008***	0.869***	0.702***	0.366***	0.366***	0.683***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.090)	(0.090)	(0.001)
EXCESSRET $_{t-1}$	-0.220	-0.300	-0.395*	-0.361*	-0.851	-0.851	-0.222
	(0.293)	(0.195)	(0.079)	(0.090)	(0.288)	(0.289)	(0.291)
ECONFREE	4.824***	4.483***	2.384***	3.382***	7.894***	7.885***	4.767***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)
CAPLCONS	85.744***	67.386***	65.938***	58.522***	1.021	0.996	86.147***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.961)	(0.962)	(0.000)
EXCHG	0.835	1.243**	1.124**	1.360**	1.147	1.144	0.857
	(0.144)	(0.033)	(0.043)	(0.026)	(0.333)	(0.334)	(0.136)
SSDUMMY	-0.230***	-0.051	-0.163**	0.058	Dropped	Dropped	-0.234***
	(0.000)	(0.380)	(0.017)	(0.361)			(0.000)
TURNOVER		3.488***					
		(0.000)					
TRADVOL_1			0.213***				
			(0.000)				
TRADVOL_2				7.967***			
				(0.000)			
PRIIMPACT_1					-3.195		
					(0.224)		
PRIIMPACT_2						-3.182	
						(0.225)	
PRIIMPACT_3							-0.067
							(0.558)
Number of Observations.	213	213	213	213	71	71	213
Number of Groups	3	3	3	3	1	1	3
Adj R^2	0.5856	0.5894	0.5927	0.5822	0.1562	0.1561	0.5837
Country effects *F* test that all $u_i = 0$	[0.000]						[0.000]
Hausman χ^2	[0.000]	[0.216]	[0.292]	[0.061]	n/a	n/a	[0.001]
Estimation	FE	Pooled OLS	Pooled OLS	Pooled OLS	Pooled OLS	Pooled OLS	FE
Heteroskedasticity	[0.000]						
Breusch-Pagan LM test of variances = 0		[0.397]	[0.375]	[0.883]			
Wooldridge for Autocorrelation	[0.053	[0.060]	[0.048]	[0.032]	n/a	n/a	[0.050]

Table II. Panel D. Asia

	U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.170***	1.152***	0.778***	1.060***	0.827***	0.825***	1.145***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	0.193	0.107	-0.018	0.105	0.019	0.012	0.181
	(0.535)	(0.734)	(0.953)	(0.733)	(0.955)	(0.971)	(0.564)
ECONFREE	-1.111	-0.873	-0.602	-0.654	0.067	0.055	-1.000
	(0.164)	(0.271)	(0.418)	(0.411)	(0.899)	(0.916)	(0.219)
CAPLCONS	-1.141***	-1.055***	-1.072***	-1.085***	-0.931***	-0.935***	-1.151***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	0.394	0.381	0.436	0.384	0.564	0.564	0.402
	(0.346)	(0.364)	(0.274)	(0.363)	(0.222)	(0.220)	(0.325)
SSDUMMY	-0.129*	-0.124*	-0.053	-0.131*	0.001	0.001	-0.116
	(0.092)	(0.101)	(0.468)	(0.081)	(0.989)	(0.984)	(0.132)
TURNOVER		0.845					
		(0.206)					
TRADVOL_1			0.252***				
			(0.000)				
TRADVOL_2				1.211			
				(0.146)			
PRIIMPACT_1					-0.582***		
					(0.004)		
PRIIMPACT_2						-0.610***	
						(0.002)	
PRIIMPACT_3							-0.325
							(0.193)
Number of Observations.	414	414	414	414	343	343	414
Number of Groups	6	6	6	6	5	5	6
Adj R^2	0.5759	0.5765	0.5935	0.5790	0.5757	0.5761	0.5753
Country effects *F* test that all $u_i = 0$	[0.000]	[0.000]	[0.000]	[0.000]			[0.000]
Hausman χ^2	[0.000]	[0.001]	[0.011]	[0.000]	n/a	n/a	[0.000]
Estimation	FE	FE	FE	FE	RE	RE	FE
Heteroskedasticity	[0.000]	[0.000]	[0.000]	[0.000]			
Breusch-Pagan LM test of variances = 0					[0.000]	[0.000]	
Wooldridge for Autocorrelation	[0.326]	[0.416]	[0.407]	[0.408]	[0.009]	[0.009]	[0.325]

V. A. 4. Does the Past Liquidity Matter?

In this section, we substitute a lagged liquidity for the current one to investigate if liquidity in the earlier month has any impact on equity flows after controlling for those macro factors mentioned above. Using lagged liquidity may also help to assess the robustness of results and to address the potential problem on endogeneity[29] for our estimations.

Because the data on *PRIIMPACT*_1 and *PRIIMPACT*_2 is lacking for some countries in the Europe, Africa, and Middle East region, here we have to omit these two measures of liquidity on equity flows for this region. Recall that previous results we do not observe a significant impact of *PRIIMPACT*_3 on equity flows even though the coefficients of *PRIIMPACT*_3 have a negative sign as we hypothesize. For this reason, *PRIIMPACT*_3 is not examined in this exercise. Table III indicates that with very few exceptions, the coefficients for the past *TURNOVER*, *TRADVOL*_1, *TRADVOL*_2, *PRIIMPACT*_1, and *PRIIMPACT*_2, as well as the coefficients for all control variables are similar to those in Table II. We compare the results in the two tables: the magnitude of the coefficients for the past liquidity is lower than that for the contemporaneous liquidity. Stated differently, the explanatory power of equity flows by past local market liquidity is less pronounced for all models in Table III than that in Table II which shows the regressions in contemporaneous variables. Also, the lagged liquidity does not affect the other coefficients.

[29] Gelos and Wei (2005) address the problem of endogeneity in several ways. One way is using lagged independent variable to estimate their regression.

Table III. Regressions with Lagged Liquidity

Table III includes four Panels A – D presenting estimation results for full sample, Latin America sample, Europe, Africa, and Middle East sample, and Asia sample, respectively. Panel A, B, and D include five models [2] – [6] and Panel C only include three models [2] – [4], each with a different measure of liquidity. In regressions [2] to [7], liquidity is measured by *TURNOVER*, *TRADVOL*_1, *TRADVOL*_2, *PRIIMPACT*_1, *PRIIMPACT*_2, and *PRIIMPACT*_3, respectively. All regressions are estimated over the period from January 1995 to December 2002.

The dependent variable, y_{it}, in fixed country effect estimation is the U.S. equity inflow into country *i* at month *t* scaled by country *i*'s GDP:

$$y_{it} = \alpha + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{i,t-1} + \mu_i + \varepsilon_{it}$$

$X_{k,it}$ denotes the control variables including *SIZE*, $EXCESSRET_{t-1}$, *ECONFREE, CAPLCONS*, *EXCHG*, and *SSDUMMY*. All control variables are at month *t*, except *EXCESSRET*, the excess return of country equity market of a period *t*-1. *SIZE* is market size. *ECONFREE* is the natural logarithm of the index of economic freedom. *CAPLCONS* is the capital control. *EXCHG* is the change in exchange rate. *SSDUMMY* is the dummy equal to 1 if shorting-selling is allowed in stock market.

$LIQUID_{i,t-1}$ denotes the lagged liquidity. In this table, we analyze five liquidity measures: *TURNOVER* is the ratio of value of share traded over market capitalization; *TRADVOL*_1 is the natural logarithm of the value of share traded; *TRADVOL*_2 is the value of share traded as a percentage of GDP; *PRIIMPACT*_1 is the absolute value of the IFCG price change over dollar value traded; *PRIIMPACT*_2 is the absolute value of the IFCI price change over dollar value traded. All liquidity measures are at month $t-1$.

Constants and the country-specific intercepts are included but not reported. Enclosed in parenthesis are the *p*-values which are computed using robust standard errors, allowing for clustering by country. Statistical significance at the 1%, 5% and 10% level are denoted by ***, **, and *, respectively.

Table III. Panel A. Full Sample					
	U.S. Equity Flows				
	[2]	[3]	[4]	[5]	[6]
SIZE	1.103***	0.830***	0.981***	1.018***	1.016***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	-0.145***	-0.146***	-0.143***	-0.029	-0.030
	(0.000)	(0.000)	(0.000)	(0.914)	(0.914)
ECONFREE	2.496***	2.220***	2.594***	2.573***	2.579***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAPLCONS	-1.091***	-1.165***	-1.131***	-1.319***	-1.322***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	0.073	-0.105	0.030	0.190	0.187
	(0.844)	(0.753)	(0.936)	(0.668)	(0.671)
SSDUMMY	0.049	0.102	0.032	0.073	0.074
	(0.470)	(0.137)	(0.630)	(0.355)	(0.336)
TURNOVER$_{t-1}$	1.386*				
	(0.057)				
TRADVOL_1$_{t-1}$		0.205***			
		(0.000)			
TRADVOL_2$_{t-1}$			1.932**		
			(0.022)		
PRIIMPACT_1$_{t-1}$				-0.114	
				(0.430)	
PRIIMPACT_2$_{t-1}$					-0.136
					(0.320)
Number of Observations.	956	957	957	735	735
Adj R^2	0.5333	0.5446	0.5357	0.4963	0.4964

Table III. Panel B. Latin America					
	U.S. Equity Flows				
	[2]	[3]	[4]	[5]	[6]
SIZE	2.259***	1.066*	1.249*	2.347***	2.339***
	(0.001)	(0.103)	(0.065)	(0.001)	(0.001)
EXCESSRET $_{t-1}$	-0.103***	-0.113***	-0.109***	-0.178	-0.179
	(0.000)	(0.000)	(0.000)	(0.714)	(0.722)
ECONFREE	2.849***	3.858***	3.085***	2.766***	2.767***
	(0.001)	(0.000)	(0.001)	(0.003)	(0.004)
CAPLCONS	-2.616***	-2.130**	-2.285**	-2.621**	-2.625**
	(0.008)	(0.033)	(0.028)	(0.014)	(0.014)
EXCHG	-0.511	-0.868**	-0.704	-0.498	-0.502
	(0.360)	(0.098)	(0.173)	(0.485)	(0.489)
SSDUMMY	0.556***	0.669***	0.496***	0.333**	0.333**
	(0.003)	(0.000)	(0.001)	(0.029)	(0.025)
TURNOVER$_{t-1}$	9.448***				
	(0.002)				
TRADVOL_1$_{t-1}$		0.466***			
		(0.000)			
TRADVOL_2$_{t-1}$			41.574***		
			(0.000)		
PRIIMPACT_1$_{t-1}$				0.214	
				(0.368)	
PRIIMPACT_2$_{t-1}$					0.199
					(0.381)
Number of Observations.	329	330	330	326	326
Adj R^2	0.3764	0.4018	0.3872	0.3497	0.3496

Table III. Panel C. Europe, Africa, and Middle East

	U.S. Equity Flows		
	[2]	[3]	[4]
SIZE	0.716***	0.682***	0.681***
	(0.001)	(0.002)	(0.002)
EXCESSRET $_{t-1}$	-0.290	-0.307	-0.311
	(0.182)	(0.132)	(0.117)
ECONFREE	4.783***	3.572***	3.892***
	(0.000)	(0.000)	(0.000)
CAPLCONS	82.045	79.404	71.625
	(0.000)	(0.000)	(0.000)
EXCHG	0.943	0.793	0.796
	(0.142)	(0.212)	(0.193)
SSDUMMY	-0.216***	-0.278***	-0.222***
	(0.000)	(0.000)	(0.000)
TURNOVER$_{t-1}$	1.779*		
	(0.054)		
TRADVOL_1$_{t-1}$		0.113**	
		(0.043)	
TRADVOL_2$_{t-1}$			4.982
			(0.122)
PRIIMPACT_1$_{t-1}$			
PRIIMPACT_2$_{t-1}$			
Number of Observations.	213	213	213
Adj R^2	0.5892	0.5906	0.5928

Table III. Panel D. Asia

	U.S. Equity Flows				
	[2]	[3]	[4]	[5]	[6]
SIZE	1.165***	0.959***	1.089***	1.112***	1.105***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	0.165	0.093	0.119	0.094	0.096
	(0.588)	(0.768)	(0.703)	(0.784)	(0.774)
ECONFREE	-1.031	-0.777	-0.747	-0.579	-0.533
	(0.209)	(0.318)	(0.357)	(0.512)	(0.545)
CAPLCONS	-1.112***	-1.093***	-1.093***	-1.207***	-1.213
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	0.380	0.176	0.333	0.484	0.477
	(0.383)	(0.654)	(0.447)	(0.348)	(0.353)
SSDUMMY	-0.127*	-0.079	-0.129*	-0.122	-0.118
	(0.095)	(0.301)	(0.083)	(0.116)	(0.111)
TURNOVER$_{t-1}$	0.284				
	(0.723)				
TRADVOL_1$_{t-1}$		0.143**			
		(0.037)			
TRADVOL_2$_{t-1}$			0.960		
			(0.245)		
PRIIMPACT_1$_{t-1}$				-0.013	
				(0.954)	
PRIIMPACT_2$_{t-1}$					-0.077
					(0.726)
Number of Observations.	414	414	414	339	339
Adj R^2	0.575	0.5813	0.5775	0.6061	0.6062

V. B. A Comparison of Short and Long-Horizon U.S. Equity Flows

Since some of liquidity dimensions, such as trading frequency and trading volume, reflect trading activities that might respond to current or past month equity flows, it is possible that liquidity is influenced by the current or past equity flows. However, the influence should be less in the long term than that in the short term. To control for the potential endogeneity and as another robustness check, we estimate both short and long-horizon regressions of U.S. equity flows on various explanatory variables. Inspired by Edison and Warnock (2003a)[30], we calculate the average twelve-month-ahead equity flows to perform a long-horizon regression, and use one-month-ahead equity flows for a short-horizon regression. We employ fixed-effect estimator with Newey and West (1987) standard errors to investigate the impact of various macro factors, especially liquidity, on both the average twelve-month and one-month-ahead U.S. equity flows. The regression model is as follows:

$$\frac{\sum_{j=1}^{m} y_{i,t+j}}{m} = \alpha_i + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{it} + \varepsilon_{i,t+m} \qquad (2)$$

where

- $\frac{\sum_{j=1}^{m} y_{i,t+j}}{m}$ is the average monthly U.S. equity inflows into country i from month $t+1$ to month $t+m$ scaled by country i's GDP; $m = 1$ and 12.
- As mentioned earlier, overlapping observations induces the serial correlation of regression residuals. The OLS standard errors may not account for this fact and will lead to biased inference. To correct for serial correlation and conditional heteroskedasticity, Newey-West standard errors are used here.

The time period is from January 1995 through December 2003. The empirical results are reported in Table IV. As the table shows, the impacts of various macro factors on average twelve-month-ahead U.S. equity inflows into emerging markets are fairly strong. For the full sample, the coefficients on all control variables are statistically significant and all have the signs consistent with our expectation. Regarding the regional samples, there is one result inconsistent

[30] They estimate long-horizon regression to alleviate endogeneity issues and smooth the very volatile data on net purchases. They also use Newey and West standard errors to correct for the error autocorrelation induced by the overlapping structure of the long-horizon regressions.

with our expectation: *CAPLCONS* in Latin America has a positive but insignificant coefficient, which is different from the previous estimation. A similar divergence occurs in *CAPLCONS* for Europe, Africa, and Middle East region, where the coefficient on *CAPLCONS* is positive and statistically significant. For this puzzling result, we offer no satisfactory explanation[31]. A possible explanation is that capital control is intended for ordinary investors while it is not a major concern for well-connected institutional investors. The variables *SIZE*, $EXCESSRET_{t-1}$, *ECONFREE*, and *SSDUMMY* are all significant with expected signs in Latin America. Also for the Latin American sample, *EXCHG* is significantly negatively correlated with long-horizon equity inflows into Latin America markets with the exception of models (3) and (4). The sign is opposite to previous results. In Europe, Africa, and Middle East market, *SIZE*, *ECONFREE*, *CAPLCONS*, and *SSDUMMY* all significantly determine equity inflows. However, the evidence on *SSDUMMY* is mixed. Models (2) and (4) produce a positive and significant sign. In the Asian sample, while all control variables have the expected signs, only *SIZE* and *CAPLCONS* have statistically significant relation with long-horizon equity flows.

With respect to liquidity, the impacts of six liquidity measures on U.S. equity flows are consistent with our expectation. The long-horizon effects of *TURNOVER* and *TRADVOL*_1 are positive and significant for all but the Asian sample where the coefficients are insignificant. *TRADVOL*_2 has a positive impact on equity flows with a statistically significant coefficient of 10.30 and 25.28 for Europe, Africa, and Middle East sample and Latin America sample, respectively. The significant and positive relation between *TRADVOL*_2 and the average twelve-month-ahead equity flow holds for all regressions except those for the Asian samples. As we have noted, *TRADVOL*_2 measures the effects of trading value as a share of national output. For example, a 1 percent increase in the value of share traded in a market of Latin America leads to a 25.28 percent increase in U.S. equity inflows into that region. Furthermore, the coefficients for *PRIIMPACT*_1 and *PRIIMPACT*_2 are negative and significant for the full sample, but not significant for Latin America and Asia samples. Because of lack of data, we omit the regressions on *PRIIMPACT*_1 and *PRIIMPACT*_2 for Europe, Africa, and Middle East sample. As hypothesized, *PRIIMPACT*_3 has a negative impact on equity flows for Latin America and Europe, Africa, and Middle East samples, even though the coefficient is not significant. For the

[31] Edison and Warnock (2003a) have the same conclusion on capital controls: a reduction in capital controls results in a significant increase in long-horizon equity flows to emerging Asia, but not to Latin America.

full sample and the Asian sample, the coefficient of *RIIMPACT_*3 on the long-run equity flows is also insignificant but positive. The evidence of liquidity effects in Asia here is relatively weak, compared to that in Table II, suggesting that liquidity effects in Asia are relatively short term[32].

Table V reports the empirical results on the impacts of macro factors on one-month-ahead U.S. equity flows. Most variables are again related to equity flows and the magnitude is even more than in the long-horizon regression. An emerging country with larger equity market *SIZE* attracts more U.S. equity inflows, which is highly significant in all cases. The larger the country's *ECONFREE*, the more equities U.S. investors would purchase from that country. The result is significant for all but the Asian sample where the models produce negative and insignificant coefficients of *ECONFREE* as those in Table II. It appears that Asia's *ECONFREE* does not directly influence equity flows in a short-horizon but it does in a long-horizon. With some exceptions, the coefficients of $EXCESSRET_{t-1}$ are negative for all cases and statistically significant for the full sample and Latin America. A reduction in *CAPLCONS* results in equity inflows into Latin America and Asia markets. The coefficients of *CAPLCONS* are significantly negative in the full sample, Latin America, and Asia markets; however for the Europe, Africa, and Middle East market, we still find the puzzling positive and statistically significant coefficient for *CAPLCONS*. The negative sign in *EXCHG* is in line with the estimation in Table IV for the full sample and Latin America. The coefficient of *EXCHG* is significantly negative in most models for Latin America. However, for Europe, Africa, and Middle East and Asia samples, *EXCHG* positively influences equity inflows, but not significantly in most models. As a comparison, *EXCHG* is significant in the long-horizon regression but not in short-run regression for the full sample, suggesting that the effect of the change in exchange rate may take a long time to appear. *SSDUMMY* have significantly positive coefficients in the full sample and Latin America. The evidence on *SSDUMMY* in Europe, Africa, and Middle East sample and Asia sample is mixed.

Regarding the effect of liquidity in one-month-ahead equity flows, the evidence shows that the short-horizon effects of *TURNOVER* and *TRADVOL_*1 are positive and significant for all but Asia sample where the coefficients are insignificant. *TRADVOL_*2 has a positive and statistically significant impact on equity flows for Europe, Africa, and Middle East sample and

[32] The Asian financial crisis in 1997 and 1998 may affect the results, although many other emerging markets also suffer tremendous stress. During a financial crisis foreign equity flows may dry up or behave differently from normal times.

