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Emerging Markets Review 4 (2003) 1–24

EMERGING MARKETS REVIEW

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Liquidity and stock returns in emerging equity markets

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Received 21 May 2002; received in revised form 29 November 2002; accepted 9 December 2002

Abstract

Using data for 27 emerging equity markets for the period January 1992 through December 1999, we document the behavior of liquidity in emerging markets. We find that stock returns in emerging countries are positively correlated with aggregate market liquidity as measured by turnover ratio, trading value and the turnover–volatility multiple. The results hold in both cross-sectional and time-series analyses, and are quite robust even after we control for world market beta, market capitalization and price-to-book ratio. The positive correlation between stock returns and market liquidity in a time-series analysis is consistent with the findings in developed markets. However, the positive correlation in a cross-sectional analysis appears to be at odds with market microstructure theory that has been empirically supported by studies on developed markets. Our findings regarding the cross-sectional relation between stock returns and liquidity is consistent with the view that emerging equity markets have a lower degree of integration with the global economy.

JEL classifications: F20; F21; G12; G15

Keywords: Market liquidity; Turnover ratio; Emerging markets; Stock market returns

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PII: S1566-0141(02)00060-2

1. Introduction

The importance of emerging equity markets in the context of investment portfolios and international diversification has received considerable attention. Six emerging markets rank among the top 20 markets in the world in terms of capitalization.[1] With respect to trading value, Taiwan, Korea, and Malaysia were among the 10 most active markets during 1998. Furthermore, trading in these three markets is not concentrated in a few companies. Many emerging markets trade a large number of domestic companies. For example, as of December 2000, there were approximately 6000 companies listed in India, second only to the US, Korea has more companies listed than either France or Germany. Nevertheless, many emerging markets are still very concentrated, with high trading costs and low trading volume.[2]

We investigate the time-series variation in aggregate liquidity for several emerging equity markets and also examine the cross-sectional behavior of liquidity across countries. Aggregate liquidity, as opposed to the cross-sectional analysis of individual securities in traditional microstructure theory, is critical because it is related to the important issue of whether liquidity is a priced factor in global equity markets. We find that stock returns in emerging countries are positively correlated with market liquidity as measured by turnover ratio, trading value, and turnover–volatility multiple. The results hold in both cross-sectional and time-series analyses, and are quite robust even after we control for world market beta, market capitalization and price-to-book ratio.[3]

The positive correlation between stock returns and market liquidity in a time-series analysis is consistent with the findings for developed markets. However, the positive correlation between stock returns and liquidity in the cross-sectional analysis appears to be at odds with market microstructure theory that has been empirically supported by studies on developed markets.[4] Evidently, our study identifies what seems to be a unique characteristic of stock returns in emerging equity markets.

It is important to emphasize that the notion of liquidity for individual assets is quite different from the notion of liquidity of an overall equity market. While supply and demand conditions determine liquidity in both cases, the factors that characterize the supply and demand functions for individual assets within a market are different from the factors that characterize the liquidity of a country's equity market. Whereas unique individual security characteristics determine its relative liquidity, the liquidity of a country's equity market is largely determined by macroeconomic factors that are systemic to the economy.[5] Moreover, the assessment of liquidity in a given

[1] These countries are Malaysia, South Africa, Mexico, Korea, Singapore and Thailand.

[2] For example, of the 6000 companies listed in the Indian stock exchange, only 1500 trade on a daily basis. Moreover, the top 200 companies account for almost 95% of daily traded volume.

[3] These variables have been identified in the literature (Fama and French, 1995, 1996) as having explanatory power for stock returns.

[4] Section 2 discusses the relationship between liquidity and stock returns in greater detail.

[5] For instance, legal, political as well as macroeconomic factors are likely to play an important role.

equity market relative to other markets is likely to have significant implications regarding the flow of capital and hence growth and development of that market.

A potential explanation for the positive correlation between liquidity and emerging stock market returns can be made from the perspective of lower level of global market integration. While Longin and Solnik (1995) report an overall increase in the correlation structure among developed markets, Bekaert and Harvey (1997) find evidence for varying degrees of integration of emerging equity markets with the world economy. If emerging markets are not fully integrated with the global economy, lack of liquidity will not function as a risk factor, and thus cross-sectional returns will not necessarily be lower for liquid markets. In this sense, our findings are supportive of the view that emerging equity markets have a lower degree of integration with the global economy.

The remainder of this paper is organized in four sections. Section 2 reviews the existing literature on the relation between stock returns and market liquidity. Section 3 presents the data and descriptive statistics on 27 emerging equity markets for the period January 1992 through December 1999. We present several measures of stock market liquidity and examine their behavior over time. Section 4 presents the empirical methodology and provides a discussion and interpretation of our empirical findings. After addressing several estimation issues, we estimate the relation between liquidity and stock returns using an ordinary least squares (OLS) regression. Robustness tests are conducted using regional classifications and an estimation of a multivariate vector autoregressive (VAR). The final section provides a brief summary of the paper and some concluding remarks.

2. Market liquidity and stock returns

There is a large body of research that supports the view that the liquidity of securities affects their expected returns. The influence of trading costs on required returns examined by Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), Jacoby et al. (2000) implies a direct link between liquidity and corporate cost of capital. Those studies present a model showing that liquidity, marketability or transactions costs influence investors' portfolio decisions. Since rational investors require a higher risk premium for holding illiquid securities, cross-sectional risk-adjusted returns are lower for liquid stocks. This proposition has been empirically supported in various studies on *mature* capital markets.

Amihud and Mendelson (1989) conduct cross-sectional analyses of US stock returns and show that risk-adjusted returns are decreasing with respect to liquidity, as measured by the bid-ask spread. Brennan et al. (1998) investigate the relation between expected returns and several firm characteristics including market liquidity, as measured by trading volume. They find a significant negative relation between returns and trading volume for both NYSE and NASDAQ stocks, thus linking expected returns and liquidity. Amihud et al. (1997) report that liquidity improvement on the Tel Aviv Stock Exchange was associated with a positive and permanent price appreciation. Datar et al. (1998) use turnover rate as a measure of liquidity,

and provide evidence for a negative correlation between liquidity and stock returns.[6]

Haugen and Baker (1996) report that the liquidity of stocks is one of several common factors in explaining stock returns across global markets. They report that the cross-sectional stock returns in developed markets have common determinants from period to period and from country to country, and that the liquidity of stocks is one of the important determinants of stock returns. Estrada (2001) shows that the semi-deviation with respect to the mean is a useful variable in explaining the cross-section of industry returns in emerging markets. He further indicates that the semi-deviation might be a plausible variable to be used in a CAPM framework to compute the cost of equity in emerging markets.

The economic development literature establishes a strong link between financial markets development and economic growth. For instance, Atje and Jovanovic (1993), Levine and Zervos (1998) and Levine (1997) suggest that well-functioning stock markets enhance the liquidity of capital investment and thus promote long-run economic growth. The role of stock markets is emphasized more strongly in developing countries, where the need for funding profitable long-term investments is stronger than in developed countries.

A number of recent papers examine the valuation effects of stock market liberalization in emerging markets. They show evidence that stock market liquidity positively predicts growth, capital accumulation, and productivity improvements, and that liquid equity markets provide important requisites for economic growth. Bekaert and Harvey (1997, 2000) show that liberalization tends to decrease aggregate dividend yields and suggest that the price changes reflect a change in the cost of capital rather than a change in earnings of firms. They further point out that while capital market integration process reduces the cost of capital in emerging markets, that reduction is far less than we expected.

Henry (2000a,b) provide the most detailed empirical evidence in support of the hypothesis that stock market liberalization in emerging countries will cause the country's aggregate cost of capital to decline, leading to an equivalent increase in the country's equity price index. On average, in the 8-month period preceding market liberalization, a country's aggregate share price index experiences a 38% increase in real dollar terms. Using data for the same time period but employing a slightly different sample, Kim and Singal (2000) provide very similar evidence that emerging stock market returns are abnormally high in the 8 months period leading to liberalization events.