Latin America sample. *PRIIMPACT*_1 and *PRIIMPACT*_2 are negative for the full sample and Asia sample, but only significant for Asia samples. With regard to Latin America, two price impact measures are positively related to immediate and short-horizon equity inflows into Latin America (as shown in Panel B of Table II and Table V) but negatively related to long-horizon equity inflows (in Panel B of Table IV). It seems that the negative impact of price impact on U.S. equity inflows into Latin America takes more than one month to become visible. As for the effects of *PRIIMPACT*_3, there is little evidence that it affects U.S. equity flows. Recall that *PRIIMPACT*_3 reflects more of smalls stocks' price impacts. If U.S. investors are mostly interested in larger stocks, small stocks' price impacts are of little concern to them, which potentially explains the lack of significance for *PRIIMPACT*_3.

Comparing the coefficient estimates in Table IV and V with those in Table II, it appears that the effects of control variables last over a year. Specifically, across these three tables, *SIZE* has the larger magnitude in the short horizon and in the contemporaneous period than in the long horizon. This is true for all cases. Moreover, a comparison of the full sample across the three tables shows us that the coefficients for *EXCESSRET*, *ECONFREE*, and *CAPLCONS* are smaller in the long-horizon estimation; on the other hand, *EXCHG* has the largest and significant effect on equity flows in the long-horizon regression. More importantly, the impacts of *TURNOVER*, *TRADVOL*_1, and *TRADVOL*_2 on equity flows are stronger in the contemporaneous period and short horizon than in the long horizon for all cases. While the effects of *PRIIMPACT*_1, *PRIIMPACT*_2, and *PRIIMPACT*_3 vary across regions, the typical pattern is similar to the other liquidity measures.

Table IV. Estimation of the Average Twelve-Month-Ahead U.S. Equity Flows

Table IV includes four Panels A – D presenting estimation results for full sample, Latin America sample, Europe, Africa, and Middle East sample, and Asia sample, respectively. For each panel except Panel C where model (5) and (6) are omitted due to the limited availability of the data, seven regression models [1] – [7] are estimated, each with a different measure of liquidity except for model [1] which only includes control variables. In regressions [2] to [7], liquidity is measured by *TURNOVER*, *TRADVOL*_1, *TRADVOL*_2, *PRIIMPACT*_1, *PRIIMPACT*_2, and *PRIIMPACT*_3, respectively. All regressions are estimated over the period from January 1995 to December 2002.

The dependent variable, $\frac{\sum_{j=1}^{m} y_{i,t+j}}{m}$, in fixed country effect estimation is the average twelve-month ahead U.S. equity inflows into country *i* at month *t* scaled by country *i*'s GDP:

$$\frac{\sum_{j=1}^{m} y_{i,t+j}}{m} = \alpha_i + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{it} + \varepsilon_{i,t+m}$$

$X_{k,it}$ denotes the control variables including *SIZE*, $EXCESSRET_{t-1}$, *ECONFREE, CAPLCONS*, *EXCHG*, and *SSDUMMY*. All explanatory variables are at month *t*, except *EXCESSRET*, the excess return of country equity market of a period *t*-1. *SIZE* is market size. *ECONFREE* is the natural logarithm of the index of economic freedom. *CAPLCONS* is the capital control. *EXCHG* is the change in exchange rate. *SSDUMMY* is the dummy equal to 1 if shorting-selling is allowed in stock market.

$LIQUID_{it}$ denotes the alternative liquidity measure: *TURNOVER* is the ratio of value of share traded over market capitalization; *TRADVOL*_1 is the natural logarithm of the value of share traded; *TRADVOL*_2 is the value of share traded as a percentage of GDP; *PRIIMPACT*_1 is the absolute value of the IFCG price change over dollar value traded; *PRIIMPACT*_2 is the absolute value of the IFCI price change over dollar value traded; *PRIIMPACT*_3 is the absolute value of local stock market price change over dollar value traded.

Constants and the country-specific intercepts are included but not reported. Enclosed in parenthesis are the *p*-values which are computed using Newey-West standard errors to control for heteroskedasticity and serial correlation. Statistical significance at the 1%, 5% and 10% level are denoted by ***, **, and *, respectively.

Table IV. Panel A. Full Sample

	Average 12-month-ahead U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.014***	0.984***	0.864***	0.929***	0.958***	0.958***	1.021***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	-0.088**	-0.099***	-0.095***	-0.093***	-0.109***	-0.109***	-0.088**
	(0.013)	(0.000)	(0.001)	(0.003)	(0.000)	(0.000)	(0.013)
ECONFREE	2.389***	2.545***	2.310***	2.496***	2.968***	2.966***	2.399***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAPLCONS	-0.972***	-0.806***	-0.942***	-0.915***	-0.631***	-0.631***	-0.969***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	-0.404**	-0.386**	-0.347*	-0.397**	-0.291*	-0.294*	-0.412**
	(0.0250	(0.030)	(0.058)	(0.027)	(0.104)	(0.092)	(0.022)
SSDUMMY	0.090**	0.104***	0.119***	0.087**	0.172***	0.172***	0.090**
	(0.013)	(0.003)	(0.001)	(0.015)	(0.000)	(0.000)	(0.010)
TURNOVER		1.532**					
		(0.014)					
TRADVOL_1			0.097***				
			(0.000)				
TRADVOL_2				1.036			
				(0.167)			
PRIIMPACT_1					-0.119*		
					(0.081)		
PRIIMPACT_2						-0.115*	
						(0.062)	
PRIIMPACT_3							0.088
							(0.213)
Number of Observations	957	956	957	957	744	744	957
Adj R^2	0.7091	0.7139	0.7132	0.7110	0.6907	0.6907	0.7089

Table IV. Panel B. Latin America

	Average 12-month-ahead U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.052***	1.057***	0.375	0.417	1.023***	1.024***	1.031***
	(0.001)	(0.000)	(0.258)	(0.191)	(0.001)	(0.001)	(0.001)
EXCESSRET $_{t-1}$	-0.113***	-0.111***	-0.112***	-0.109***	-0.112***	-0.112***	-0.113***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ECONFREE	4.228***	4.240***	4.679***	4.258***	4.228***	4.228***	4.227***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAPLCONS	0.154	0.157	0.258	0.185	0.139	0.139	0.145
	(0.844)	(0.843)	(0.741)	(0.805)	(0.860)	(0.867)	(0.855)
EXCHG	-0.521*	-0.501*	-0.395	-0.422	-0.517*	-0.517*	-0.516*
	(0.078)	(0.088)	(0.165)	(0.164)	(0.089)	(0.081)	(0.096)
SSDUMMY	0.243***	0.405***	0.408***	0.327***	0.243***	0.243***	0.243***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
TURNOVER		7.274***					
		(0.000)					
TRADVOL_1			0.245***				
			(0.000)				
TRADVOL_2				25.282***			
				(0.000)			
PRIIMPACT_1					-0.044		
					(0.609)		
PRIIMPACT_2						-0.043	
						(0.612)	
PRIIMPACT_3							-0.042
							(0.600)
Number of Observations	330	329	330	330	330	330	330
Adj R^2	0.6065	0.6291	0.6292	0.6259	0.6054	0.6054	0.6054

Table IV. Panel C. Europe, Africa, and Middle East

	Average 12-month-ahead U.S. Equity Flows				
	[1]	[2]	[3]	[4]	[7]
SIZE	0.563***	0.852***	0.735***	0.520***	0.563***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	0.026	-0.006	-0.186	-0.143	0.025
	(0.883)	(0.977)	(0.310)	(0.446)	(0.889)
ECONFREE	3.250***	2.930***	0.155	1.433***	3.230***
	(0.000)	(0.000)	(0.758)	(0.001)	(0.000)
CAPLCONS	75.805***	58.364***	52.147***	42.507***	75.940***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	-0.232	0.587	0.216	0.518	-0.224
	(0.603)	(0.332)	(0.627)	(0.358)	(0.630)
SSDUMMY	-0.184***	0.184**	-0.073	0.211***	-0.186***
	(0.000)	(0.045)	(0.274)	(0.000)	(0.001)
TURNOVER		2.663***			
		(0.009)			
TRADVOL_1			0.274***		
			(0.000)		
TRADVOL_2				10.298***	
				(0.000)	
PRIIMPACT_3					-0.023
					(0.727)
Number of Observations	213	213	213	213	213
Adj R^2	0.6932	0.6256	0.6822	0.6599	0.6917

Table IV. Panel D. Asia

	Average 12-month-ahead U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.076***	1.056***	0.992***	1.062***	0.821***	0.822***	1.091***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	0.124	0.033	0.079	0.113	-0.074	-0.074	0.132
	(0.526)	(0.870)	(0.668)	(0.554)	(0.795)	(0.794)	(0.497)
ECONFREE	0.623	0.874	0.731	0.680	0.628	0.623	0.554
	(0.306)	(0.121)	(0.222)	(0.252)	(0.181)	(0.183)	(0.3740
CAPLCONS	-0.937***	-0.846***	-0.923***	-0.930***	-0.347***	-0.345***	-0.931***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.005)	(0.000)
EXCHG	-0.289	-0.303	-0.280	-0.290	-0.266	-0.272	-0.294
	(0.132)	(0.139)	(0.141)	(0.118)	(0.185)	(0.173)	(0.151)
SSDUMMY	0.021	0.026	0.037	0.021	-0.039	-0.040	0.013
	(0.622)	(0.532)	(0.387)	(0.620)	(0.348)	(0.342)	(0.755)
TURNOVER		0.893					
		(0.209)					
TRADVOL_1			0.054				
			(0.123)				
TRADVOL_2				0.151			
				(0.840)			
PRIIMPACT_1					-0.208		
					(0.193)		
PRIIMPACT_2						-0.200	
						(0.215)	
PRIIMPACT_3							0.201
							(0.334)
Number of Observations	414	414	414	414	343	343	414
Adj R^2	0.7138	0.7156	0.7142	0.7132	0.6286	0.6285	0.7133

Table V. Estimation of the One-Month-Ahead U.S. Equity Flows

Table V includes four Panels A – D presenting estimation results for full sample, Latin America sample, Europe, Africa, and Middle East sample, and Asia sample, respectively. For each panel except Panel C where model (5) and (6) are omitted due to the limited availability of the data, seven regression models [1] – [7] are estimated, each with a different measure of liquidity except for model [1] which only includes control variables. In regressions [2] to [7], liquidity is measured by *TURNOVER*, *TRADVOL*_1, *TRADVOL*_2, *PRIIMPACT*_1, *PRIIMPACT*_2, and *PRIIMPACT*_3, respectively. All regressions are estimated over the period from January 1995 to December 2002.

The dependent variable, $\frac{\sum_{j=1}^{m} y_{i,t+j}}{m}$, in fixed country effect estimation is One-month ahead U.S. equity inflows into country i at month t scaled by country i's GDP:

$$\frac{\sum_{j=1}^{m} y_{i,t+j}}{m} = \alpha_i + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{it} + \varepsilon_{i,t+m}$$

$X_{k,it}$ denotes the control variables including *SIZE*, $EXCESSRET_{t-1}$, *ECONFREE, CAPLCONS*, *EXCHG*, and *SSDUMMY*. All explanatory variables are at month t, except *EXCESSRET*, the excess return of country equity market of a period t-1. *SIZE* is market size. *ECONFREE* is the natural logarithm of the index of economic freedom. *CAPLCONS* is the capital control. *EXCHG* is the change in exchange rate. *SSDUMMY* is the dummy equal to 1 if shorting-selling is allowed in stock market.

$LIQUID_{it}$ denotes the alternative liquidity measure: *TURNOVER* is the ratio of value of share traded over market capitalization; *TRADVOL*_1 is the natural logarithm of the value of share traded; *TRADVOL*_2 is the value of share traded as a percentage of GDP; *PRIIMPACT*_1 is the absolute value of the IFCG price change over dollar value traded; *PRIIMPACT*_2 is the absolute value of the IFCI price change over dollar value traded; *PRIIMPACT*_3 is the absolute value of local stock market price change over dollar value traded.

Constants and the country-specific intercepts are included but not reported. Enclosed in parenthesis are the p-values which are computed using Newey-West standard errors to control for heteroskedasticity and serial correlation. Statistical significance at the 1%, 5% and 10% level are denoted by ***, **, and *, respectively.

Table V. Panel A. Full Sample

	One-month-ahead U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.152***	1.128***	0.873***	1.048***	1.059***	1.056***	1.155***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	-0.126***	-0.136***	-0.139***	-0.132***	-0.121***	-0.121***	-0.126***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ECONFREE	2.467***	2.576***	2.319***	2.599***	2.803***	2.807***	2.470***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAPLCONS	-1.208***	-1.070***	-1.151***	-1.138***	-1.196***	-1.198***	-1.207***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	-0.142	-0.128	-0.036	-0.134	-0.080	-0.075	-0.145
	(0.684)	(0.705)	(0.911)	(0.698)	(0.839)	(0.849)	(0.667)
SSDUMMY	0.110	0.121*	0.164**	0.105	0.168**	0.169**	0.109
	(0.107)	(0.076)	(0.019)	(0.118)	(0.031)	(0.029)	(0.113)
TURNOVER		1.243*					
		(0.088)					
TRADVOL_1			0.181***				
			(0.000)				
TRADVOL_2				1.278			
				(0.132)			
PRIIMPACT_1					-0.091		
					(0.552)		
PRIIMPACT_2						-0.109	
						(0.465)	
PRIIMPACT_3							0.033
							(0.790)
Number of Observations	957	956	957	957	744	744	957
Adj R^2	0.5346	0.5372	0.5449	0.5365	0.5062	0.5063	0.5341

Table V. Panel B. Latin America

	One-month-ahead U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.971***	1.979***	0.686	0.855	2.130***	2.119***	1.996***
	(0.001)	(0.001)	(0.284)	(0.216)	(0.001)	(0.001)	(0.001
EXCESSRET $_{t-1}$	-0.099***	-0.097***	-0.098***	-0.093***	-0.100***	-0.100***	-0.099***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ECONFREE	3.446***	3.456***	4.302***	3.500***	3.442***	3.444***	3.447***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAPLCONS	-2.023*	-2.037*	-1.826*	-1.968**	-1.939*	-1.943*	-2.011*
	(0.070)	(0.059)	(0.076)	(0.048)	(0.085)	(0.093)	(0.075)
EXCHG	-1.236*	-1.209*	-0.997	-1.063*	-1.255**	-1.252*	-1.241*
	(0.062)	(0.053)	(0.121)	(0.086)	(0.047)	(0.051)	(0.060)
SSDUMMY	0.371**	0.588***	0.685***	0.520***	0.369**	0.369**	0.371**
	(0.012)	(0.001)	(0.000)	(0.001)	(0.013)	(0.012)	(0.013)
TURNOVER		9.730***					
		(0.002)					
TRADVOL_1			0.465***				
			(0.000)				
TRADVOL_2				44.392***			
				(0.000)			
PRIIMPACT_1					0.241		
					(0.287)		
PRIIMPACT_2						0.221	
						(0.317)	
PRIIMPACT_3							0.050
							(0.763)
Number of Observations	330	329	330	330	330	330	330
Adj R^2	0.3597	0.3796	0.4059	0.3934	0.3590	0.3589	0.3578

Table V. Panel C. Europe, Africa, and Middle East

	One-month-ahead U.S. Equity Flows				
	[1]	[2]	[3]	[4]	[7]
SIZE	0.785***	1.042***	0.918***	0.748***	0.785***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
EXCESSRET $_{t-1}$	-0.275	-0.332	-0.441*	-0.410	-0.275
	(0.291)	(0.184)	(0.086)	(0.128)	(0.290)
ECONFREE	4.462***	4.177***	2.065***	3.038***	4.433***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
CAPLCONS	87.869***	72.145***	69.674***	61.962***	88.075***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	1.035	1.524	1.353	1.583*	1.046
	(0.296)	(0.118)	(0.158)	(0.086)	(0.288)
SSDUMMY	-0.199***	0.012	-0.126*	0.093	-0.201***
	(0.000)	(0.860)	(0.060)	(0.160)	(0.000)
TURNOVER		3.050***			
		(0.000)			
TRADVOL_1			0.212***		
			(0.000)		
TRADVOL_2				8.095***	
				(0.001)	
PRIIMPACT_3					-0.034
					(0.728)
Number of Observations	213	213	213	213	213
Adj R^2	0.5908	0.5876	0.5988	0.5895	0.5888

Table V. Panel D. Asia

	One-month-ahead U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
SIZE	1.201***	1.196***	1.038***	1.171***	0.858***	0.856***	1.213***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCESSRET $_{t-1}$	-0.057	-0.077	-0.144	-0.080	-0.188	-0.195	-0.051
	(0.865)	(0.827)	(0.692)	(0.819)	(0.585)	(0.572)	(0.886)
ECONFREE	-0.745	-0.690	-0.534	-0.623	0.049	0.043	-0.799
	(0.380)	(0.398)	(0.488)	(0.451)	(0.931)	(0.940)	(0.362)
CAPLCONS	-1.108***	-1.088***	-1.080***	-1.093***	-0.804***	-0.810***	-1.103***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
EXCHG	0.161	0.158	0.178	0.158	0.190	0.197	0.157
	(0.615)	(0.642)	(0.606)	(0.660)	(0.570)	(0.556)	(0.675)
SSDUMMY	-0.010	-0.009	0.022	-0.010	0.050	0.051	-0.016
	(0.899)	(0.908)	(0.783)	(0.893)	(0.404)	(0.394)	(0.829)
TURNOVER		0.197					
		(0.831)					
TRADVOL_1			0.105				
			(0.110)				
TRADVOL_2				0.324			
				(0.722)			
PRIIMPACT_1					-0.360		
					(0.105)		
PRIIMPACT_2						-0.403*	
						(0.064)	
PRIIMPACT_3							0.159
							(0.698)
Number of Observations	414	414	414	414	343	343	414
Adj R^2	0.5747	0.5737	0.5768	0.5739	0.5670	0.5674	0.5738

V. C. Dynamic Specifications

In this section, we use a dynamic framework as an alternative approach to estimate the impact of macro factors, especially liquidity, on U.S. equity inflows into emerging markets. The dynamic specification is of the following type:

$$y_{it} = \alpha_i + \sum_{s=1}^{S} \phi_s y_{i,t-s} + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{it} + \varepsilon_{it} \tag{3}$$

where

$\sum_{s=1}^{S} \phi_s y_{i,t-s}$ denotes the lagged U.S. equity flows of country *i* at time *t*; $s \geq 1$; *S* is the number of lags; ϕ_s is the coefficients of $y_{i,t-s}$

We assume that the coefficient of the lagged dependent variables, ϕ_s, is constant across countries, and $y_{i,t-s}$ is uncorrelated with the error term ε_{it}. There are three reasons for us to employ a dynamic model of equation (3), given below.

First, including lagged dependent variables as a proxy in the static model may help us controlling for unobserved or omitted variables which is suspected to be correlated with liquidity or any other explanatory variables. We expect that the sign of ϕ is positive if the U.S. equity flows have inertia (if the U.S. investors take the earlier month equity flows into consideration when they make decision on current month equity allocation).

Second, a dynamic model[33] with lagged dependent variable on the right hand side of the equation may eliminate the serial correlation of the errors, because the lagged dependent variable implicitly includes lagged error terms into the specification. As discussed earlier, the autocorrelation test shows some serial correlations[34] exist in some models.

Third, equity flow in our sample is a monthly time series with a trend. The presence of a unit root is possible. The latter may affect our inference about the coefficients of liquidity by running a spurious regression. We conduct ADF unit root test with time trend and one or more

[33] According to Arellano and Bond (1991), we first test for the dynamic relationship by conducting the following test: run the FE model and get the residuals; construct the lagged residuals, and add into the original FE model specification; obtain the estimates and test whether the coefficient on lagged residuals is significant. The F-test rejects the null hypothesis that the lagged residuals have no significant effect. The test suggests that the inclusion of the lagged dependent variable is justified.

[34] We re-test for the autocorrelation for the models with lagged equity flows and find no autocorrelation presents.

lags, as well as KPSS[35] stationary tests, for the U.S. equity flows. The results suggest that stationarity of equity flows and their lag lengths vary across countries. Performing a first-difference[36] regression model would help render data stationary, ensure reliable inferences, and eliminate the time-invariant fixed effects, α_i

Given the above-mentioned reasons, we use two approaches to address the issue in this section. One is LSDV model[37] or fixed-effect model with lagged dependent variables. For this estimation, we include up to three lags of the levels of equity flows and compute Newey-West standard errors to control for heteroskedasticity and serial correlation corrections up to three lags. Further lags have been tested and found to be insignificant. As a comparison, we also perform a Fixed Effects Two-Stage Least-Squares (FE-2SLS) estimator with three lags of equity flows. We use $y_{i,t-4}$, $y_{i,t-5}$, and $y_{i,t-6}$ as instrumental variables in 2SLS estimation. The results are reported in Panel A and B of Table VI, where we only run the regressions for the full sample.

Table VI reports the results for the dynamic specification by the two methods. When we include the lagged equity flows, all control variables and liquidity measures continue to have the coefficients with the similar magnitude and consistent signs as those in Table II. There are some differences compared to the previous results, as follows. The coefficients of *EXCESSRET* are now positive but insignificant and the coefficients on *EXCHG* are not significant. Also, the 2SLS estimation does not indicate significant coefficients for *PRIIMPACT*_1 and *PRIIMPACT*_2; on the other hand, the estimation of LSDV with lagged dependent variables shows the significant impacts of *TURNOVER*, *TRADVOL*_1, *TRADVOL*_2, *PRIIMPACT*_, and *PRIIMPACT*_2 on the U.S. equity flows, which is consistent with the previous result. It again indicates that emerging stock market liquidity measured by trading frequency, trading volume, and price impact is an important determinant of U.S. equity inflows, after controlling for the historical equity flows. In addition, the coefficients on the lagged equity flows are positive as expected, which implies that

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35 Kwiatkowski, Phillips, Schmidt, and Shin (KPSS, 1992) test is for stationarity of a time series. Augmented Dickey-Fuller (ADF) test takes nonstationarity as the null hypothesis. For both test results we do not report here.

36 The OLS estimation would still be inefficient because ($\varepsilon_{it} - \varepsilon_{i,t-1}$) is correlated with ($y_{i,t-1} - y_{i,t-2}$) on the right hand side of the first-difference equation because $y_{i,t-1}$ is correlated with $\varepsilon_{i,t-1}$.

37 Arellano and Bond (1991)-GMM uses lagged first differences of the variables for the equation in level as instruments to control for the endogeneity of the lagged dependent variables. In the empirical literature, while AB-GMM estimator is the standard procedure dealing with such issue, it is designed for small-T large-N panels. Especially, it leads to a very large number of instruments for the TSCS data as ours.

the U.S. equity flows have inertia. That is, an increased equity flows in a specific month usually is followed by another month of increased equity flows.

The similar results from the two estimations suggest the following: that there is little endogeneity issue or that the instrumental variables do not carry additional information. For the 2SLS estimation, we also use a larger number of lagged instrumental variables not reported here, but the results do not change qualitatively.

Table VI. Estimation of a Dynamic Specification

Table VI includes two Panels A and B presenting estimation results of two approaches, LSDV and FE 2SLS, for full sample, respectively. For each panel, seven regression models [1] – [7] are estimated, each with a different measure of liquidity except for model [1] which only includes control variables. In regressions [2] to [7], liquidity is measured by *TURNOVER*, *TRADVOL*_1, *TRADVOL*_2, *PRIIMPACT*_1, *PRIIMPACT*_2, and *PRIIMPACT*_3, respectively. All regressions are estimated over the period from January 1995 to December 2002.
The dependent variable, y_{it}, in dynamic estimation is the U.S. equity inflows into country *i* at month *t* scaled by country *i*'s GDP:

$$y_{it} = \alpha_i + \sum_{s=1}^{S} \phi_s y_{i,t-s} + \sum_{k=1}^{M} \beta_k \cdot X_{k,it} + \gamma \cdot LIQUID_{it} + \varepsilon_{it}$$

$y_{i,t-s}$ denotes the lagged equity flows. Here three lags of the levels of equity flows are included. The 2SLS estimation uses $y_{i,t-4}$, $y_{i,t-5}$, and $y_{i,t-6}$ as instrumental variables.

$X_{k,it}$ denotes the control variables including *SIZE*, $EXCESSRET_{t-1}$, *ECONFREE, CAPLCONS*, *EXCHG*, and *SSDUMMY*. All explanatory variables are at month *t*, except *EXCESSRET*, the excess return of country equity market of a period *t*-1. *SIZE* is market size. *ECONFREE* is the natural logarithm of the index of economic freedom. *CAPLCONS* is the capital control. *EXCHG* is the change in exchange rate. *SSDUMMY* is the dummy equal to 1 if shorting-selling is allowed in stock market.

$LIQUID_{it}$ denotes the alternative liquidity measure: *TURNOVER* is the ratio of value of share traded over market capitalization; *TRADVOL*_1 is the natural logarithm of the value of share traded; *TRADVOL*_2 is the value of share traded as a percentage of GDP; *PRIIMPACT*_1 is the absolute value of the IFCG price change over dollar value traded; *PRIIMPACT*_2 is the absolute value of the IFCI price change over dollar value traded; *PRIIMPACT*_3 is the absolute value of local stock market price change over dollar value traded.

Constants and the country-specific intercepts are included but not reported. Enclosed in parenthesis are the *p*-values which are computed using Newey-West standard errors to control for heteroskedasticity and serial correlation corrections up to three lags. Statistical significance at the 1%, 5% and 10% level are denoted by ***, **, and *, respectively.

			Table VI. Panel A. Full Sample - LSDV estimation				
				U.S. Equity Flows			
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
$EQUITYFLOWS_{t-1}$	0.377***	0.374***	0.361***	0.374***	0.418***	0.418***	0.377***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EQUITYFLOWS_{t-2}$	0.166***	0.166***	0.156***	0.166***	0.130***	0.130***	0.166***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)	(0.000)
$EQUITYFLOWS_{t-3}$	0.047	0.045	0.047	0.045	0.056	0.056	0.047
	(0.186)	(0.209)	(0.170)	(0.205)	(0.144)	(0.131)	(0.168)
SIZE	0.607***	0.580***	0.349***	0.482***	0.517***	0.515***	0.594***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EXCESSRET_{t-1}$	0.240	0.149	0.101	0.176	0.228	0.227	0.241
	(0.168)	(0.392)	(0.516)	(0.280)	(0.334)	(0.306)	(0.157)
ECONFREE	0.902**	1.092***	0.868**	1.081***	0.981**	0.982**	0.890**
	(0.018)	(0.004)	(0.022)	(0.004)	(0.035)	(0.036)	(0.023)
CAPLCONS	-0.462***	-0.297***	-0.442***	-0.384***	-0.508***	-0.509***	-0.467***
	(0.001)	(0.028)	(0.001)	(0.004)	(0.000)	(0.000)	(0.001)
EXCHG	-0.253	-0.253	-0.167	-0.255	-0.177	-0.176	-0.240
	(0.391)	(0.363)	(0.551)	(0.356)	(0.595)	(0.582)	(0.412)
SSDUMMY	0.020	0.035	0.077	0.015	0.046	0.046	0.021
	(0.745)	(0.559)	(0.178)	(0.796)	(0.528)	(0.508)	(0.725)
TURNOVER		1.628***					
		(0.002)					
TRADINGVOL_1			0.183***				
			(0.000)				
TRADINGVOL_2				1.592***			
				(0.006)			
PRIIMPACT_1					-0.233**		
					(0.049)		
PRIIMPACT_2						-0.244**	
						(0.026)	
PRIIMPACT_3							-0.152
							(0.153)
Number of Observation	933	932	933	933	726	726	933
Adj. R^2	0.6570	0.6604	0.6674	0.6605	0.6483	0.6484	0.657

Table VI. Panel B. Full Sample - FE 2SLS estimation

	U.S. Equity Flows						
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
$EQUITYFLOWS_{t-1}$	0.372***	0.368***	0.353***	0.368***	0.413***	0.413***	0.371***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$EQUITYFLOWS_{t-2}$	0.164***	0.164***	0.154***	0.165***	0.127***	0.127***	0.163***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)	(0.000)
$EQUITYFLOWS_{t-3}$	0.048	0.047	0.048	0.047	0.058	0.058	0.049
	(0.141)	(0.148)	(0.137)	(0.149)	(0.116)	(0.116)	(0.135)
SIZE	0.588***	0.558***	0.312***	0.457***	0.495***	0.494***	0.571***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$EXCESSRET_{t-1}$	0.270	0.182	0.119	0.204	0.262	0.261	0.273
	(0.136)	(0.317)	(0.510)	(0.260)	(0.286)	(0.287)	(0.131)
ECONFREE	0.902**	1.076**	0.889**	1.079**	0.957**	0.958**	0.909**
	(0.038)	(0.014)	(0.038)	(0.013)	(0.050)	(0.050)	0.037)
CAPLCONS	-0.458***	-0.292**	-0.447***	-0.381***	-0.504***	-0.505***	-0.465***
	(0.000)	(0.026)	(0.000)	(0.002)	(0.001)	(0.001)	(0.000)
EXCHG	-0.283	-0.279	-0.177	-0.281	-0.198	-0.198	-0.264
	(0.386)	(0.389)	(0.581)	(0.386)	(0.587)	(0.587)	(0.419)
SSDUMMY	0.026	0.041	0.087	0.023	0.054	0.054	0.029
	(0.637)	(0.460)	(0.122)	(0.687)	(0.377)	(0.373)	(0.607)
TURNOVER		1.730***					
		(0.001)					
TRADINGVOL_1			0.196***				
			(0.000)				
TRADINGVOL_2				1.661***			
				(0.001)			
PRIIMPACT_1					-0.234		
					(0.178)		
PRIIMPACT_2						-0.245	
						(0.151)	
PRIIMPACT_3							-0.202
							(0.250)
Number of Observation	897	896	897	897	699	699	897
Adj. R^2	0.473	0.478	0.4917	0.4795	0.4918	0.492	0.4738

VI. Conclusion and Contributions

We utilize a time series-cross sectional data framework to examine the impacts of various macro factors, especially liquidity, on U.S. equity inflows into emerging markets. Since liquidity has many dimensions, an emphasis is placed on employing various measures of liquidity. To investigate this issue, we perform both static and dynamic analyses, as well as short and long-horizon regressions. Our study contributes by including a more comprehensive set of macro factors and by examining the role of liquidity in greater details.

We find the importance of macro factors such as market size, past excess return of local stock market, country economic freedom, capital control, the change of exchange rate, and trading restriction in determining U.S. equity inflows into emerging markets. Empirical evidence indicates that emerging country's equity market size is a highly significant and most important determinant of U.S. equity inflows. To the extent that market size proxies for liquidity, this supports liquidity as an important concern to investors. Capital control and country's economic freedom appear in most cases to be significant and their coefficients are negative and positive, respectively. A few exceptions where we have positive signs for Capital control are the regressions for Europe, Africa, and Middle East sample. Some puzzling results on the effects of economic freedom are present in Asia sample. The past local market excess return has a negative effect on equity inflows, suggesting a contrarian strategy by some investors.

The evidence regarding liquidity in general supports our hypotheses that liquidity attracts equity flows. The effect of trading frequency measured by turnover on U.S. equity flows is positive and consistent across regions. The significant and direct relation between dollar trading volume and equity flows implies that U.S. investors prefer to purchase more equities in more liquid and active emerging markets, with a varying magnitude of the effect across regions. For example in the Asian region, the relation between equity flows and volume-related liquidity is weak while that between flows and price impacts of trading is quite strong. This reinforces the notion that there are multiple dimensions in liquidity.

Lagged liquidity also has significant impact on equity flows, but the coefficients for lagged liquidity are smaller than those for contemporaneous liquidity. Evidence on price impact also largely supports our hypothesis: larger price pressure per dollar of trading leads to less purchase of foreign equities by U.S. investors. With some exceptions, the relation is statistically significant. Moreover, after controlling for the lagged equity flows, the coefficients on most liquidity measures continue to be statistically significant with the sign as expected.

Summing up, the evidence indicates, though not overwhelmingly, U.S. equity flows tend to be greater for larger, deeper, and active emerging markets, for markets where total value traded and trading frequency are greater, and for markets where price impact is lower. The results from the coefficient estimation of liquidity point to the importance of liquidity measurements, arguably more so for emerging markets where the level of liquidity is generally low.

Another issue is addressed by this research is if the impacts of the macro factors, especially liquidity, on U.S. equity flows differs across time horizons. The long-horizon result is most clear: all explanatory variables used in this study play a significant role in explaining the U.S. long-horizon equity inflows into sample emerging markets. Short-term (one-month) effects of some explanatory variables in equity flows persist over the long horizon, though the magnitude of the effects is less the longer the time horizon. The evidence is statistically significant for the full sample and Latin American but not the other two regions.

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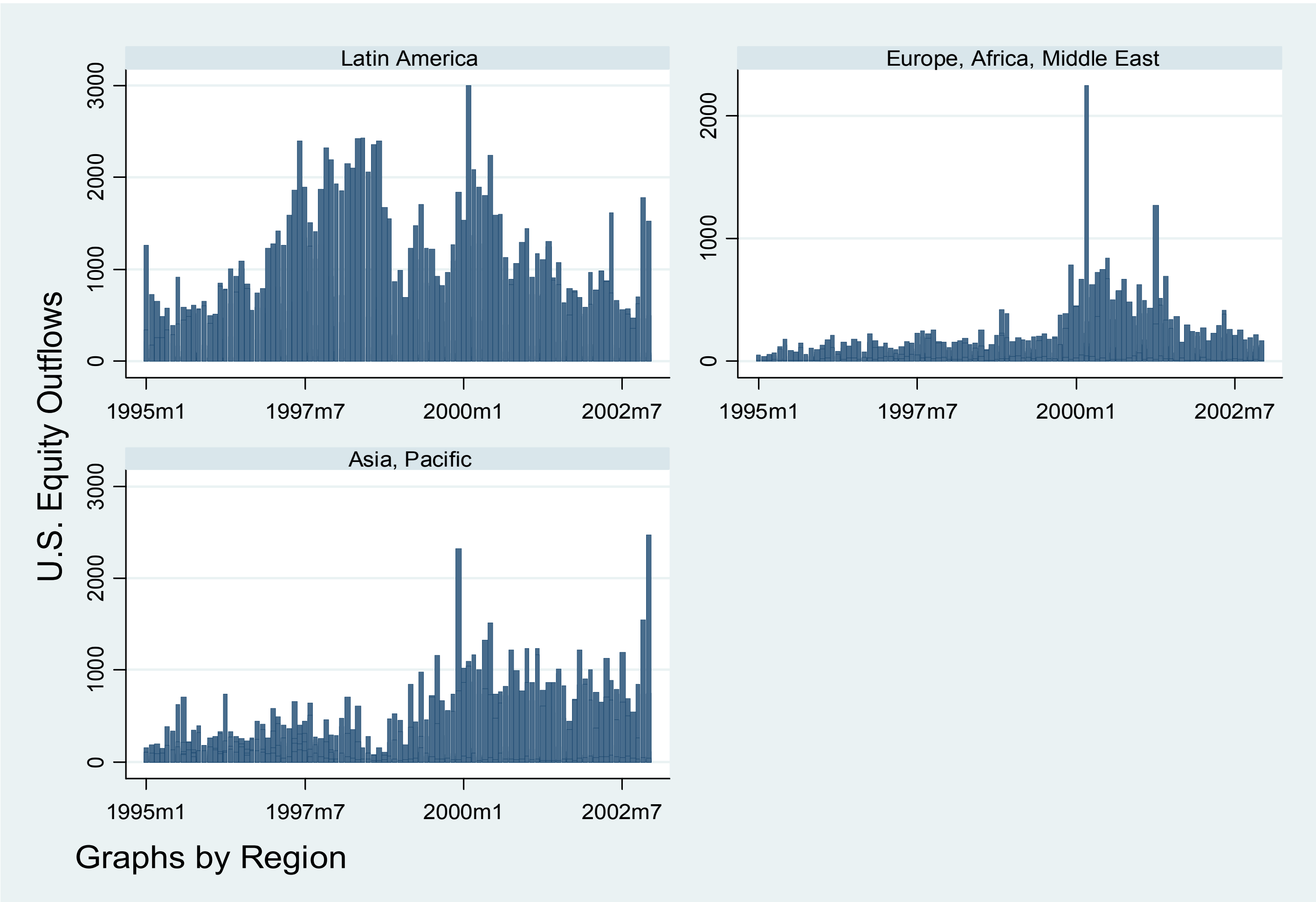
Figure 1
Monthly Foreign Equities (millions of USD) Purchased by U.S. Investors
(Jan. 1995 – Dec. 2002)

<u>Graphs by Country</u>

Sources: Data sources are reported in Table A1 of Appendix.

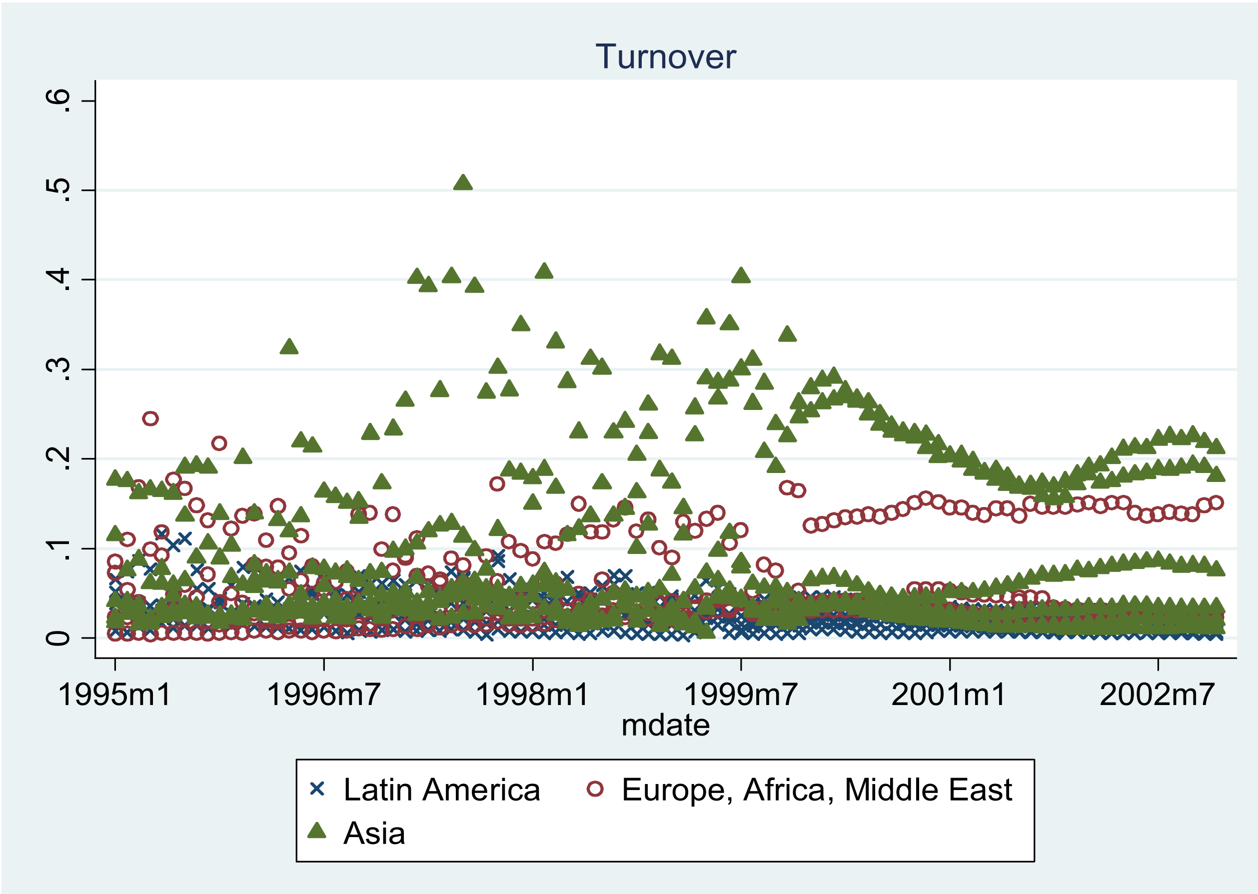
Figure 2
Monthly Foreign Equities (millions of USD) Purchased by U.S. Investors
Jan. 1995 – Dec. 2002