Given that stock market liquidity in emerging countries is positively related to economic growth, liberalization policies, and the level of global integration, it is quite reasonable to expect that markets with higher levels of aggregate liquidity would also have higher stock valuations relative to other markets. The rationale

[6] For instance, Amihud et al. (1990) report that during the stock market crash of October 19th 1987, price declines were greater for illiquid stocks, and price recoveries were greater for liquid stocks. Furthermore, returns on US Treasuries are also found to be increasing with respect to the bid-ask spread as demonstrated in Amihud and Mendelson (1991), Kamara (1994). For a comprehensive examination of stock market liquidity over time, see Jones (2000).

behind this argument can be supported either on the basis of the positive relationship between liquidity and economic growth or on the basis of the observed positive relation between an increase in market liberalization policies and overall market liquidity. Using data for 27 emerging equity markets for the period January 1992 through December 1999, we provide evidence in support of this conjecture.

3. Data and measures of stock market liquidity

3.1. Data

The primary source for the data used in this study is the Emerging Market Database, part of the International Financial Statistics, originally compiled and maintained by the World Bank. Beginning with 1998, the Emerging markets database is being maintained by Standard & Poor's. We use monthly data for 27 emerging equity markets covering the period January 1992 through December 1999.[7] The monthly returns on US equity indices were obtained from CRSP. We also used regional Morgan Stanley World Index (MSCI), as a proxy for the returns on the world market index. For comparability purposes, all the return data used in this study are in terms of US dollars.

Table 1 presents a statistical snapshot on the 27 emerging markets examined in this study. Each variable is recorded as of December 1999 to depict the present situation of each of the markets examined.[8] The first column gives the number of listed companies in the major stock exchange in each country. The columns that follow provide data on market capitalization, trading value in millions of US dollars, turnover ratio, turnover to standard deviation (S.D.) ratio, monthly stock returns, number of IFC stocks, the ratio of IFC stocks to total capitalization (column 9), the ratio of IFC stock to total trading value (column 10), PE ratio, PB ratio, the average dividend yield and the country's currency exchange rate for the month.

The turnover ratio (column 5) is calculated as the ratio of trading value (column 3) over market capitalization (column 2). The S.D. of returns used in column 6 was calculated using a trailing twelve monthly returns for each of the emerging equity markets.[9] The IFC data (denoted as S&P IFCG beginning with year 1999) in columns 8, 9 and 10 represent the same variables pertaining to the set of firms that the World Bank would classify as sufficiently liquid or marketable to be included in the emerging market index developed by the Bank.

Table 2 provides descriptive statistics on the variables that will be employed in our regression estimation. As expected, all the variables in Table 2 appear to exhibit a reasonable mean value, but with extreme values for the minimum and maximum.

[7] In the Factbook of year 2000 on Emerging Stock Markets published by S&P, the number of country's that are identified by the International Finance Corporation (IFC) as emerging markets are 54. However, a trade-off between the length of the time-series needed and the number of markets to be included in the analysis is unavoidable.

[8] Data for Portugal was not available for the year 1999. The values reported for Portugal are as of December 1998.

[9] This methodology for estimating volatility was originally suggested by Schwert (1989).

Table 1
Basic statistics of emerging markets (as of December 1999)