Graphs by Region



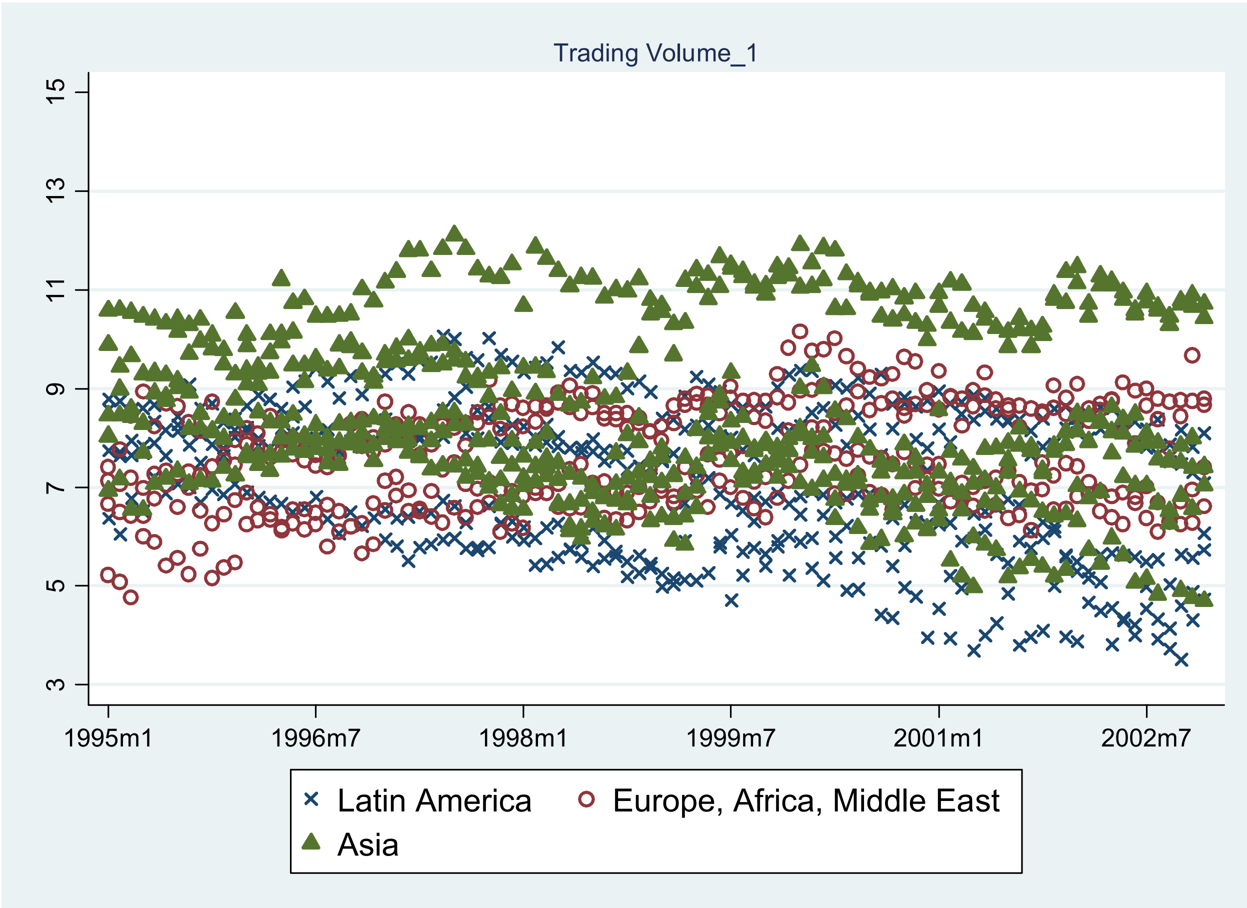
Sources: Data sources are reported in Table A1 of Appendix.

Figure 3
Monthly Foreign Market Turnover (Jan. 1995 – Dec. 2002)



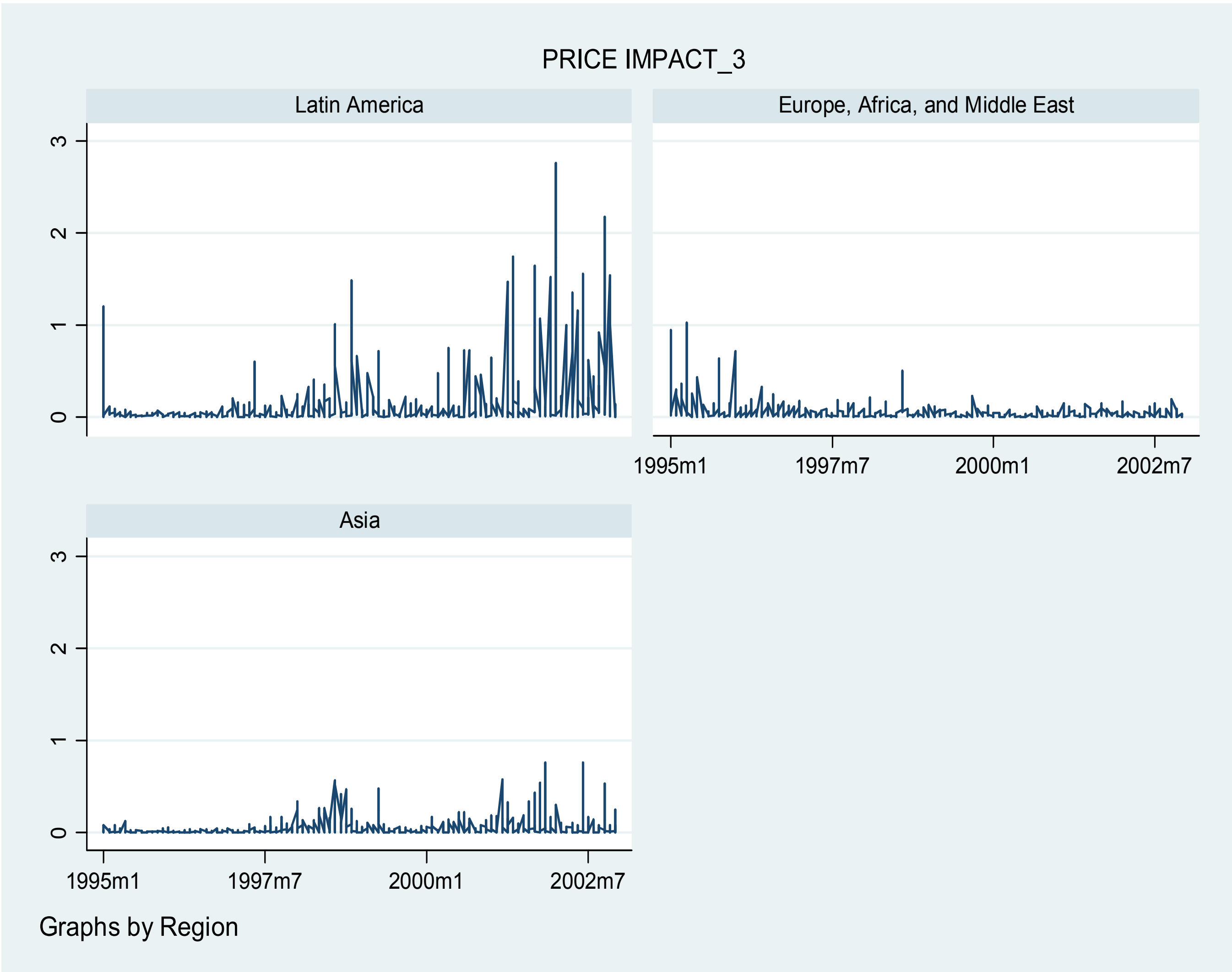
Sources: Data sources are reported in Table A1 of Appendix. And see the text for details.

Figure 4
Monthly Foreign Market Trading Volume (Jan. 1995 – Dec. 2002)



Sources: Data sources are reported in Table A1 of Appendix. And see the text for details.

Figure 5
Monthly Foreign Market Price Impact (Jan. 1995 – Dec. 2002)



Sources: Data sources are reported in Table A1 of Appendix. And see the text for details.

Appendix

Table AI. Data Sources

Variable	Data Description	Data Source
U.S. Equity Flows	Gross purchases of foreign stocks from foreign country by the U.S. investors	Department of the Treasury – the U.S. Treasury International Capital TIC Reporting System
Market Size	Market Capitalization	World Federation of Exchanges
Stock Market Return	Emerging country stock market price index	World Federation of Exchanges
U.S. Market Return	Value-weighted return on NYSE/AMEX/NASDAQ	WRDS Database
GDP	Gross Domestic Product	International Monetary Fund
Economic Freedom[38]	Index of Economic Freedom World Rankings	The Heritage Foundation website and The Wall Street Journal
Capital Control	The intensity of capital controls or changes in foreign ownership restriction	Edison and Warnock (2003b)
Exchange Rate	Country's exchange rate relative to the U.S. dollar	World Federation of Exchanges
Short-selling restriction	Whether short selling is practiced in emerging markets: a dummy = 1 if short-selling is practiced, 0 otherwise	Bris, Goetzmann, and Zhu (2007) The original resource is the International Securities Services Association Handbook
Market Turnover	The ratio of the value of shares traded to the value of shares outstanding	World Federation of Exchanges
Trading Volume	Value of share traded	World Federation of Exchanges
IFCG Price Index	International Finance Corporation's Global Price Index	Standard & Poor's
IFCI Price Index	International Finance Corporation's Investable Price Index	Standard & Poor's

[38] The ten components of economic freedom are: Business Freedom, Trade Freedom, Fiscal Freedom, Government Size, Monetary Freedom, Investment Freedom, Financial Freedom, Property rights, Freedom from Corruption, and Labor Freedom. Some factors are based on historical information.

Appendix

Table AII. Local Stock Markets of Fifteen Emerging Countries

Country	Exchange
Latin America	
Argentina	Buenos Aires SE
Peru	Lima SE
Mexico	Mexican Exchange
Chile	Santiago SE
Brazil	Sao Paulo SE and Rio de Janeiro
Europe, Africa, Middle East	
Turkey	Istanbul SE
South Africa	Johannesburg - JSE
Israel	Tel Aviv SE
Poland	Warsaw SE
Asia	
Malaysia	Kuala Lumpur and Bursa Malaysia
Indonesia	Jakarta and Indonesai SE
Korea South	Korea Exchange
Philippines	Philippine SE
Taiwan	Taiwan SE Corp
Thailand	Thailand SE

Sources: World Federation of Exchange

Chapter Three:
Liquidity Risk Premium Puzzle and Possible Explanations

I. Introduction

The literature on liquidity indicates that liquidity and its volatility play an important role in trading and asset pricing. This study concentrates on one surprising and puzzling empirical finding by Chordia, Subrahmanyam, and Anshuman (2001b) that indicates a significantly negative relation between return and volatility of trading activity, where trading activity is measured by both dollar trading volume and share turnover. If the volatility of trading activity is a suitable measure of liquidity risk, their finding contradicts the risk-return tradeoff principle. Hereinafter, we will refer to their finding as 'negative liquidity risk premium' or 'liquidity risk puzzle'. In this study, we attempt to resolve the puzzle by testing the return and liquidity risk relation using alternative liquidity measures and by incorporating potential factors that might affect the relation into the analysis.

Liquidity typically refers to the ease of buying and selling at the fair price. This definition is evidently imprecise and recent studies suggest that there are several dimension of liquidity. The first part of our analysis concentrates on the measurement problem. Because liquidity has many dimensions, it is plausible that Chordia et al. (2001b)'s finding is the result of using an inappropriate proxy for liquidity risk. Indeed, Johnson (2008) argues that volume represents liquidity risk, rather than the level of liquidity. Therefore, it is potentially useful to use alternative liquidity measures.

Moreover, liquidity risk premium varies over time and their study does not control for that. Using arguments of market imperfections and behavioral finance, it is potentially useful to compare the liquidity risk premium under normal conditions and under extreme down markets. As an example, it is plausible that during extreme down markets, investors might act erratically and pursue risky trades in the hope of turning a loss into a gain (Prospect Theory). If so, empirically we would not be surprised to simultaneously observe low returns and high liquidity volatility. To further test whether the puzzle exists only in limited circumstances, we analyze the role of firm size and investor sentiment in the relation between returns and liquidity risk. Arguably, small stocks and stocks subject to greater sentiment are more vulnerable to liquidity risk and/or panic selling. If so, the relation between return and liquidity volatility is likely to be stronger and positive for these stocks.

The remainder of the paper is organized as follows. Section II discusses the most related research and their implications. Section III describes the methodology and data. Empirical results using alternative liquidity measures are discussed in Section IV. We find that with the use of alternative liquidity measures, a negative liquidity risk premium is no longer evident, but the results vary across time periods and are not conclusive. Consequently, in Section V we explore potential factors that might influence the return-liquidity risk relationship, including market conditions, firm size effect, and investor sentiments. Our concluding remarks are given in Section VI.

II. Related Literature

While our focus is on the volatility of liquidity, for the sake of completeness we begin with a review of studies that examine the relation between return and liquidity; this is followed by surveying the literature on liquidity volatility and a discussion of alternative measurements of liquidity; finally, several factors that might explain the liquidity risk puzzle are presented.

II. A. Liquidity and Return

The seminal paper by Amihud and Mendelson (1986) show that bid-ask spreads and returns are positively related. This is sensible in that the bid-ask spread represents a transaction cost, thus investors demand higher return as a compensation for the cost. Brennan, Chordia, and Subrahmanyam (1998) document a negative relation between average returns and dollar trading volume, with the latter being used as a proxy for liquidity. According to Amihud (2002), liquidity also predicts future returns and liquidity shocks are positively correlated with return shocks.

More recent empirical work indicates a systematic, market-wide component of liquidity (Chordia, Roll, and Subrahmanyam (2000) and Huberman and Halka (2001)). Securities whose returns positively correlated with market liquidity should have high expected returns (Pastor and Stambaugh (2003) and Sadka (2006)). Moreover, Chordia, Roll, and Subrahmanyam (2001a) show that recent market volatility results in a decrease in trading activity and spreads. There are strong day- of-the-week effects; Fridays accompany a significant decrease in trading activity and liquidity, while Tuesdays display the opposite pattern. Long- and short-term interest rates influence liquidity. Trading activity increases just prior to major macroeconomic announcements.

Further, Hameed, Kang, and Viswanathan (2007) find that negative lagged market return worsens stock liquidity, after controlling for the firm specific factors and market volatility effects. The theoretical modes in Gromb and Vayanos (2002) and Brunnermeier and Pederson (2007) suggest that the reduction in liquidity following a down market would be dominant in high volatility stocks.

II. B. Volatility of Liquidity

The previous section concentrates the level of liquidity; here we focus on papers that examine the volatility of liquidity (second moment). Surprisingly, a well-known study by Chordia et al. (2001b) provides evidence on a negative, economically significant, and strong relation between average returns and the variability of trading activity--measured by both dollar trading volume and share turnover, after controlling for the well-known size, book-to-market ratio, and momentum effects, as well as the price level and dividend yield. This finding of a negative liquidity risk premium is contrary to the principle of risk-return tradeoff.

Interestingly, a recent study by Johnson (2008) theoretically argues that volume is positively related to the variance of liquidity or liquidity risk. Stated differently, volume represents liquidity risk, rather than the level of liquidity. The intuition is that trading in any typical day comes from a small subset of the investor population, thus volume does not adequately capture the level of liquidity. He performs some test of his theory using Government bond data as well as the stock market data. He finds some empirical evidence supportive of his theoretical prediction. That is, he finds that volume[39] is a good measure of liquidity risk and that volume is not correlated with proxies for liquidity level. If his theory is true, it implies that Chordia et al. (2001b)'s puzzling finding may be due to the usage of an inappropriate measure of liquidity risk.

[39] In constructing empirical proxies for market volume, Johnson (2008) points out that since both expected volume and the total quantity of securities are not constant, and volume is not i.i.d, he scales volume by supply to obtain his independent variable, turnover, in the model.

Chordia et al. (2001a)[40] document that daily changes in market averages of liquidity and trading activity are highly volatile and negatively serially dependent. They also find that liquidity plummets in down markets. Watanabe and Watanabe (2007) develop a dynamic theoretical model in which investors are not equally informed about others' liquidity preference. They use trading volume as proxy for the uncertainty about investors' liquidity preference. Extreme high volume indicates that the market is transforming from a low-liquidity-beta period to a high-liquidity-beta period. Empirically, they find evidence that high-liquidity-beta occurs rather infrequently and is characterized by high volatility. They further point out that liquidity risk is priced because illiquidity shocks make investor consumptions volatile and risk-averse investors dislike volatile consumptions; the more volatile their consumptions become, the more risk premium they will require. These studies justify the need to carefully examine extreme down markets.

Moreover, we argue that even in extreme down markets, there will be a minimum level of liquidity trading or a 'floor' of liquidity. The existence of a minimum level of liquidity trading implies that the value of liquidity should behave like that of option. As such, the higher the volatility of liquidity, the higher the value of option. This argument plus above-mentioned studies justify the potential usefulness to compare down and up markets.

II. C. Liquidity Measures

The theoretical model of Kyle (1985) indicates that liquidity is a broad concept, thus not easily measured by one variable. That is, liquidity has more than one dimension[41], including trading costs, trading intensity, and price impacts. In particular Korajczyk and Sadka (2008) use a combination of different liquidity measures and conclude that it is more informative than a single liquidity measure. In other words, liquidity cannot be measured by one variable alone.

There are quite a few alternative liquidity measures. Bekaert, Harvey, and Lundblad (2003) use a transformation of the proportion of zero daily firm returns, averaged over the month, as a measure of liquidity. Their liquidity measures significantly predict future returns,

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[40] In their study, the measures of the level of liquidity involves Quoted Spread, % Quoted Spread, Effective Spread, % Effective Spread, Depth, $Depth, and Composite Liquidity (% Quoted Spread/$Depth), and Number Trades.

[41] Kyle (1985) proposes that in a continuous auction equilibrium, market liquidity is a slippery and elusive concept, partly because it encompasses a number of transactional properties of markets, such as tightness (the cost of turning around a position over a short period of time), depth (the size of an order flow innovation required to change prices a given amount), and resiliency (the speed with which prices recover from a random, uninformative shock).

whereas alternative measures such as turnover do not. Amihud (2002) proposes a price impact measure, defined as the absolute value of stock returns scaled by dollar volume. The measure of stock illiquidity is the daily ratio of absolute stock return to its dollar volume, averaged over some period. It can be interpreted as the average price response associated with one dollar of trading volume, thus serving as a rough measure of price impact. Jun, Marathe, and Shawky (2003) analyze some emerging market stocks and use the turnover ratio as a proxy for liquidity. Interestingly, they find a positive relation between returns and market turnover, a finding that is also inconsistent with risk and return tradeoff. Brennan and Subrahmanyam (1996) use price impact, which is the price response to signed order flow (order size), and the fixed cost of trading to measure stock illiquidity, and find that these measures of illiquidity positively affect stock returns. Datar, Naik, and Radcliffe (1998) employ the turnover rate as a proxy for liquidity on monthly return data for NYSE stocks over the period 1962 to 1991. Chalmers and Kadlec (1998) measure liquidity by using the amortized effective spread[42] and document that liquidity positively affects stock returns. Chordia et al. (2001b) use both dollar trading volume and stock turnover to measure liquidity.

In sum, these studies imply two important points. First, the use of different liquidity measures sometimes produces conflicting results. Second, liquidity has many dimensions: trading costs, trading intensity, and the impact of trading on prices (price impacts).