Country	Number of listed companies	Market cap. (mil. $)	Trading value (mil. $)	Turnover ratio	Turnover/ S.D. ratio	Mean monthly return (%)	Number IFC stocks	IFC cap. (%)	IFC trade (%)	P/E ratio	P/B ratio	Dividend yield	Exchange rate
Argentina	129	83 887	433	0.50	0.05	4.80	28	28.50	87.60	39.40	1.50	3.20	1.00
Brazil	478	227 962	11 249	5.30	0.52	24.00	90	67.30	37.30	23.50	1.60	3.20	1.79
Chile	285	68 228	412	0.60	0.14	5.20	48	70.80	74.70	35.00	17.00	3.00	529.80
China	950	330 703	16 374	4.00	0.36	−4.80	219	55.30	43.80	47.80	3.00	0.80	8.28
Colombia	145	11 590	88	0.80	0.07	−1.20	23	64.00	69.20	30.60	0.80	6.30	1875.00
Czech	164	11 796	304	2.70	0.29	2.50	28	81.50	99.50	−14.90	0.90	1.70	35.91
Greece	281	204 213	17 854	8.50	1.23	−3.10	59	51.60	33.00	55.60	9.40	1.10	329.51
Hungary	66	16 317	1222	8.00	0.91	18.50	15	84.60	88.40	18.10	3.60	1.10	254.02
India	5863	184 605	18 027	10.40	1.16	13.20	143	63.30	76.30	25.50	3.30	1.20	43.52
Indonesia	277	64 087	2202	3.70	0.33	16.00	55	59.40	62.70	−7.40	3.00	0.60	7050.00
Jordan	152	5827	34	0.60	0.22	3.30	40	78.60	42.10	14.10	1.50	2.70	0.71
Korea	725	308 534	80 591	26.90	2.28	3.20	162	86.40	72.20	−33.50	20.00	6.00	1137.80
Malaysia	757	145 445	3199	2.30	0.18	10.60	139	66.10	47.30	−18.00	1.90	1.40	3.80
Mexico	188	154 044	3383	2.40	0.30	16.20	57	77.80	92.00	14.10	2.20	0.90	9.48
Nigeria	194	2940	19	0.70	0.06	21.00	28	61.70	64.90	9.60	1.60	8.10	100.05
Pakistan	765	6965	2946	43.90	4.77	12.90	49	70.90	98.90	13.20	1.40	5.70	51.88
Peru	242	13 392	118	0.90	0.18	0.90	32	61.80	68.20	25.70	1.50	2.20	3.51
Philippines	226	48 105	1665	3.50	0.48	8.30	58	63.00	41.50	22.20	1.40	0.90	40.30
Poland	221	29 577	1256	4.60	0.52	15.40	33	71.60	23.00	22.00	2.00	0.90	4.14
Portugal[a]	135	62 954	3178	5.10	0.43	0.60	22	77.60	67.40	22.80	3.40	1.80	170.73
S. Africa	668	262 478	6122	2.50	0.42	13.10	64	46.50	67.00	17.40	2.70	2.30	6.16
Sri Lanka	239	1584	22	1.40	0.21	3.20	52	66.40	80.00	6.60	1.00	6.20	71.20

Table 1 *(Continued)*

Country	Number of listed companies	Market cap. (mil. $)	Trading value (mil. $)	Turnover ratio	Turnover/ S.D. ratio	Mean monthly return (%)	Number IFC stocks	IFC cap. (%)	IFC trade (%)	P/E ratio	P/B ratio	Dividend yield	Exchange rate
Taiwan	462	375 991	92 725	25.80	3.09	9.40	106	67.80	58.60	52.50	3.40	0.60	31.35
Thailand	392	58 365	2630	4.80	0.39	14.20	64	74.20	66.40	−12.20	2.10	0.30	37.58
Turkey	285	112 716	18 524	21.20	0.81	79.80	53	78.80	59.50	34.60	8.90	1.10	542 400.00
Venezuela	87	7471	42	0.60	0.04	5.00	16	59.10	36.80	10.80	0.40	6.20	648.75
Zimbabwe	70	2514	20	0.80	0.12	11.10	22	68.90	65.00	10.80	3.00	2.50	37.95

This table presents a snapshot as of December 1999 of the 27 emerging markets examined in this study.
[a] As of December 1998.

Table 2
Descriptive statistics for emerging equity markets

Variable	*N*	Mean	S.D.	Minimum	Maximum
Return (%)	2460	2.279	11.808	−40.100	135.200
MSCI (%)	96	1.195	3.611	−16.757	7.625
Turnover ratio	2460	5.085	6.826	0.000	61.800
Log trading value	2460	6.464	2.454	−1.204	12.094
Turnover/S.D.	2163	0.588	0.800	0.000	11.623
P/*B* ratio	2436	2.188	1.316	0.300	20.000
Market cap. (bil. $)	2460	10.1290	1.585	5.398	13.933

This table provides descriptive statistics of pooled monthly data for all 27 emerging equity markets over the period January 1992 through December 1999. Returns are monthly returns of stock indices, MSCI is the monthly change in MSCI. The turnover ratio is the ratio of trading value to market capitalization, trading value is the natural log of trading value in million dollars, turnover/S.D. is turnover ratio divided by S.D. calculated using a trailing 12 month returns. The *P*/*B* ratio is the price-to-book-value ratio, and market cap. is market capitalization value.

For instance, a mean monthly return of 2.279% is somewhat high, but still reasonable for that period of time. However, a maximum value of 135% in a given month appears unreasonable but it did occur.[10] It should be noted that variables expressed as a ratio are far less likely to suffer from extreme values than absolute value numbers. For instance, the turnover ratio, turnover–volatility and PB ratio are likely to behave better under statistical testing than the other non-ratio variables.

Table 3 presents the correlation coefficients among the three liquidity variables along with returns and other market variables. It is difficult to discern any particular pattern of association between the variables based on Table 3. As expected however, the liquidity measures are highly correlated with each other. A particularly significant

Table 3
Correlation coefficients among variables

	Return	MSCI	Turnover ratio	Trading volume	Turnover/ S.D.	*P*/*B* ratio	Market cap.
Return	1.00	0.31*	0.18*	0.06*	0.08	0.10*	0.01
MSCI		1.00	0.03	0.02	0.04	0.03	0.02
Turnover ratio			1.00	0.61*	0.85*	0.24*	0.35*
Log trading value				1.00	0.60*	0.27*	0.90*
Turnover/S.D.					1.00	0.20*	0.41*
P/*B* ratio						1.00	0.22*
Market cap.							1.00

This table reports correlation coefficients among variables measured monthly across all 27 emerging equity markets for the period January 1992 through December 1999. Return is monthly returns of stock indices, MSCI is the monthly change in MSCI, turnover ratio is the ratio of trading value to market capitalization, trading value is the natural log of trading value in million dollars, turnover/S.D. is turnover ratio divided by the S.D. of the trailing 12 month returns, *P*/*B* ratio is price-to-book-value ratio, and market cap. is market capitalization value. Significance at the 5% level is indicated by *.

[10] This value represents the monthly return for the market in China for August 1994.

correlation coefficient appears to be between the turnover ratio and stock returns. Another important coefficient to note is the high level of correlation between trading value and market capitalization. This high correlation between trading value and size of the market underscores the importance of controlling for size when this variable is used to measure liquidity.

3.2. Measures of stock market liquidity

Chordia et al. (2001) examine the time-series behavior of liquidity for stocks on the NYSE. They suggest several aggregate measures of market liquidity as well as several firm-specific variables related to bid-ask spreads as proxy for liquidity. Unfortunately, none of these bid-ask spread variables are likely to be available in an international context. Aggregate measures of market liquidity on a monthly basis were obtained from the Emerging Markets Database published annually by the World Bank.

Trading value of a given security is an increasing function of its liquidity, other things being equal (Amihud and Mendelson, 1986). Aggregated over the whole market, trading value provides a measure of a market's liquidity. Trading values are measured in million of US dollars using the exchange rate of each country. A more comparable measure of liquidity across markets is the *turnover ratio*. While such a measure does not directly capture the costs of buying and selling securities at quoted prices, averaged over a long time period, the turnover ratio is likely to vary with the ease of trading, hence with market liquidity.

Another less commonly used measure of market liquidity is the *turnover–volatility ratio*. To construct this measure we divide the turnover ratio by the S.D. of stock market returns. More liquid markets should be capable of handling high volumes of trading without large price swings. This measure is essentially a volatility-adjusted measure of a market's turnover ratio. In the context of emerging markets with relatively high levels of market volatility, this measure may be more appropriate to use in estimating the fundamental relation between liquidity and equity returns.

3.3. Market liquidity over time

The very nature of classifying an equity market as an 'emerging market' implies that it is gaining in quality and efficiency as time goes by. In fact, the work of Bekaert and Harvey (1997) clearly points out that the behavior of emerging markets is changing significantly over time with respect to their degree of integration with the global economy. It is, therefore, important to examine the possible changes in the liquidity of these markets over time and to explore the impact of such changes on equity returns.

To examine the time-series behavior of the liquidity variables, we run OLS regressions for the three liquidity variables against a time trend. Table 4 presents the estimated coefficients obtained from a panel regression using data for all of the 27 emerging markets for the entire sample period (January 1992 through December

Table 4
Time trend of liquidity variables

	Dependent variable		
	Turnover ratio	Trading value	Turnover/S.D.
Intercept	3.898* (18.721)	5.605* (56.013)	0.478* (20.103)
Time variable	0.024* (8.244)	0.017* (20.367)	0.002* (5.916)
Adj. *R*-squared	0.249	0.370	0.182

This table shows the results of time-series regression analysis to three liquidity variables, turnover ratio (turnover), trading value (trade) and turnover-to-volatility ratio (turnover/S.D.). We regress three liquidity variables on period variable for each emerging market, and report average regression coefficients and adjusted *R*-squared values. Significance at the 1% level is indicated by *.