II. D. Behavioral Finance Arguments as Possible Explanations for the Puzzle

During past several decades, a considerable number of studies have introduced investor psychology to explain stock price movements and some empirical puzzles[43]. Here we concentrate on the studies related to sentiment and the Prospect Theory developed by Kahneman and Tversky (1979). Under the Prospect theory, agents' attitudes differ across the positive and negative domains of the utility function such that individual investors are risk-seeking over losses and risk-averse over gains. Also under the theory, investors with loss aversion preference react more strongly to losses than they do to gains, and therefore more losers cause more trading.

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[42] The effective spread the absolute difference between the mid-point of the quoted bid-ask spread and the transaction price that follows, classified as being a buy or sell transaction, and then divided by the stock's holding period, obtained from the turnover rate on the stock, to obtain the amortized spread. In other words, amortized spread is spread adjusted by the holding period.

[43] Prast (2004) summarizes such puzzles as stock price under- and overreactions, excessive trading and the gender puzzle, financial hypes and panic, the equity premium puzzle, the winner or loser puzzle, and the dividend puzzle.

Another strand of behavioral finance considers the role of sentiment. Generally, studies on sentiment suggest that sentiment-driven trading increases market liquidity. For example, Liu (2006) and Kurov (2008) provide empirical evidence that the stock market is more liquid when investor sentiment is higher. In other related work, Fisher and Statman (2000) and Baker and Wurgler (2006) recognize that investor sentiment may be an important component of the market pricing process. Some theoretical studies posit that investor behavior is correlated with asset pricing. Barberis, Schleifer, and Vishny (1998) and Daniel, Hirshleifer, and Subrahmanyam (1998)'s theoretical models of stock returns allow for optimistic expectations. When investors overestimate growth prospects, stocks are overvalued. As optimistic expectations are not fulfilled, the returns of these stocks will be low. In another theoretical study by De long, Shleifer, Summers, and Waldmann (1990), investor sentiment is defined as the irrational expectations that noise traders have about the future stock price. The demand of noise traders for stocks is driven by their sentiment, and the higher investor sentiment, the greater the amount of noise trading and liquidity.

Consistent with the findings above, Graham, Harvey and Huang (2004) point out that individual investor overconfidence can explain why investors trade more frequently and hold more internationally diversified portfolios. Campbell and Kraussl (2006) show that the level of risk aversion depends crucially on the confidence level associated with the investor downside risk constraint: the more safety the investor requires, the higher the confidence level associated with the downside risk constraint and the less tolerant the investor is to risk.

III. Methodology and Data

III. A. A Model for the Relation between Excess Return and Liquidity Risk

Following Chordia et al (2001b), the excess return is computed as $r_{i,t}^{*} = r_{i,t} - RF_t \quad (1)$,

where $r_{\mathrm{i,t}}$ is the return on each stock i in month t and RF_t is the return on the riskless asset. Alternatively, the excess return $r_{i,t}^{*}$ can be calculated as the following based on Fama and French (1993) model.

$$r_{i,t} - RF_t = \alpha_i + \beta_{i,MKT} MKT + \beta_{i,SMB} SMB + \beta_{i,HML} HML + \varepsilon_i \qquad (1')^{44}$$

The independent variables include market risk premium *MKT* = *RM* - *RF*, the size premium *SMB*, and the book-to-market premium *HML*, in month *t*. $\beta_{i,k}$ is the *k*th factor loading, β_{MKT}, β_{SMB}, and β_{HML}, for each stock *i*; The factor loadings are estimated from month $t - 60$ to month $t - 2$.

Following Chordia et al. (2001b), the excess returns are used as the dependent variable in the following regression:

$$r^*_{i,t} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + e_{i,t} \qquad (2)$$

where

- $r^*_{i,t}$ is the excess return, or the raw return less the risk-free rate, on stock *i* in month *t*
- c_0 is the intercept term for the regression; c_m is the coefficients on characteristic *m*
- $e_{i,t}$ is a random error term.
- $Z_{m,i,t}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables.

SIZE – the natural logarithm of the market value of the equity of the firm at month $t - 2$;

BM – the natural logarithm of the ratio of the book value of equity plus deferred taxes to the market value of equity, using the previous year data as in Fama and French (1992);

PRICE – the natural logarithm of the reciprocal of the share price at month $t - 2$;

YLD – the dividend yield as measured by the sum of all dividends paid over the previous 12 months, divided by the share price at moth $t - 2$;

MOMENTUM:

- *RET 2-3* – the cumulative return over the two months ending at the beginning of the previous month, which can be written as $(1 + r_{t-2})(1 + r_{t-3}) - 1$
- *RET 4-6* – the cumulative return over the three months ending 3 months previously, which can be written as $\prod_{h=4}^{6} (1 + r_{t-h}) - 1$

[44] In Chordia et al. (2001b), the alternative methods used to compute the excess return give similar results. Therefore, we only use Equation (1) to compute the excess return.

- *RET 7-12* – the cumulative return over the six months ending 6 months previously, which can be written as $\prod_{h=7}^{12}(1+r_{t-h})-1$

- ***LIQUID*** – the natural logarithm of the alternative measures of liquidity for stock *i* during month *t* – 2; β_1 is the coefficient on *LIQUID*. As argued earlier, it is potentially useful to capture liquidity using alternative measures. To verify their results, our first two liquidity measures are the same as those of Chordia et al (2001b), followed by alternative measures of liquidity.

- *LIQ*_1: Dollar Trading Volume which is calculated by stock price times shares traded

- *LIQ*_2: Turnover or the ratio of trading volume over shares outstanding:

$$TURNOVER_{i,t} = \frac{TVS_{i,t}}{NSO_{i,t}}$$

where $TVS_{i,t}$ is the trading volume in shares of stock *i* at month *t* and $NSO_{i,t}$ is the number of shares outstanding of stock *i* at month *t*. A variation of this is given in Johnson (2008), which calculate turnover by taking the ratio of dollar volume to the average of beginning-of-month and end-of-month capitalization. A stock with a higher (lower) turnover rate indicates that investors tend to hold the stock over a shorter (longer) time horizon, therefore the stock is considered as more (less) liquid. As documented by Amihud and mendelson (1986), illiquid assets would be held by investors over a longer time horizon.

- *LIQ*_3: Share Trading Volume or the number of shares traded

- *LIQ*_4: Amivest Ratio, used by Cooper, Goth, and Avera (1985), Amihud, Mendelson, and Lauterbach (1997), and Berkman and Elsewarapu (1998), is computed as the ratio of the sum of the daily volume to the sum of the daily absolute return. The larger the number, the smaller the price changes relative to trading volume, thus the more liquid the market.

$$\text{A}mivest_{i,t} = \frac{\sum_{d=1}^{D_{i,t}} DVOL_{i,d,t}}{\sum_{d=1}^{D_{i,t}} \left|r_{i,d,t}\right|}$$

- *LIQ*_5: Amihud Illiquidity Ratio or price impact which is the absolute value of price percentage change over dollar trading volume (it is roughly the inverse of Amivest ratio).

This measure follows Amihud (2002)[45] and is based on the idea that illiquidity is the relationship between the price change and the associated order flow or trading volume (or the response of price to order flow). The computation of the illiquidity ratio for individual stocks can be described as the ratio of the daily absolute return to the dollar trading volume on that day, averaged over one month:

$$\mathrm{ILL}_{i,t} = \left(\frac{1}{D_{i,t}}\right)\sum_{d=1}^{D_{i,t}} \frac{|r_{i,d,t}|}{DVOL_{i,d,t}}$$

where $r_{i,d,t}$ is the return on stock i on day d in month t and $DVOL_{i,d,t}$ is the corresponding daily dollar trading volume on day d. $D_{i,t}$ is the number of daily observations during month t for stock i. The ratio gives the absolute price change per dollar of monthly trading volume, or the monthly price impact of the order flow. The larger the number, the larger the price impact of trading and the less liquid the market.

- ***LIQ_VOLATILITY*** – Following Chordia et al. (2001b), we use the coefficient of variations in liquidity as the measure of liquidity risk. More specifically:
- *CV_LIQ*: The natural logarithm of the coefficient of variation (ratio of standard deviation to the mean) of each measure of liquidity calculated over month t – 37 to t – 2.[46]

III. B. Data

III. B. 1. Data Selection

The data covers common stocks[47] (CRSP share code = 10 and 11) traded in NYSE and AMEX during January 1975 and December 2008. Data on book-to-market ratio is obtained from

[45] He finds that over time excess returns are an increasing function of expected illiquidity of the stock market.

[46] We also perform the same analysis using the standard deviation of liquidity. There are however several reasons why the coefficient of variation might be appropriate. First, the coefficient of variation of liquidity incorporates the standard deviation and the level of liquidity concurrently and relatively. Second, we find that liquidity measures are highly correlated with their standard deviations but not with their coefficients of variations; thus, the use of the coefficient of variation is likely subject to a lower degree of multi-collinearity problem. Moreover, since the metrics of alternative liquidity measures are different, the use of standard deviation makes comparisons across different measures less straightforward.

[47] The following securities were not included in the sample since their trading characteristics might differ from ordinary equities: ADRs, shares of beneficial interest, units, companies incorporated outside the U.S., Americus Trust components, closed-end funds, preferred stocks and REITs.

COMPUSTAT. A stock included in the sample for a given month has to satisfy the following criteria: individual stock's return in the current month, *t*, and in 24 of the previous 60 months has to be available from CRSP; sufficient data has to be available to calculate the size, price, and dividend yield as of month $t - 2$, as well as the different measures of liquidity over the previous 36 months; sufficient data has to be available on the COMPUSTAT tapes to calculate the book to market ratio as of December of the previous year; book-to-market ratios are winsorized at 0.995 and 0.005 fractiles; stocks with prices below $5 and above $1,000 in any given month are excluded for that month. Our total number of firm-month observations is 415,403 and our sample includes an average of 1660 stocks each month. Comparing with the sample employed in Chordia et al. (2001), we extend ours to the recent data on stocks and analyze a longer period of time period than that in their paper.

The variables employed in the time-series and cross-sectional regression involve stock's raw return, one-month T-bill rate, firm size, book-to-market ratio, the reciprocal of the share price, the dividend yield, the lagged return variables for momentum effects, alternative liquidity measures, and the coefficient of variation of liquidity measures.

III. B. 2. Descriptive Statistics

Table I provides summary descriptive statistics of monthly unlogged stock characteristics and various liquidity proxies and their volatility used in this study. It also shows that our sample characteristics are similar to those typically found in the literature. The variables display considerable skewness. Following Chordia et al. (2001b), we take the logarithms of all firm characteristic variables except dividend yield and three momentum variables. Moreover, the transformed variables used for all of the regressions in our analysis are the deviations from the cross-sectional means for a given month.

With regard to liquidity measures, the mean of dollar trading volume is about $339.6 million and the median is much lower ($20.8 million). This indicates that its distribution is skewed to the right. The pattern that median is lower than mean is also shown in other liquidity measures. Additionally, the distributions of share trading volume and Amivest illiquidity measures exhibit extreme values: while the mean of shares traded is 8.76 million, its median is only 0.009 million, suggesting that for 1 percent change in price, the median dollar trading volume was about $9,000 during our sample period. Figure I shows that the liquidity measures vary over time. In particular, the graph (1) indicates a rising trend in dollar trading volume, turnover, and share trading volume during the past two decades. We also observe a clear decline around 1988, immediately after the 1987 crash of stock markets.

Table II reports the cross-sectional correlations between excess return and various transformed characteristics variables that we use in the regression. It is not surprising that *SIZE* is highly correlated with *LIQ*_1 or dollar trading volume and its standard deviation. The Amihud measure *LIQ*_5 is negatively correlated (-0.87) with firm size, indicating that a given amount of dollar trading volume could lead to a large price movement for a small stock with a high Amihud measure. All liquidity measures are highly correlated with their standard deviations but not with their coefficients of variation. As a comparison among the different liquidity measures, Amivest has the highest coefficient of variation (1.86) and Turnover has the lowest variation (0.51) during the sample period.

Not surprisingly, most liquidity measures are related to each other over the sample period. Turnover is negatively correlated (-0.71) with Amihud illiquidity ratio; this makes sense since trading is likely to have larger price impacts on infrequently traded stocks (due to low market depth or greater information asymmetry).

Table I. Descriptive Statistics

This table provides summary descriptive statistics of monthly unlogged stock characteristics and various liquidity proxies and their volatility. The data covers common stocks (CRSP share code = 10 and 11) traded in NYSE and AMEX during January 1975 through December 2008. Data on book-to-market ratio is obtained from COMPUSTAT. A stock included in the sample for a given month has to satisfy the following criteria: individual stock's return in the current month, t, and in 24 of the previous 60 months has to be available from CRSP; sufficient data has to be available to calculate the size, price, and dividend yield as of month $t-2$, as well as the different measures of liquidity over the previous 36 months; sufficient data has to be available on the COMPUSTAT tapes to calculate the book to market ratio as of December of the previous year; book-to-market ratios are winsorized at 0.995 and 0.005 fractiles; stocks with prices below \$5 and above \$1,000 in any given month are excluded for that month. The total number of firm-month observations is 415,403 and our sample includes an average of 1660 stocks each month.

	Mean	**Median**	**Std Dev**
SIZE ($ billions)	3.78	0.51	15.8
BM	0.85	0.73	0.54
Price ($)	30.09	24.5	28.4
Yield (%)	3.25	2.25	9.1
Ret2_3 (%)	3.23	2.35	14.9
Ret4_6 (%)	4.78	3.51	18.2
Ret7_12 (%)	9.38	6.67	26.80
Dollar Trading Volume ($ millions)	339.6	20.8	1430
Standard Deviation ($ millions)	115.6	13.4	404.3
Coefficient of Variation	0.60	0.54	0.29
Turnover*100	6.89	4.16	9.45
Standard Deviation *100	2.83	1.97	3.04
Coefficient of Variation	0.51	0.46	0.24
Share Trading Volume (millions)	8.76	0.009	40.7
Standard Deviation (millions)	2.8	0.005	10.3
Coefficient of Variation	0.54	0.49	0.24
Amivest Liquidity (billions)	86.6	0.004	27200
Standard Deviation (billions)	817	0.04	38200
Coefficient of Variation	1.86	1.61	0.89
Amihud (2002) Illiquidity*10^{-6}	6.18	0.06	91.3
Standard Deviation *10^{-6}	4.23	0.04	34.6
Coefficient of Variation	0.70	0.61	0.37

Table II Correlation between Excess Return and Explanatory Variables

The table presents the cross-sectional correlations between *EXCESS RET* and the transformed variables that we use in the regression. *EXCESS RET* is the excess monthly return from January 1975 through December 2008. *SIZE* is the logarithm of the market capitalization of firms in billions of dollars. *BM* is the logarithm of the book-to-market ratio. *PRICE* is the logarithm of the share price reciprocal. *YIELD* is the dividend yield. *RET*2_3, *RET*4_6, and *RET*7_12 denote the cumulative returns over month $t-3$ to $t-2$, $t-6$ to $t-4$, and $t-12$ to $t-7$, respectively. *LIQ*_1 to *LIQ*_5 denote alternative liquidity measures: Dollar Trading Volume, Turnover, Share Trading Volume, Amivest Liquidity, and Amihud Illiquidity, respectively. *CV_LIQ*_1 to *CV_LIQ*_5 denote the coefficient of variation of alternative liquidity measures over month $t-37$ to $t-2$. *SD_LIQ*_1 to *SD_LIQ*_5 denote the standard deviation of alternative liquidity measures over month $t-37$ to $t-2$. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month.

	EXCESS RET	*SIZE*	*BM*	*PRICE*	*YIELD*	*RET2_3*	*RET4_6*	*RET7_12*	*LIQ_1*	*LIQ_2*	*LIQ_3*	*LIQ_4*	*LIQ_5*
SIZE	0.043	1											
BM	-0.121	-0.575	1										
PRICE	-0.169	-0.464	0.477	1									
YIELD	0.014	-0.109	0.076	0.121	1								
RET2_3	-0.033	0.040	-0.134	-0.205	-0.031	1							
RET4_6	0.005	0.051	-0.155	-0.218	-0.028	-0.048	1						
RET7_12	0.005	0.078	-0.210	-0.264	-0.027	0.010	-0.022	1					
LIQ_1	0.035	0.886	-0.471	-0.390	-0.080	0.018	0.032	0.056	1				
SD_LIQ_1	-0.058	0.828	-0.394	-0.248	-0.033	-0.068	-0.047	-0.021	0.875				
CV_LIQ_1	0.004	-0.270	0.023	-0.022	0.022	0.063	0.111	0.198	-0.214				
LIQ_2	0.016	0.499	-0.214	-0.192	-0.023	-0.012	0.001	0.013	0.844	1			
SD_LIQ_2	-0.033	0.362	-0.152	-0.095	0.013	-0.039	-0.025	-0.009	0.561	0.629			
CV_LIQ_2	0.010	-0.358	0.146	0.117	0.064	0.023	0.030	0.049	-0.301	-0.148			
LIQ_3	-0.018	0.806	-0.352	-0.093	-0.047	-0.048	-0.037	-0.027	0.953	0.849	1		
SD_LIQ_3	-0.050	0.768	-0.318	-0.033	-0.023	-0.076	-0.073	-0.073	0.827	0.657	0.883		
CV_LIQ_3	0.001	-0.255	0.042	0.109	0.055	0.013	0.025	0.076	-0.221	-0.118	-0.203		
LIQ_4	-0.050	0.746	-0.390	-0.353	-0.075	0.037	0.033	0.047	0.784	0.602	0.732	1	
SD_LIQ_4	-0.043	0.668	-0.286	-0.188	-0.031	-0.066	-0.057	-0.056	0.691	0.518	0.685	0.578	
CV_LIQ_4	-0.009	0.155	-0.085	-0.074	-0.004	-0.015	-0.001	0.009	0.177	0.151	0.167	0.140	
LIQ_5	-0.013	-0.874	0.452	0.442	0.111	-0.039	-0.037	-0.053	-0.923	-0.714	-0.853	-0.783	1
SD_LIQ_5	0.056	-0.805	0.305	0.243	0.062	0.084	0.085	0.107	-0.802	-0.568	-0.787	-0.673	0.847
CV_LIQ_5	0.023	-0.220	0.011	0.022	0.019	0.031	0.051	0.107	-0.173	-0.069	-0.180	-0.172	0.213

IV. Empirical Relations between Returns and Liquidity Risk

The empirical results regarding the liquidity risk premium using alternative liquidity measures are reported in Table III.[48] The table contains five regression specifications from [1] to [5], each specification corresponding to a different measure of liquidity – dollar trading volume, turnover, share trading volume, Amivest ratio, and Amihud illiquidity ratio (which is close to the inverse of Amivest ratio), respectively. If all of them capture the true liquidity, the expected signs between excess returns and each of the liquidity measures are stated in parentheses as follows: dollar volume (-), turnover (-), share volume (-), Amivest ratio (-), and Amihud ratio (+). As for liquidity risk, we expect a positive relation between returns and liquidity risk, regardless of how liquidity is measured. However, to the extent that Johnson (2008) argument is correct that trading volume itself reflects liquidity volatility, then the expected sign between return and volatility of trading volume-based liquidity measures would be ambiguous. The volatility of liquidity is computed as the coefficient of variation of alternative liquidity measures over the month $t-37$ to $t-2$. The number of firm-month observations varies across regressions due to missing value and zero returns (i.e., zero price changes), because zero returns would render the Amivest ratio undefined. Except for the regression involving the Amivest ratio, the number of observations for a regression is roughly 300,000. The sample covers the period from 1975 to 2008.

We first discuss the results on the control variables then turn to our focus of the relation between returns and liquidity level and, especially, the relation between returns and the volatility of liquidity. The firm-characteristic control variables, dividend yield, and three momentum variables have consistent explanatory power for excess return across all regressions. The results imply that investors require higher excess return for small and value stocks and stocks at lower prices. With few exceptions, all regression specifications indicate a negative but insignificant relation between dividend yield and excess return. Regarding the results on past returns, the cumulative return over month t-2 and t-3 has a significantly negative impact on excess return across all regression specifications. Most coefficients on the cumulative return over month t-4 to t-6 have positive but insignificant sign. For all regressions, the cumulative return over month t-7

[48] To facilitate comparison with Chordia et al. (2001b), we perform regressions without liquidity risk, as they do. These results are given in Table A1 of the appendix.

to t-12 is positively and significantly related with excess return. It appears that prior 2 to 3 months winners have significantly lower expected return, whereas the prior 7 to 12 months winners have significantly high expected return. That implies that investors do not chase the near-term winner but chase the intermediate term winner during our analysis period. These results concerning the control variables are similar in all subsequent tables, so we will focus on the variables related to liquidity from this point on.

The coefficients of alternative liquidity measures are of the expected signs with the exception of regression [3], where share trading volume is used as the proxy for liquidity; moreover, all coefficients are significant with the exception of regressions [1], [2], and [3]. Recall that regressions [1] – [3] all involve trading-volume-based liquidity. Therefore, the results suggest that Johnson (2008) might be correct in suggesting that trading volume is an inappropriate metric for liquidity. Other than trading volume, these results are consistent with the notion that returns are greater the lower the liquidity, because investors require higher returns as a compensation for low liquidity.

Concerning our focus the relation between returns and liquidity volatility, we find strikingly different results using different liquidity measures. Using all three trading-volume-based liquidity volatility in regressions [1] to [3], we find a significantly negative coefficient of liquidity volatility. These are consistent with Chordia et al. (2001b) whose methodology corresponds to regressions [1] and [2], but inconsistent with a tradeoff between return and liquidity risk. The results further reinforce the idea that trading volume might not capture liquidity adequately. When we measure liquidity by the effects of trading on prices in regressions [4] and [5], we find a significantly positive relation between returns and liquidity risk. This is consistent with a significantly positive tradeoff between returns and liquidity risk and might resolve the liquidity risk premium puzzle.

It should be emphasized that our doubts concerning volume as an appropriate liquidity measure do not come solely on the arguments of Johnson (2008), they are also based on our empirical findings, namely 1) a negative relation between volume volatility and returns that contradicts tradeoff between risk and return and 2) a positive relation between price impact volatility and returns that is consistent with a tradeoff. Nevertheless, even if trading volume does not adequately capture liquidity, it is still difficult to explain a negative relation between return and the volatility of volume. A partial reconciliation of the differences in results using alternative liquidity measures is that price impact is arguably more important for at least the large traders. On the other hand, it can be argued that the amount of trading, aside from the theoretical argument that it might not capture liquidity, is not as important as the composition of volume; more specifically, traders might be more concerned about the where trading comes from—the more it comes from informed trading, the less a high trading volume is desirable. However, the above argument may explain an insignificant relation between returns and volume volatility, but does not explain a significant negative relation as we find here. Consequently, this argument only partially addresses the puzzle and we need to further explore potential factors that might help to resolve the liquidity risk puzzle. Before we turn to the analysis involving potential factors, some robustness checks are in order. Since we suspect, as argued earlier, that aversion to liquidity risk might depend on market conditions, a natural robustness test is to check whether results are sensitive to time period; this robustness check and others are presented next.

Table III. Regression of Excess Return on Liquidity, Liquidity Risk and Control Variables

The OLS estimate results are reported in this table which contains five regressions [1] to [5], each with a different measure of liquidity – *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. The sample period is from January 1975 through December 2008. The excess returns are used as the dependent variable in the following regression:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (2)$$

where $r_{i,t}^{*}$ denotes excess return on stock *i* in month *t*; $Z_{m,i,t}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. $LIQ\_VOLATILITY_{i,t}$ denotes liquidity volatility. In the table below, *SIZE* is the logarithm of the market capitalization of firms in billions of dollars. *BM* is the logarithm of the book-to-market ratio. *PRICE* is the logarithm of the share price reciprocal. *YIELD* is the dividend yield. *RET*2_3, *RET*4_6, and *RET*7_12 denote the cumulative returns over month $t-3$ to $t-2$, $t-6$ to $t-4$, and $t-12$ to $t-7$, respectively. *CV_LIQ* is the coefficient of variation of liquidity over month $t-37$ to $t-2$. All coefficients are multiplied by 100. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month. *t*-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

	[1]	[2]	[3]	[4]	[5]
SIZE	-0.41	-0.42	-0.42	-0.24	-0.33
	(-8.23)[a]	(-13.66)[a]	(-8.59)[a]	(-5.28)[a]	(-6.94)[a]
BM	0.69	0.70	0.67	0.74	0.67
	(13.29)[a]	(13.47)[a]	(12.89)[a]	(11.14)[a]	(12.77)[a]
PRICE	0.89	0.90	0.91	0.84	0.78
	(15.96)[a]	(16.13)[a]	(14.64)[a]	(11.80)[a]	(13.72)[a]
YIELD	-0.13	-0.11	-0.11	0.88	-0.33
	(-0.59)	(-0.52)	(-0.51)	(2.25)	(-1.48)
RET2_3	-1.63	-1.65	-1.63	-1.62	-1.99
	(-11.92)[a]	(-12.06)[a]	(-11.91)[a]	(-8.94)[a]	(-14.30)[a]
RET4_6	0.08	0.05	0.07	-0.03	0.56
	(0.73)	(0.49)	(0.65)	(-0.21)	(4.97)[a]
RET7_12	1.18	1.16	1.17	1.14	0.95
	(15.35)[a]	(15.19)[a]	(15.36)[a]	(11.28)[a]	(12.25)[a]
LIQUID	-0.001	-0.002	0.001	-0.09	0.03
	(-0.04)	(-0.08)	(0.04)	(-4.26)[a]	(1.28)
CV_LIQ	-0.25	-0.33	-0.38	0.13	0.30
	(-4.16)[a]	(-5.24)[a]	(-6.48)[a]	(2.05)[b]	(4.80)[a]
_CONS	0.99	1.00	0.99	1.00	1.00
	(44.74)[a]	(44.97)[a]	(44.90)[a]	(32.17)[a]	(42.58)[a]

Sub-Period Results and Other Robustness Checks

The sample period is separated into three sub-periods: 1975/01 – 1984/12, 1985/01 – 1994/12, and 1995/01 – 2008/12, which will be referred to as sub-periods 1, 2, and 3, respectively. We perform the same analysis on each of the sub-periods and the results are shown in Table IV. We first concentrate on trading-volume-based measures. As in Table III, some results using trading volume are counter-intuitive and contrary to our expectations for both the level of trading volume and the volatility of volume. In particular, sub-period 2 results indicate that returns are higher the greater the volume. If greater volume proxies for greater liquidity, returns should be lower, not higher. Even more counter-intuitive, all coefficients of liquidity volatility are negative in regressions [1] to [3] and in all sub-periods, although in two out of nine cases, they are not statistically significant. Therefore, in both level and volatility of trading volume, the results cast serious doubt whether trading volume can serve as an adequate proxy for liquidity. As for liquidity measures that are based on price impacts in regressions [4] and [5], we find a negative relation between returns and Amivest ratio and a positive relation between returns and Amihud ratio, which are consistent with our expectations and consistent with those in Table III. However, the results regarding volatility of price impacts are not robust. More specifically, in sub-periods 2 and 3 and using the Amivest ratio, and in sub-period 1 and using Amihud ratio, the relation between return and liquidity risk is positive as expected, but not statistically significant.

As noted in descriptive statistics, all liquidity measures are highly correlated with firm size. For this reason, we perform an additional robustness check by excluding the level of liquidity in each regression and re-estimate the relation between excess return and the coefficient of variation of liquidity. The full-period results are similar to those mentioned above thus not reported. Another robustness check is to use the first difference of liquidity risk, which is justified by stationarity test that shows liquidity risk is non-stationary. The results are largely similar to that in Table III: volatility of price impact is positively correlated with returns and consistent with a tradeoff between risk and return; liquidity risk based on trading volume remains mixed.[49]

[49] These results are reported in Table A2 in the appendix.

Table IV. Regression of Excess Return on Explanatory Variables for Sub-periods

The sample period is separated into three sub-periods: 1975/01 – 1984/12, 1985/01 – 1994/12, and 1995/01 – 2008/12. The table contains five regressions [1] to [5], each with a different measure of liquidity – *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. For each regression specification, the same analysis on each of the sub-periods is performed. The excess returns are used as the dependent variable in the following regression:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (2)$$

where $r_{i,t}^{*}$ denotes excess return on stock *i* in month *t*; $Z_{m,i,t}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. $LIQ\_VOLATILITY_{i,t}$ denotes liquidity volatility. In the table below, *SIZE* is the logarithm of the market capitalization of firms in billions of dollars. *BM* is the logarithm of the book-to-market ratio. *PRICE* is the logarithm of the share price reciprocal. *YIELD* is the dividend yield. *RET*2_3, *RET*4_6, and *RET*7_12 denote the cumulative returns over month $t-3$ to $t-2$, $t-6$ to $t-4$, and $t-12$ to $t-7$, respectively. *CV_LIQ* is the coefficient of variation of liquidity over month $t-37$ to $t-2$. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month. All coefficients are multiplied by 100. *t*-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

Table IV. (*Continued*)

	[1]			[2]			[3]		
	75/01-84/12	85/01-94/12	95/01-08/12	75/01-84/12	85/01-94/12	95/01-08/12	75/01-84/12	85/01-94/12	95/01-08/12
SIZE	-0.16	-1.15	-0.41	-0.41	-0.95	-0.61	-0.19	-1.12	-0.44
	(-1.68)[c]	(-12.91)[a]	(-4.95)[a]	(-6.53)[a]	(-15.28)[a]	(-11.08)[a]	(-1.97)[b]	(-12.86)[a]	(-5.29)[a]
BM	1.34	0.45	0.61	1.34	0.46	0.61	1.33	0.44	0.59
	(12.27)[a]	(4.81)[a]	(7.83)[a]	(12.37)[a]	(4.95)[a]	(7.81)[a]	(12.12)[a]	(4.73)[a]	(7.52)[a]
PRICE	1.08	0.32	0.80	1.09	0.32	0.81	1.33	0.17	0.96
	(10.23)[a]	(3.23)[a]	(8.97)[a]	(10.25)[a]	(3.27)[a]	(9.15)[a]	(11.20)[a]	(1.53)	(9.75)[a]
YIELD	-0.32	0.16	0.65	-0.31	0.17	0.68	-0.33	0.16	0.66
	(-0.79)	(0.50)	(1.42)	(-0.78)	(0.54)	(1.49)	(-0.81)	(0.53)	(1.45)
RET2_3	-0.65	-2.48	-1.74	-0.66	-2.51	-1.72	-0.63	-2.50	-1.73
	(-2.61)[a]	(-9.95)[a]	(-7.78)[a]	(-2.65)[a]	(-10.12)[a]	(-7.71)[a]	(-2.57)[a]	(-10.06)[a]	(-7.75)[a]
RET4_6	0.53	-1.41	0.84	0.51	-1.46	0.84	0.54	-1.45	0.83
	(2.71)[a]	(-7.00)[a]	(4.48)[a]	(2.65)[a]	(-7.29)[a]	(4.55)[a]	(2.81)[a]	(-7.23)[a]	(4.49)[a]
RET7_12	1.16	1.15	1.53	1.15	1.11	1.53	1.17	1.12	1.52
	(9.02)[a]	(8.16)[a]	(11.36)[a]	(9.05)[a]	(7.93)[a]	(11.54)[a]	(9.22)[a]	(7.98)[a]	(11.48)[a]
LIQUID	-0.25	0.18	-0.14	-0.26	0.17	-0.13	-0.24	0.17	-0.14
	(-4.77)[a]	(3.76)[a]	(-3.15)[a]	(-4.92)[a]	(3.49)[a]	(-2.89)[a]	(-4.59)[a]	(3.61)[a]	(-3.11)[a]
CV_LIQ	-0.07	-0.30	-0.15	-0.02	-0.24	-0.51	-0.20	-0.27	-0.36
	(-0.58)	(-3.03)[a]	(-1.62)[c]	(-0.15)	(-2.37)[b]	(-4.80)[a]	(-1.75)[c]	(-2.72)[a]	(-3.79)[a]
_CONS	0.38	1.07	1.37	0.38	1.08	1.37	0.39	1.08	1.36
	(7.73)[a]	(29.32)[a]	(28.71)[a]	(7.72)[a]	(29.38)[a]	(28.97)[a]	(7.82)[a]	(29.40)[a]	(28.79)[a]

Table IV. (*Continued*)

	[4]			[5]		
	75/01-84/12	85/01-94/12	95/01-08/12	75/01-84/12	85/01-94/12	95/01-08/12
SIZE	-0.34	-0.79	-0.41	-0.29	-0.47	-0.44
	(-3.41)[a]	(-8.07)[a]	(-5.87)[a]	(-2.86)[a]	(-5.81)[a]	(-6.12)[a]
BM	1.27	0.51	0.67	1.33	0.54	0.65
	(8.21)[a]	(3.94)[a]	(7.41)[a]	(10.57)[a]	(6.01)[a]	(8.47)[a]
PRICE	0.99	0.22	0.73	0.42	0.25	0.83
	(6.68)[a]	(1.59)	(7.12)[a]	(3.38)[a]	(2.58)[a]	(9.41)[a]
YIELD	1.35	1.83	1.04	-0.64	0.24	0.59
	(1.37)	(3.02)[a]	(1.77)[c]	(-1.51)	(0.77)	(1.28)
RET2_3	-0.37	-3.15	-1.57	-1.99	-2.36	-1.69
	(-1.04)	(-8.94)[a]	(-5.93)[a]	(-7.15)[a]	(-9.77)[a]	(-7.76)[a]
RET4_6	0.03	-1.66	0.79	2.65	-1.54	0.79
	(0.10)	(-5.82)[a]	(3.61)[a]	(12.01)[a]	(-7.91)[a]	(4.40)[a]
RET7_12	1.19	0.87	1.48	0.59	1.07	1.32
	(6.54)[a]	(4.41)[a]	(9.49)[a]	(4.02)[a]	(8.00)[a]	(10.51)[a]
LIQUID	-0.14	-0.05	-0.13	0.19	0.30	0.09
	(-3.27)[a]	(-1.15)	(-4.56)[a]	(3.63)[a]	(6.44)[a]	(2.27)[b]
CV_LIQ	0.32	0.06	0.07	0.02	0.37	0.68
	(2.35)[b]	(0.53)	(0.82)	(0.17)	(3.54)[a]	(7.12)[a]
_CONS	0.36	1.05	1.37	0.32	0.99	1.43
	(4.69)[a]	(19.60)[a]	(23.31)[a]	(5.47)[a]	(26.35)[a]	(30.30)[a]

A Summary on Liquidity Risk Puzzle

To this point we investigate the existence of the liquidity risk puzzle by using various measures of liquidity and find that the puzzle does exist for some measures of liquidity, in particular trading-volume-based liquidity (dollar and share trading volumes, and turnover). Moreover, the empirical relation between returns and both the level and volatility of trading volume are often counter-intuitive. This reinforces the argument by Johnson (2008) that trading volume does not adequately capture liquidity. The puzzle disappears when liquidity is measured by Amivest liquidity and Amihud illiquidity ratios that are based on price impacts. Furthermore, the sub-period results suggest that the results are sensitive to sample periods. In sum, we *can* conclude that a negative liquidity risk premium is not a robust result and that there is evidence suggesting that volume might not capture true liquidity.

The results indirectly suggest liquidity has multi-dimensions and a single measure of liquidity may not adequately capture the role of liquidity in pricing. The sub-period results tend to be more mixed than those in the full period, suggesting that liquidity risk attitude might depend on market conditions. Also, our literature review suggests that some behavioral tendencies might help in resolving the liquidity risk puzzle. Consequently in the next section, we investigate whether market conditions, firm size, and an index of investor sentiment affect the results.

V. Potential Factors that Might Influence the Return-Liquidity Risk Relation

V. A. The Impact of Market Condition on the Relation between Liquidity Risk and Excess Return

As suggested by behavioral finance theories such as Kahneman and Tversky (1979), investors tend to be more concerned about losses than gains such that their trading strategy in up (bullish) markets and down (bearish) markets will diverge. Specifically, the Prospect Theory suggests that investors evaluate risky prospects based on changes in their wealth (a change can be positive or negative), but not based on subsequent levels of wealth. It is plausible that during extreme down markets, investors might act erratically (e.g., loss-averse and risk-seeking) and pursue risky trades to break even or turn a profit. If so, it is plausible that we could observe, *simultaneously*, low returns and great variations in liquidity. The liquidity volatility can be further magnified by short-selling restrictions that are more likely to be restrictive under extreme down markets. Motivated by this and some empirical studies[50], we test whether the relation between excess return and volatility of liquidity differ between down and up markets.

Literature provides various ways to classify down and up market[51]. Inspired by Fabozzi and Francis (1977), we compute the extreme down markets as CRSP value-weighted monthly market return being 1.5 times its standard deviations below mean return. For tractability and ease of interpretation, we employ a dummy variable approach. Alternatively, we can partition the total sample months into two mutually exclusive subsets: one set includes months in which market returns $r_{m,t}$ was 1.5 standard deviations below the market mean, which is referred to the extreme down category; the other set includes the remaining months. However, this partitioning procedure ignores trends in the market.

Specifically, we test the sensitivity to market conditions by the following regression equation:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + \gamma D_t + \delta D_t * LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (3)$$

where

- D_t is a dummy variable which assumes the value of one in extreme down market and zero otherwise; the extreme down market is defined as market return being 1.5 standard deviation below mean returns.
- $LIQ\_VOLATILITY_{i,t}$ denotes liquidity risk and is measured by the coefficient of variation of alternative liquidity measure over month $t-37$ to $t-2$.
- γ and δ are the coefficients on D_t and the interaction term $D_t * LIQ\_VOLATILITY_{i,t}$, respectively. They measure the differential effects introduced by extreme down markets.

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[50] See literature reviewed in section II.B. Also, Bhardwaj and Brooks (1993) indicate significant differences between systematic risk in bull and bear markets. Howton and Peterson (1998) show the importance of changing systematic risk over bull and bear markets. It is plausible that liquidity beta also varies through time.

[51] Bhardwaj and Brooks (1993) use the median return on the market portfolio as the demarcating value with which to separate bull from bear months. Wiggins (1992) and Chen (1982) define up (down) markets as months in which the market excess return was greater (less) than zero. Fabozzi and Francis (1977 and 1979) define substantial up (down) months as months in which the return on the market portfolio was greater (less) than 1.5 times its standard deviation, thereby separating the market into periods when the market was substantially up or down or neither.

- It is expected that in normal markets the relation between return and liquidity volatility is positive, whereas in down markets the relation can be negative. That is, the coefficient δ is expected to be negative.

The results are reported in Table V. Recall in previous tables, the coefficients on volume-related are mostly insignificant. Here, the coefficients of dollar trading volume, turnover, and share trading volume, as shown in regressions [1], [2], and [3], respectively, become positive and statistically significant. A positive relation between volume and return contradicts trading volume as an appropriate measure of liquidity. The coefficient on Amivest in regression [4] continues to have the expected sign and the statistical significance level consistent with the previous results. However, the coefficient on Amihud in regression [5] becomes insignificantly negative.

As for the coefficients on liquidity risk, again results using trading-volume-related risk are counter-intuitive: here they are significantly negative, contrary to the notion of tradeoff between risk and returns. The coefficients of price-impact-liquidity-risk remain to be positive and statistically significant as in Table III. We note that all negative coefficients that are contrary to a positive tradeoff between returns and liquidity risk are much smaller in magnitude, compared to those in Table III. Hence, the addition of market condition variables appears to reduce the magnitude of the puzzle but does not completely resolve the puzzle.

The dummy variable for market condition in all regressions has a negative and statistically significant sign. This indicates that under extreme down market, or $D_t = 1$, excess return would approximately be lower by 10 percent, holding other things constant, during our sample period. This is not surprising as the dummy should capture extreme down markets.