1999). The results are quite compelling. All three liquidity variables are shown to exhibit an increasing trend over time. This indicates that as a group, emerging equity markets have, over the nineties, experienced increased levels of liquidity.

In order to better understand the behavior aggregate liquidity over time, we standardize the three liquidity variables by dividing each series by the initial monthly observation for each country. We then calculate the averages of the standardized variables for each month across all of the 27 emerging markets and plot them in Fig. 1. It is evident from the graph that all three liquidity measures have increased over time implying an overall enhanced liquidity for emerging equity markets over that period. This observed increase in the liquidity of emerging markets is likely to have important implications for both the equity returns of these markets as well as their behavior relative to the global economy over that time period.

While, in general, we document a significant increase in liquidity for emerging markets as a group, it is important to note that not all markets have experienced the same degree of liquidity improvements. To underscore the differences between the various markets, we regress the liquidity variables against a time dummy separately for each emerging market. Table 5 reports the estimated parameters along with their *t*-statistic and the *R*-squared for each country. As indicated by significant positive coefficients, improvements in liquidity over the period are observed for Brazil, Greece, Hungary, India, Nigeria, Pakistan, Portugal, S. Africa, Taiwan, Turkey and Zimbabwe. On the other hand, significant deterioration in liquidity over the same period is observed for Argentina, Columbia, Jordan, Mexico, Peru, Sri Lanka, Thailand and Venezuela. The remaining countries show mixed or statistically insignificant changes in their liquidity over time.

4. Methodology and empirical results

4.1. Panel data regressions

To estimate the relation between aggregate liquidity and stock returns, we first need to address several estimation issues in our time-series data. Using data for

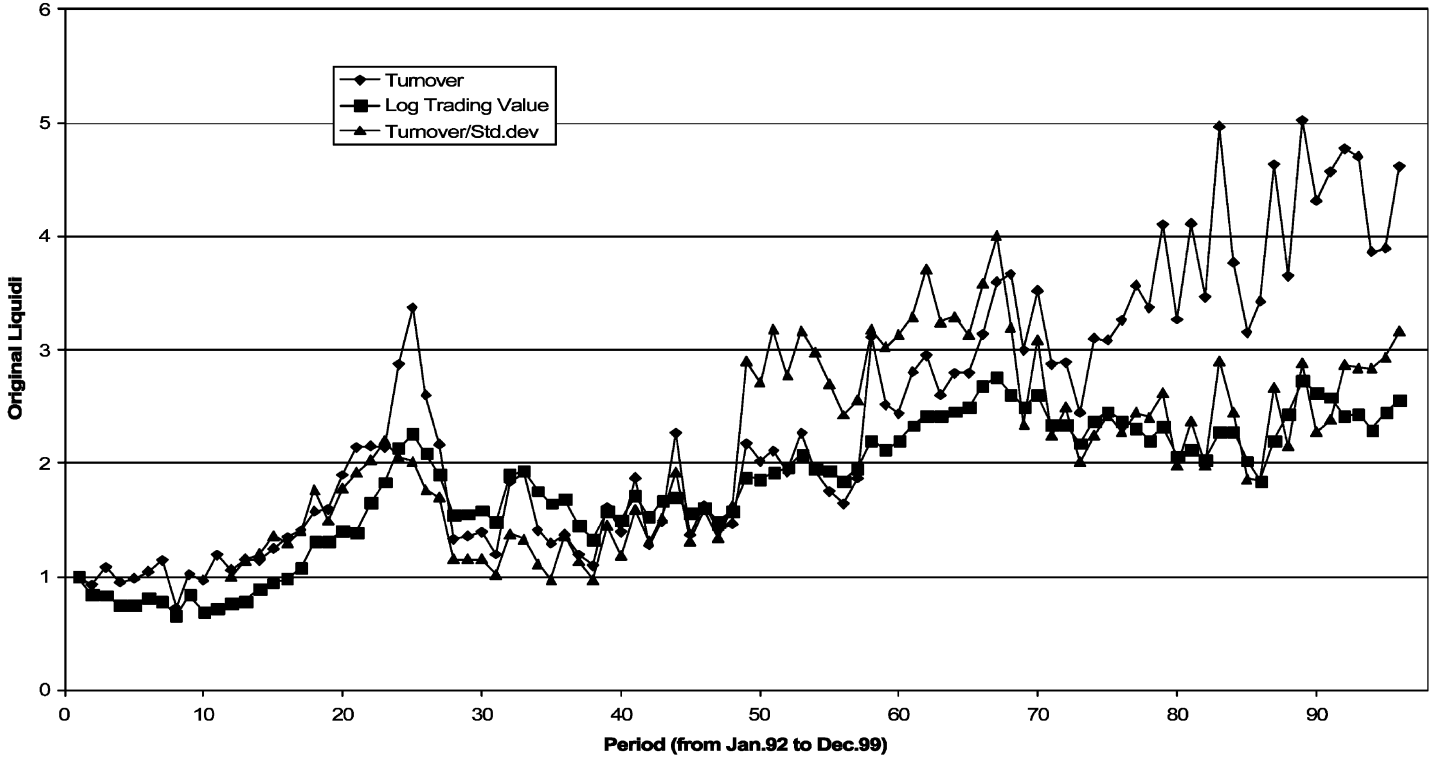

Fig. 1. Time trend of liquidity variables. This graph shows the time trend of the three liquidity variables averaged for all of the 27 emerging markets for the period January 1992 through December 1999. Each of the liquidity variables is standardized by dividing the series by the first period value for each country. The plot shows the average of each variable in each month across countries.

Table 5
Time trend of liquidity variables for each emerging market

Country	Liquidity variables			Country	Liquidity variables		
	Turnover	Trade	Turnover/S.D.		Turnover	Trade	Turnover/S.D.
Argentina	−0.033**	−0.001	−0.001	Mexico	−0.009*	−0.005**	−0.002*
	(−5.563)	(−0.478)	(−0.442)		(−2.327)	(−3.370)	(−2.236)
	0.240	−0.008	−0.010		0.044	0.098	0.045
Brazil	0.013**	0.019**	0.004*	Nigeria	0.005**	0.034**	0.002**
	(2.717)	(9.772)	(2.492)		(8.386)	(11.866)	(4.215)
	0.063	0.499	0.058		0.422	0.595	0.166
Chile	0.003	0.0098*	0.000	Pakistan	0.261**	0.033**	0.023**
	(1.643)	(4.258)	(0.664)		(10.699)	(22.229)	(9.183)
	0.018	0.153	−0.007		0.544	0.838	0.498
China	−0.034	0.033**	0.013*	Peru	−0.037**	0.006*	−0.003**
	(−0.609)	(8.348)	(2.337)		(−7.043)	(2.429)	(−4.331)
	−0.008	0.453	0.058		0.369	0.056	0.198
Colombia	−0.005**	0.004	−0.002**	Philippine	0.015**	0.017**	0.000
	(−3.019)	(1.857)	(−5.184)		(4.412)	(7.394)	(0.752)
	0.079	0.025	0.235		0.163	0.361	−0.005
Czech	0.013	0.001	−0.013**	Poland	−0.121**	0.028**	0.002
	(1.342)	(0.178)	(−6.849)		(−8.721)	(9.311)	(1.407)
	0.013	−0.017	0.489		0.475	0.508	0.013
Greece	0.097**	0.052**	0.008**	Portugal	0.048**	0.034**	0.012**
	(13.330)	(26.021)	(4.955)		(5.943)	(14.018)	(4.964)
	0.650	0.877	0.219		0.293	0.702	0.247
Hungary	0.129**	0.084**	0.012**	S. Africa	0.038**	0.028**	0.004**
	(14.177)	(28.341)	(12.854)		(16.766)	(24.752)	(5.300)
	0.707	0.906	0.695		0.798	0.896	0.311
India	0.048**	0.022**	0.008**	Sri Lanka	−0.008*	−0.007*	−0.001
	(8.100)	(11.713)	(10.854)		(−2.382)	(−2.211)	(−1.512)
	0.405	0.589	0.582		0.053	0.045	0.018
Indonesia	0.016**	0.016**	−0.004**	Taiwan	0.101**	0.017**	0.023**
	(2.895)	(5.494)	(−2.673)		(2.895)	(8.395)	(3.267)
	0.072	0.235	0.068		0.072	0.422	0.103
Jordan	−0.030**	−0.011**	−0.004**	Thailand	−0.059**	−0.014**	−0.006**
	(−7.567)	(−5.344)	(−3.684)		(−3.979)	(−6.778)	(−4.818)
	0.372	0.225	0.130		0.135	0.321	0.209
Korea	0.146**	0.009**	−0.007*	Turkey	0.063**	0.024**	0.001
	(5.617)	(3.993)	(−2.209)		(4.243)	(12.682)	(0.638)
	0.243	0.136	0.044		0.152	0.627	−0.007
Malaysia	−0.018	−0.001	−0.015**	Venezuela	−0.012**	−0.005	−0.002**
	(−1.699)	(−0.159)	(−5.735)		(−3.038)	(−1.473)	(−4.211)
	0.019	−0.010	0.275		0.080	0.012	0.166
				Zimbabwe	0.008**	0.028**	0.001**
					(5.690)	(8.875)	(3.513)
					0.248	0.450	0.119