All coefficients on the interaction terms between liquidity risk and market dummy variable are negative, and all are significant with the exception of regression [4]. This piece of result can be consistent with the Prospect Theory, as described earlier. It indicates that the loss-averse investors who take higher liquidity risk under extreme down market require lower premium. Simply put, investors tend to be risk averse under a normal or up market and relatively risk seeking under an extreme down market.

In greater details, the relation between returns and liquidity risk would depend on market conditions and requires the examination of two coefficients. In normal or up market months, $D_t =$

0, the impact of liquidity risk on excess return is $\beta_2 + \delta D_t = \beta_2$ based on Equation (3). In extreme down market months, $D_t = 1$, $\beta_2 + \delta D_t = \beta_2 + \delta$ represents the impact of liquidity risk on excess return. The table indicates that if $D_t = 0$ or under normal or up market, for one percent increase in the volatility of dollar trading volume, turnover, and share trading volume, the premium required by investors *decreases* by 0.03, 0.13, and 0.16 percent, respectively, holding other things constant. For the volatility of Amivest liquidity and Amihud illiquidity, one percent increase in volatility would be associated with a premium *increases* by 0.20 and 0.27 percent, respectively. On the other hand, if $D_t = 1$ or under extreme down market, for one percent increase in the volatility of dollar trading volume, turnover, share trading volume, Amivest liquidity, and Amihud illiquidity, the premium required would all *decrease* by 2.89 (i.e., 0.03 + 2.86), 2.52, 3.12, 0.03, and 3.48, respectively, holding other things constant. These empirical results indicate that the impact of the price-based liquidity risk on excess return is significantly positive under normal or up market and negative under extreme down market. The negative relation between trading-volume-related liquidity risk and excess return becomes stronger and even more dramatic under the extreme down markets.

Table V. The Impact of Market Condition on the Puzzle

Table V reports the estimated coefficients in regressions [1] – [5] where liquidity is measured by *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. The sample period is from January 1975 through December 2008. The following regression equation is used to test the sensitivity to market conditions:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + \gamma D_t + \delta D_t * LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (3)$$

where $r_{i,t}^{*}$ denotes excess return on stock *i* in month *t*; $Z_{m,i,t}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. $LIQ\_VOLATILITY_{i,t}$ denotes liquidity volatility. D_t denotes market dummy variable assuming the value of one in extreme down market and zero otherwise; the extreme down market is defined as market return being 1.5 standard deviations below mean returns. $D_t * LIQ\_VOLATILITY_{i,t}$ is the interaction term between market dummy variable and liquidity risk. In the table below, *CV_LIQ* is the coefficient of variation of liquidity over month *t* – 37 to *t* – 2. All variables except *EXCESS RET*, *YIELD*, three momentum effect variables, and D_t are expressed as the deviation from their monthly cross-sectional mean in each month. All coefficients are multiplied by 100. *t*-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

	[1]	[2]	[3]	[4]	[5]
SIZE	-0.64	-0.40	-0.65	-0.10	-0.33
	(-13.05)[a]	(-13.48)[a]	(-13.65)[a]	(-2.32)[b]	(-7.14)[a]
BM	0.66	0.67	0.65	0.71	0.64
	(13.17)[a]	(13.31)[a]	(12.75)[a]	(11.01)[a]	(12.55)[a]
PRICE	0.93	0.94	0.71	0.93	0.79
	(17.20)[a]	(17.45)[a]	(11.73)[a]	(13.50)[a]	(14.33)[a]
YIELD	-0.35	-0.34	-0.33	0.72	-0.45
	(-1.65)[c]	(-1.58)	(-1.56)	(1.90)[c]	(-2.07)[b]
RET2_3	-1.78	-1.81	-1.79	-1.93	-2.13
	(-13.46)[a]	(-13.66)[a]	(-13.51)[a]	(-10.97)[a]	(-15.78)[a]
RET4_6	0.60	0.56	0.58	0.40	0.95
	(5.52)[a]	(5.21)[a]	(5.41)[a]	(2.80)[a]	(8.66)[a]
RET7_12	1.09	1.06	1.08	0.97	0.98
	(14.64)[a]	(14.38)[a]	(14.63)[a]	(9.94)[a]	(13.15)[a]
LIQUID	0.24	0.24	0.25	-0.08	-0.01
	(9.04)[a]	(9.24)[a]	(9.31)[a]	(-4.06)[a]	(-0.42)
CV_LIQ	-0.03	-0.13	-0.16	0.20	0.27
	(-0.47)	(-2.04)[b]	(-2.78)[a]	(3.09)[a]	(4.44)[a]
D	-9.89	-9.90	-9.89	-9.58	-10.32
	(-140.32)[a]	(-140.42)[a]	(-140.35)[a]	(-107.43)[a]	(-142.68)[a]
D*LIQ_VOLATILITY	-2.86	-2.39	-2.96	-0.23	-3.75
	(-13.77)[a]	(-10.15)[a]	(-13.28)[a]	(-0.99)	(-16.15)[a]
_CONS	1.58	1.59	1.59	1.63	1.63
	(72.34)[a]	(72.63)[a]	(72.55)[a]	(53.33)[a]	(70.67)[a]

V. B. Small vs. Large

It is worthwhile to check whether the results might be influenced by a firm size effect, because liquidity risk is potentially much more important for small stocks than for large stocks. As documented in the previous literature, firm size[52] can be also a proxy for information asymmetry. To the extent that firm size is a proxy for information asymmetry and that information asymmetry influences the return-liquidity-risk relation, incorporating firm size into the analysis might help to resolve the liquidity risk puzzle. Therefore, we add an interaction term to the base equation and investigate how firm size influences the relation between liquidity risk and excess return. The regression equation is described as follows:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + \phi SIZE_{i,t} * LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (4)$$

where

- $SIZE_{i,t} * LIQ\_VOLATILITY_{i,t}$ is an interaction term between firm size and liquidity volatility. The latter is measured by the coefficient of variation of alternative liquidity measure over month $t - 37$ to $t - 2$ for each stock.
- ϕ is the coefficient on the interaction term. Because liquidity likely is more critical for smaller firms than for large firms, the coefficient of the interaction term, ϕ, is expected to be negative. That is, investors require smaller liquidity risk premium for larger firms.

The results are reported in Table VI. Comparing with those in Table III, the signs and magnitudes of the coefficients on control variables and alternative liquidity measures remain unchanged. The signs of liquidity risk remain qualitatively the same as those in Table III; that is, the relation between returns and liquidity volatility is significantly negative when liquidity is measured by trading volume, whereas the relation is significantly positive when liquidity is measured by price impacts of trading. As in our analysis that incorporates market conditions, it is noteworthy that all negative coefficients are smaller in magnitudes, compared to Table III. Therefore, the inclusion of the firm size effect helps to reduce the magnitude of the puzzle but does not resolve it.

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[52] Regarding the measures of information uncertainty, Zhang (2006) provides six proxies: firm age, analyst coverage, cash flow volatility, analyst forecast dispersion, firm size, and stock volatility. Higher firm age, analyst coverage, and firm size reflect lower information uncertainty, while higher cash flow volatility, analyst dispersion, and stock volatility indicate higher information uncertainty.

According to Equation (4), the impact of liquidity risk on excess return can be expressed as $\beta_2 + \phi SIZE_{i,t}$. As shown in regressions [1], [2], and [3], respectively, the estimated coefficients on the volatilities of dollar trading volume, turnover, and share trading volume, as well as on their interaction terms with stock size, are negative and statistically significant. Specifically, for one percent increase in the variation of dollar trading volume, turnover, and share trading volume, risk premium required by investors would *reduce* by $(0.16 + 0.29 * SIZE_{i,t})$, $(0.22 + 0.41 * SIZE_{i,t})$, and $(0.27 + 0.31 * SIZE_{i,t})$, respectively. In regressions [4] and [5] where liquidity is measured by Amivest liquidity and Amihud illiquidity, respectively, the impact of the volatility of liquidity on excess return is significantly positive, a result consistent with that in Table III. The coefficients on the interaction terms are negative but insignificant. Therefore, the overall effect of one percent increase in volatility of Amivest liquidity and Amihud illiquidity on excess return is that risk premium would *increase* by $(0.17 - 0.09 * SIZE_{i,t})$ and $(0.31 - 0.03 * SIZE_{i,t})$, respectively. Although we observe a positive impact of price-based liquidity risk on excess return, this impact turns modest or even weak as firm size increases. That is, there is a firm size effect: The larger the firm, the lower the risk premium on liquidity volatility, and this is true for all liquidity measures, though insignificant so for price-based liquidity.

The results in this section can be summarized as follows. We find some evidence of a firm size effect: liquidity risk premium is greater the smaller the firm size, regardless of the liquidity measure employed. As in the case of incorporating market conditions into the analysis, the firm size effect does not fully resolve the liquidity risk, because the signs of liquidity risk remain the same as those in previous sections.

Table VI. The Impact of Firm Size on the Puzzle

This table reports the estimated coefficients in regressions [1] – [5] where liquidity is measured by *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. The sample period is from January 1975 through December 2008. An interaction term between firm size and liquidity volatility is added to the base equation. The regression equation is described as follows:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + \phi SIZE_{i,t} * LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (4)$$

where $r_{i,t}^{*}$ denotes excess return on stock *i* in month *t*; $Z_{m,i,t}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. $LIQ\_VOLATILITY_{i,t}$ denotes liquidity volatility. $SIZE_{i,t} * LIQ\_VOLATILITY_{i,t}$ is the interaction term between firm size and liquidity risk. In the table below, *CV_LIQ* denotes liquidity volatility, which is the coefficient of variation of liquidity over month *t* – 37 to *t* – 2. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month. All coefficients are multiplied by 100. *t*-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

	[1]	[2]	[3]	[4]	[5]
SIZE	-0.40	-0.41	-0.41	-0.24	-0.33
	(-7.95)[a]	(-13.35)[a]	(-8.29)[a]	(-5.29)[a]	(-6.93)[a]
BM	0.69	0.70	0.67	0.74	0.67
	(13.18)[a]	(13.46)[a]	(12.76)[a]	(11.14)[a]	(12.77)[a]
PRICE	0.88	0.89	0.92	0.84	0.78
	(15.78)[a]	(16.09)[a]	(14.77)[a]	(11.81)[a]	(13.71)[a]
YIELD	-0.09	-0.06	-0.09	0.89	-0.33
	(-0.42)	(-0.29)	(-0.40)	(2.27)[b]	(-1.48)
RET2_3	-1.64	-1.66	-1.63	-1.62	-1.99
	(-12.01)[a]	(-12.19)[a]	(-11.96)[a]	(-8.93)[a]	(-14.30)[a]
RET4_6	0.07	0.03	0.06	-0.03	0.56
	(0.62)	(0.30)	(0.55)	(-0.20)	(94.97)[a]
RET7_12	1.18	1.14	1.16	1.14	0.95
	(15.26)[a]	(14.97)[a]	(15.23)[a]	(11.28)[a]	(12.25)[a]
LIQUID	-0.005	-0.01	-0.01	-0.09	0.03
	(-0.17)	(-0.29)	(-0.21)	(-4.23)[a]	(1.29)
CV_LIQ	-0.16	-0.22	-0.27	0.17	0.31
	(-2.59)[b]	(-3.36)[a]	(-4.41)[a]	(2.43)[b]	(4.72)[a]
SIZE*LIQ_VOLATILITY	-0.29	-0.41	-0.31	-0.09	-0.03
	(-5.54)[a]	(-7.05)[a]	(-5.49)[a]	(-1.36)	(-0.51)
_CONS	0.96	0.96	0.97	1.00	1.00
	(42.43)[a]	(41.96)[a]	(43.20)[a]	(32.16)[a]	(41.94)[a]

V. C. The Role of Investor Sentiment

As discussed in the literature review, behavioral biases might help to resolve the liquidity risk puzzle. For instance, our previous analysis of market conditions suggests that investors are not strongly averse to liquidity risk during extreme down markets. Here, we are incorporating a measure of investor sentiment and check whether it can affect the return-liquidity risk relation. Prior literature presents several measures of investor sentiment, which is referred to the level of noise traders' beliefs relative to Bayesian beliefs (Tetlock (2007)). One of them is the VIX index, which we employ here. Some document a significantly negative relation between investor sentiment and stock return. However to our knowledge, no article provides either theoretical prediction or empirical evidence on whether investor sentiment affects liquidity risk premium. Since irrational investors behave like a herd, rushing in and out of markets together, increasing the size of the herd does little to support liquidity, indeed it could reduce it and causes those markets to exhibit even greater volatility. Therefore, the following empirical analysis might provide additional insights to the negative liquidity risk premium puzzle:

$$r^*_{i,t} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + \kappa_1 VIX_t + \kappa_2 VIX_t * LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (5)$$

where

- VIX_t is a measure of the level of implied volatility of a wide range of options based on the S&P 500. It is referred to as the Investor Fear Gauge, as pointed out in Whaley (2000)[53], and can be a proxy of investor sentiment.
- $VIX_t * LIQ\_VOLATILITY_{i,t}$ is an interaction term between investor fear gauge and liquidity volatility. The liquidity risk is also measured by the coefficient of variation of the liquidity over month $t-37$ to $t-2$.
- κ_1 and κ_2 are the coefficients on VIX_t and the interaction term, respectively. Although the evidence on this issue is lacking, it is expected that the proxy for investor sentiment would help to explain the relationship between liquidity risk and excess return. In other words, the negative relation between excess return and liquidity risk premium might be

[53] Whaley (2000) use the VIX-Investor Fear Gauge as a measure of investor sentiment. This measure is computed daily by the Chicago Board Options Exchange and has been widely used by academicians and practitioners as measures of investor sentiment to gauge the prevailing level of bullishness or bearishness in the market.

partly due to the frequent trading or large trading activity of optimistic investors or investor sentiment.

The data on VIX is available only since January 1990, while our previous analysis covers a much longer period. Consequently we report results with and without the VIX index for the period 1990 to 2008. The results are displayed in Table VII, where column (a) reports the results without the VIX and its interaction term with liquidity volatility (that is, column (a) involves the same analysis as Table III but with a different sample period) and column (b) reports those with the VIX and its interaction term.

Table VII shows that volume-based-liquidity continues to demonstrate mixed results. Without the VIX index, the relation between return and volume is insignificant in regressions [1] to [3]; with the VIX index included, the relation becomes significantly positive in all three regressions, which contradicts a compensation for low liquidity and casts doubt on the validity of volume as a measure of liquidity. As for the signs for the price impact measures, they remain the same as in the previous analyses and consistent with the notion that investors require greater return for lower liquidity. Regarding the coefficients of liquidity volatility, here we observe a striking difference between results including and excluding the VIX index. Simply stated, without the VIX index, the coefficients of liquidity volatility are largely mixed as in our earlier analyses. When the VIX index and its interaction term are included, the coefficients of liquidity volatility are significantly positive in four out of five regressions and consistent with a tradeoff between returns and risk. The only exception is in regression [5], where the Amihud ratio is used as the measure of liquidity. We do not have satisfactory explanation for the result using the Amihud ratio. Nevertheless, it is fair to say that results here after controlling for investor sentiment are strongest among all our analyses in support of a positive tradeoff between risk and return.

The coefficients of the VIX index are uniformly negative and significant in all regressions. This is not surprising as a high VIX index suggests greater investor fear, which tends to be associated with down markets. The coefficients of the interaction term, $VIX_t * LIQ\_VOLATILITY_{i,t}$, are significantly negative in all regressions with the exception of, again, the one using the Amihud ratio (regression [5]). A negative coefficient of the interaction term might be explained by an argument similar to that of the Prospect Theory, as follows. When investors' fear is high, they might engage in active trading and some of the trades might not be rational; alternatively, when the market fear is high, risk-averse investors might opt out, leaving only traders for whom liquidity volatility is not a major concern. However, it should be pointed out when VIX is high, the combined coefficient of liquidity volatility and the interaction term might become negative (we use the log of VIX in the regression, and the long-term average of VIX is roughly 20). Therefore, the results here do not unambiguously point to a positive tradeoff between return and liquidity risk; more specifically the results suggest that a positive tradeoff between returns and liquidity risk is true when the level of fear is not too high. To further explore the role of investor sentiment, fuller theoretical development is needed. Nevertheless, the results here do suggest that investor sentiment plays a role in the relation between returns and liquidity risk.[54]

[54] It is possible that firms' market/book ratios might be proxies for investors' sentiment. Consequently, we perform a similar analysis based on market/book ratio and the results are listed in Table A3 in the appendix.

Table VII. The Impact of Investor Sentiment

This table reports the estimated coefficients in regressions [1] – [5] where liquidity is measured by *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. The sample period is from January 1990 through December 2008. The regression equation is described as follows:

$$r^{*}_{i,t} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + \kappa_1 VIX_t + \kappa_2 VIX_t * LIQ\_VOLATILITY_{i,t} + e_{i,t} \quad (5)$$

where $r^{*}_{i,t}$ denotes excess return on stock i in month t; $Z_{m,i,t}$ is the value of the specific stock characteristic m for stock i in month t; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. $LIQ\_VOLATILITY_{i,t}$ denotes liquidity volatility. VIX_t denotes investor sentiment and is expressed as the logarithm of the level of implied volatility of a wide range of options based on the S&P 500. $VIX_t * LIQ\_VOLATILITY_{i,t}$ is the interaction term between investor sentiment and liquidity risk. In the table below, *CV_LIQ* denotes liquidity risk which is the coefficient of variation of liquidity, over month t – 37 to t – 2. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month. In this table, column (a) reports the results without the *VIX* and its interaction term with liquidity volatility (that is, column (a) involves the same analysis as Table III but with a different sample period) and column (b) reports those with the *VIX* and its interaction term. All coefficients are multiplied by 100. t-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

Table VII. (*Continued*)

	[1]		[2]		[3]		[4]		[5]	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
SIZE	-0.49	-0.49	-0.53	-0.44	-0.50	-0.56	-0.35	-0.14	-0.39	-0.11
	(-7.06)[a]	(-7.18)[a]	(-11.90)[a]	(-9.88)[a]	(-7.37)[a]	(-8.33)[a]	(-5.67)[a]	(-2.30)[b]	(-6.48)[a]	(-1.90)[c]
BM	0.66	0.53	0.66	0.50	0.64	0.51	0.70	0.43	0.68	0.56
	(9.95)[a]	(8.04)[a]	(9.97)[a]	(7.69)[a]	(9.58)[a]	(7.71)[a]	(8.76)[a]	(5.48)[a]	(10.56)[a]	(8.80)[a]
PRICE	0.88	1.09	0.89	1.07	0.91	0.93	0.79	1.01	0.93	1.01
	(11.81)[a]	(14.70)[a]	(11.99)[a]	(14.45)[a]	(10.93)[a]	(11.22)[a]	(8.70)[a]	(11.26)[a]	(12.54)[a]	(13.81)[a]
YIELD	0.02	-0.22	0.07	-0.23	0.05	-0.24	0.76	0.60	0.03	-0.11
	(0.07	(-0.69)	(0.20	(-0.72)	(0.15	(-0.74)	(1.65)[c]	(1.31)	(0.09)	(-0.33)
RET2_3	-1.04	-1.94	-1.03	-1.87	-1.03	-1.88	-1.18	-2.40	-1.04	-1.87
	(-5.51)[a]	(-10.37)[a]	(-5.48)[a]	(-10.01)[a]	(-5.49)[a]	(-10.07)[a]	(-5.06)[a]	(-10.31)[a]	(-5.69)[a]	(-10.26)[a]
RET4_6	0.03	-0.45	0.03	-0.38	0.02	-0.38	0.06	-0.40	-0.09	-0.44
	(0.21)	(-2.95)[a]	(0.17)	(-2.47)[b]	(0.13)	(-2.52)[b]	(0.31)	(-2.11)[b]	(-0.62)	(-2.94)[a]
RET7_12	1.91	1.53	1.90	1.61	1.89	1.60	1.71	1.28	1.66	1.46
	(17.29)[a]	(13.97)[a]	(17.43)[a]	(14.88)[a]	(17.39)[a]	(14.78)[a]	(12.63)[a]	(9.57)[a]	(16.16)[a]	(14.35)[a]
LIQUID	0.0002	0.12	0.01	0.15	-0.0003	0.14	-0.10	-0.22	0.02	0.16
	(0.00)	(3.28)[a]	(0.14)	(4.08)[a]	(-0.01)	(3.88)[a]	(-3.85)[a]	(-8.49)[a]	(0.54)	(4.84)[a]
CV_LIQ	-0.22	2.88	-0.53	2.36	-0.41	1.90	0.08	2.72	0.48	-3.15
	(-2.81)[a]	(4.47)[a]	(-6.24)[a]	(3.30)[a]	(-5.25)[a]	(2.84)[a]	(1.02)	(4.21)[a]	(6.13)[a]	(-4.91)[a]
VIX		-4.20		-4.15		-4.14		-4.61		-3.97
		(-55.03)[a]		(-54.66)[a]		(-54.78)[a]		(-51.34)[a]		(-53.37)[a]
VIX*LIQ_VOLATILITY		-0.89		-0.83		-0.63		-0.90		1.19
		(-4.04)[a]		(-3.42)[a]		(-2.78)[a]		(-4.09)[a]		(5.37)[a]
_CONS	1.08	13.33	1.10	13.16	1.08	13.14	1.15	14.68	1.11	12.64
	(30.80)[a]	(59.13)[a]	(31.25)[a]	(58.83)[a]	(30.93)[a]	(58.91)[a]	(24.79)[a]	(54.90)[a]	(32.00)[a]	(57.86)[a]

VI. Conclusions and Contributions

Under traditional theories, return and liquidity risk should be positively related. Therefore, the finding of a negative relation between return and trading volume documented by Chordia et al. (2001b) presents a "liquidity risk puzzle". This study attempts to resolve the puzzle on two fronts: 1) since liquidity cannot be adequately captured by one variable, we employ alternative liquidity measures; and 2) since behavioral biases might help to explain the puzzle, we incorporate market conditions, firm size, and investor sentiment into our analysis.

Our sample covers the period 1975 to 2008 and the total number of firm-month observations is 415,403. The main findings are as follows. The relation between stock returns and volatility of liquidity does depend on the measure of liquidity. We use three liquidity measures that are based on trading volume and two on price impacts of trading. Liquidity based on trading volume produces most mixed results: not only the relation between returns and volume volatility are insignificant or negative, the relation between returns and the level of trading is often positive in our analyses. These results cast serious doubt on the appropriateness of volume as a proxy for liquidity. They also reinforce the argument by Johnson (2008) that trading volume does not adequately capture liquidity. On the other hand, the puzzle largely disappears when liquidity is measured by Amivest liquidity and Amihud illiquidity ratios that are based on price impacts. A partial reconciliation of the differences in results using alternative liquidity measures is that price impact is arguably more important than the volume of trading for at least the large traders. We also find that results are sensitive to sample periods. One thing that we *can* conclude is that a negative liquidity risk premium is not a robust result.

The second part of our paper incorporates potential factors that might affect the relation between returns and liquidity volatility, namely possible differential risk attitude in different market conditions, a possible firm size effect, and investor sentiments. Our results indicate that in extreme down markets, the aversion to liquidity volatility is lower and in fact the evidence suggests returns are lower the greater the liquidity volatility under down markets. We interpret the evidence as consistent with behavioral biases, especially that along the line of the Prospect Theory. Nevertheless, the inclusion of market conditions does not alter the mixed relation between returns and liquidity volatility, although it tends to reduce the magnitude of the puzzle. The inclusion of firm size also reduces the magnitude of the puzzle but does not completely resolve the puzzle. Additionally, we find a firm size effect; specifically, liquidity risk premium tends to be greater for small stocks. Finally, when we include the VIX index as a proxy for investor sentiment, we find that the relation between returns and liquidity risk is significantly positive in four out of five liquidity measures. This result suggests that investor sentiment might have the potential to more fully resolve the puzzle. In sum, our analysis partially but not completely addresses the puzzle. Further theoretical development is desirable.

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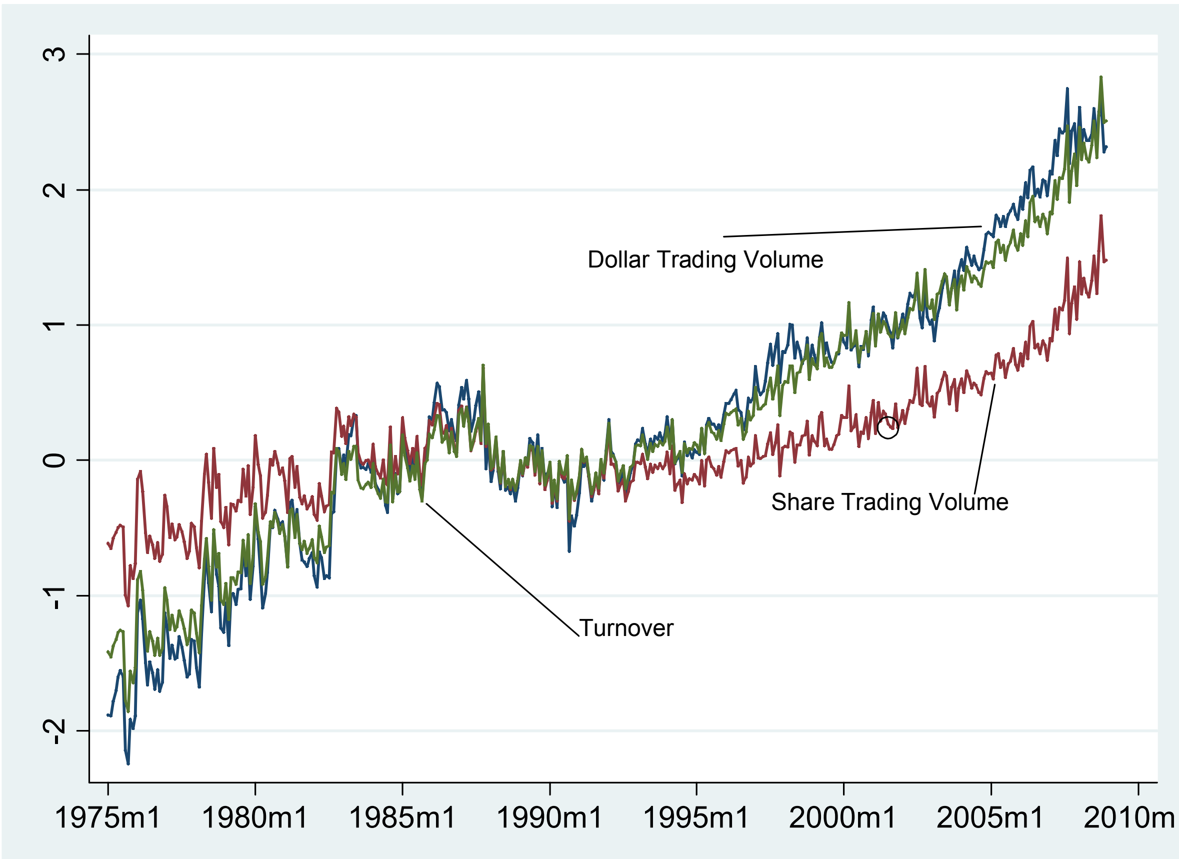
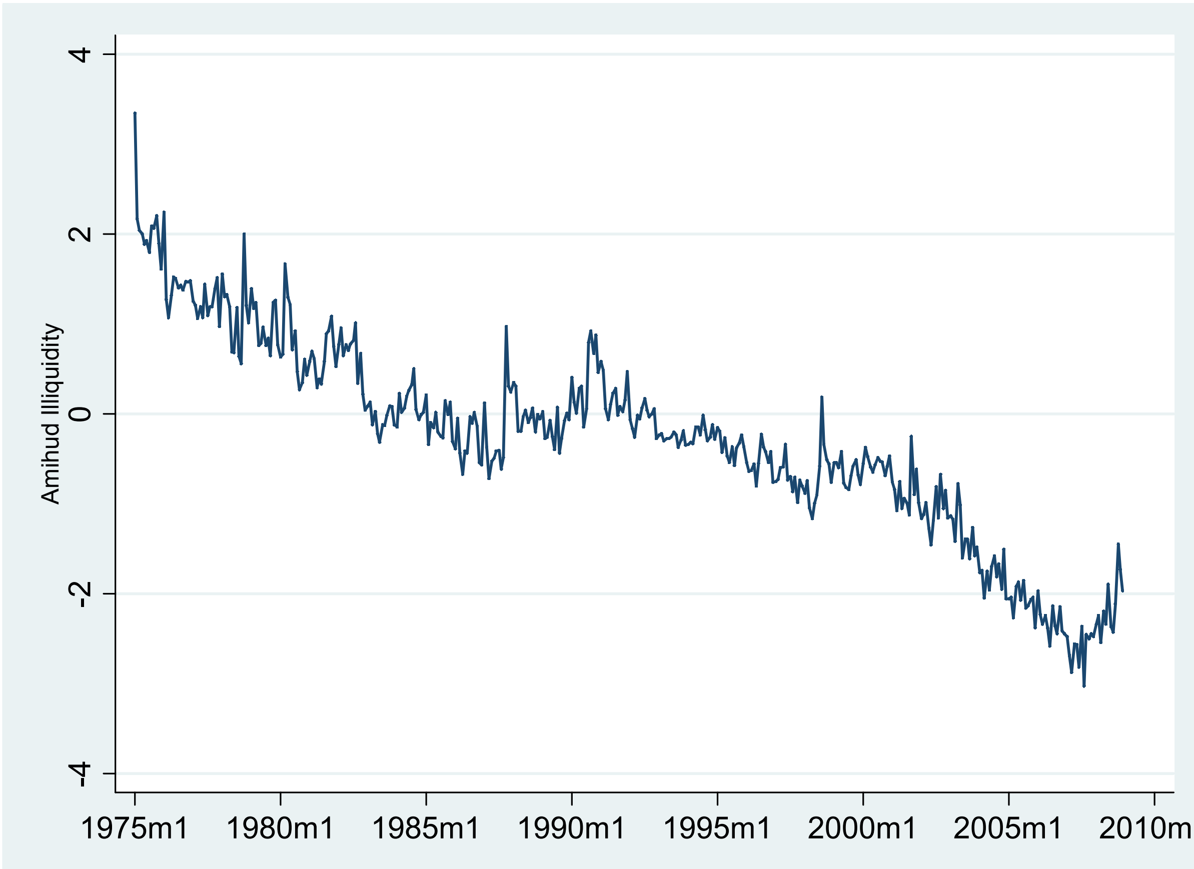
Figure I. Time Series Plots of Liquidity Measures

The figures below show the monthly cross-sectional average of dollar trading volume, turnover, share trading volume, and Amihud Illiquidity, respectively, throughout the full sample period.

(1) Dollar Trading Volume, Turnover, and Share Trading volume (1975/01 – 2008/12)



(2) Amihud Illiquidity (1975/01 – 2008/12)



Appendix

Table A1. Regression without Liquidity Risk Measure

This table reports the estimated coefficients in regressions [1] – [5] where liquidity is measured by *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. The sample period is from January 1975 through December 2008. The excess returns are used as the dependent variable in the following regression:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + e_{i,t}$$

where $r_{i,t}^{*}$ denotes excess return on stock *i* in month *t*; $Z_{\text{m,i,t}}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month. All coefficients are multiplied by 100. *t*-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

	[1]	**[2]**	**[3]**	**[4]**	**[5]**
SIZE	-0.32	-0.36	-0.32	-0.29	-0.23
	(-6.92)[a]	(-13.08)[a]	(-6.92)[a]	(-8.45)[a]	(-5.31)[a]
BM	0.72	0.72	0.72	0.73	0.75
	(14.87)[a]	(14.87)[a]	(14.87)[a]	(14.79)[a]	(15.44)[a]
PRICE	0.96	0.96	1.01	0.95	0.88
	(18.07)[a]	(18.07)[a]	(16.81)[a]	(17.64)[a]	(16.62)[a]
YIELD	-0.11	-0.11	-0.11	-0.04	-0.19
	(-0.49)	(-0.49)	(-0.49)	(-0.16)	(-0.84)
RET2_3	-1.56	-1.56	-1.56	-1.59	-1.64
	(-11.98)[a]	(-11.98)[a]	(-11.98)[a]	(-12.18)[a]	(-12.69)[a]
RET4_6	-0.02	-0.02	-0.025	-0.01	0.30
	(-0.24)	(-0.24)	(-0.24)	(-0.07)	(2.82)[a]
RET7_12	1.19	1.19	1.19	1.17	1.27
	(16.92)[a]	(16.92)[a]	(16.92)[a]	(16.55)[a]	(18.19)[a]
LIQUID	-0.05	-0.05	-0.05	-0.06	0.05
	(-1.75)[c]	(-1.75)[c]	(-1.75)[c]	(-3.95)[a]	(2.21)[b]
_CONS	0.99	0.99	0.99	0.99	0.90
	(46.14)[a]	(46.14)[a]	(46.14)[a]	(45.45)[a]	(41.51)[a]

Table A2. Regression of Excess Return on the First Difference of Non-Stationary Explanatory Variables

This table reports the estimated coefficients in regressions [1] – [5] where liquidity is measured by *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. The sample period is from January 1975 through December 2008. The excess returns are used as the dependent variable in the following regression:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + e_{i,t}$$

where $r_{i,t}^{*}$ denotes excess return on stock *i* in month *t*; $Z_{\text{m,i,t}}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. $LIQ\_VOLATILITY_{i,t}$ denotes liquidity volatility. In the table below, *CV_LIQ* denotes liquidity risk which is the coefficient of variation of liquidity, over month *t* – 37 to *t* – 2. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month. The first differences of the non-stationary explanatory variables - *SIZE*, *BM*, *PRICE*, *YIELD*, *LIQUID*, and *LIQ_VOLATILITY* – are used in the regressions. All coefficients are multiplied by 100. *t*-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

	[1]	[2]	[3]	[4]	[5]
SIZE	-1.37	-1.48	-1.37	-1.69	-0.99
	(-3.98)[a]	(-4.31)[a]	(-3.96)[a]	(-3.79)[a]	(-2.80)[a]
BM	0.47	0.47	0.47	0.09	0.42
	(2.74)[a]	(2.75)[a]	(2.75)[a]	(0.39)	(2.45)[b]
PRICE	0.57	0.58	0.69	0.40	0.51
	(2.05)[b]	(2.08)[b]	(2.46)[b]	(1.16)	(1.78)[c]
YIELD	1.04	1.05	1.04	1.60	0.99
	(1.80)[c]	(1.81)[c]	(1.80)[c]	(1.52)	(1.68)[c]
RET2_3	-1.06	-1.05	-1.05	-0.86	-1.64
	(-6.04)[a]	(-6.00)[a]	(-6.03)[a]	(-3.64)[a]	(-9.08)[a]
RET4_6	-0.36	-0.36	-0.36	-0.54	0.25
	(-3.05)[a]	(-3.05)[a]	(-3.04)[a]	(-3.44)[a]	(2.08)[b]
RET7_12	0.35	0.35	0.35	0.37	0.27
	(4.87)[a]	(4.86)[a]	(4.88)[a]	(3.81)[a]	(3.72)[a]
LIQUID	-0.10	-0.09	-0.10	-0.05	0.03
	(-2.94)[a]	(-2.68)[a]	(-2.78)[a]	(-3.04)[a]	(0.74)
CV_LIQ	0.01	-0.37	-0.13	0.39	0.44
	(0.06)	(-1.39)	(-0.52)	(1.94)[b]	(1.62)[c]
_CONS	0.94	0.94	0.94	0.83	0.88
	(47.04)[a]	(47.09)[a]	(47.07)[a]	(31.23)[a]	(42.82)[a]

Table A3. The Impact of Value Stocks on the Puzzle

This table reports the estimated coefficients in regressions [1] – [5] where liquidity is measured by *Dollar Trading Volume*, *Turnover*, *Share Trading Volume*, *Amivest Liquidity*, and *Amihud Illiquidity*, respectively. The sample period is from January 1975 through December 2008. An interaction term between firm book-to-market ratio and liquidity volatility is added to the base equation. The regression equation is described as follows:

$$r_{i,t}^{*} = c_0 + \sum_{m=1}^{M} c_m Z_{m,i,t} + \beta_1 LIQUID_{i,t} + \beta_2 LIQ\_VOLATILITY_{i,t} + \phi BM_{i,t} * LIQ\_VOLATILITY_{i,t} + e_{i,t}$$

where $r_{i,t}^{*}$ denotes excess return on stock *i* in month *t*; $Z_{m,i,t}$ is the value of the specific stock characteristic *m* for stock *i* in month *t*; M is the number of the characteristic variables. *LIQUID* denotes alternative liquidity measures. $LIQ\_VOLATILITY_{i,t}$ denotes liquidity volatility. $BM_{i,t} * LIQ\_VOLATILITY_{i,t}$ is the interaction term between firm book-to-market ratio and liquidity risk. In the table below, *CV_LIQ* denotes liquidity volatility which is the coefficient of variation of liquidity over month *t* – 37 to *t* – 2. All variables except *EXCESS RET*, *YIELD*, and three momentum effect variables are expressed as the deviation from their monthly cross-sectional mean in each month. All coefficients are multiplied by 100. *t*-statistics are in parentheses. Statistical significance at the 1%, 5% and 10% level are denoted by [a], [b], and [c], respectively.

	[1]	[2]	[3]	[4]	[5]
SIZE	-0.41	-0.42	-0.42	-0.24	-0.33
	(-8.12)[a]	(-13.62)[a]	(-8.51)[a]	(-5.28)[a]	(-7.06)[a]
BM	0.69	0.70	0.67	0.74	0.67
	(13.17)[a]	(13.44)[a]	(12.75)[a]	(11.12)[a]	(12.73)[a]
PRICE	0.88	0.89	0.92	0.84	0.78
	(15.85)[a]	(16.08)[a]	(14.70)[a]	(11.80)[a]	(13.62)[a]
YIELD	-0.12	-0.10	-0.11	0.88	-0.33
	(-0.55)	(-0.45)	(-0.50)	(2.25)[b]	(-1.49)
RET2_3	-1.65	-1.66	-1.63	-1.62	-2.01
	(-12.06)[a]	(-12.16)[a]	(-11.96)[a]	(-8.93)[a]	(-14.40)[a]
RET4_6	0.07	0.04	0.07	-0.03	0.56
	(0.66)	(0.41)	(0.62)	(-0.21)	(4.91)[a]
RET7_12	1.20	1.16	1.18	1.14	0.96
	(15.58)[a]	(15.26)[a]	(15.45)[a]	(11.28)[a]	(12.37)[a]
LIQUID	-0.001	-0.003	-0.0002	-0.09	0.03
	(-0.05)	(-0.11)	(-0.01)	(-4.26)[a]	(1.10)
CV_LIQ	-0.24	-0.33	-0.37	0.13	0.33
	(-4.00)[a]	(-5.20)[a]	(-6.26)[a]	(2.06)[b]	(5.23)[a]
BM*LIQ_VOLATILITY	0.47	0.39	0.28	0.03	0.51
	(4.13)[a]	(3.02)[a]	(2.28)[b]	(0.23)	(4.02)[a]
_CONS	0.98	0.99	0.99	1.00	1.00
	(44.19)[a]	(44.18)[a]	(44.72)[a]	(32.13)[a]	(42.54)[a]

Vita

Shu Tian was born in China. She earned her B.S. degree in Microbiology Engineering from Shandong University in China in 1998. After graduation, she worked for a medical diagnostic product company for over three years. Then she came to the United States to pursue her graduate study. She received her M.S. in Finance in 2005 from Sam Houston State University and her M.S. in Financial Economics in 2008 from the University of New Orleans where she also earned her Ph.D. in Financial Economics in May 2010. While working toward her doctoral degree, she has taught multiple courses, including Principles of Finance, Principles of Macro/Microeconomics, and Statistics for Business and Economics.