For each country, we regressed a liquidity variable on a time variable, and report parameter estimate for the time variable. Values in parenthesis are the *t*-statistic and the values below them are the adjusted *R*-squared value of the model. Significance at the 1% and 5% level is indicated by ** and *, respectively.

stock returns, liquidity measures, and other explanatory variables without appropriate adjustments may cause several potential sources of estimation biases. First, the potential presence of a time trend to liquidity may create a spurious correlation if both the dependent and independent variables share a trend. Second, serial correlation in stock returns and liquidity has been widely documented. Third, serial patterns in returns and liquidity have also been shown to exist for mature markets.

To account for these potential estimation issues, we filter all variables by regressing on monthly dummies, a time trend, the square of a time trend, and a financial-crisis dummy.[11] We then use the adjusted series to estimate the relationship between liquidity and stock returns using OLS residuals from the regression.[12] Fig. 2 shows the adjusted series of liquidity variables. Compared to Fig. 1, which shows the unadjusted series of values, Fig. 2 shows that adjusted liquidity variables have been reasonably filtered. All empirical tests in Section 4 use the adjusted values of variables (stock returns, liquidity measures, book-to-market, and changes in exchange rates).

In order to establish the time-series relationship between liquidity and the stock returns for emerging equity market, we use panel data for all 27 markets and across the entire sample period. Using monthly return observations for all emerging countries over the period January 1992 through December 1999, we regress market returns and market-model-adjusted returns on the three liquidity measures. Table 6 presents the estimated regressions. The first three columns are the estimated parameters for three regression models (M1, M2 and M3) each using an alternative liquidity variable (turnover, trading value and turnover/S.D., respectively). All three models use monthly returns as the dependent variable.

The second set of three regression models (M4, M5 and M6) shown in Table 6 differ from the earlier three models only in the use of world market beta adjusted returns as the dependent variable instead of monthly returns. Based on World Bank classifications, we classified the 27 countries into four regional groups: Asia, Middle East and Africa, Europe, and Latin America. World market betas were estimated for each country using the relevant regional MSCI. The beta coefficient for each country was estimated using the following market model regressions:

$$r_{it} = \alpha_i + \beta_i r_{Mt} + \varepsilon_{it}, \tag{1}$$

where r_{it} is the return on country i's index in month t and r_{Mt} is the monthly return on regional MSCI, α_i and β_i are constant coefficients and ε_{it} are the residuals. The market model is estimated for each country over the whole sample period, January 1992 through December 1999. We then calculated the market-model-adjusted returns as:

$$AR_{it} = r_{it} - (\alpha_i + \beta_i r_{Mt}) \tag{2}$$

[11] A financial crisis dummy takes the value of 1 for years 1997, 1998 and 1999, and 0 otherwise.

[12] We checked for the stationarity of the adjusted series using the augmented Dickey–Fuller Test, and found that the hypothesis of a unit root is rejected at the 1% significance level.

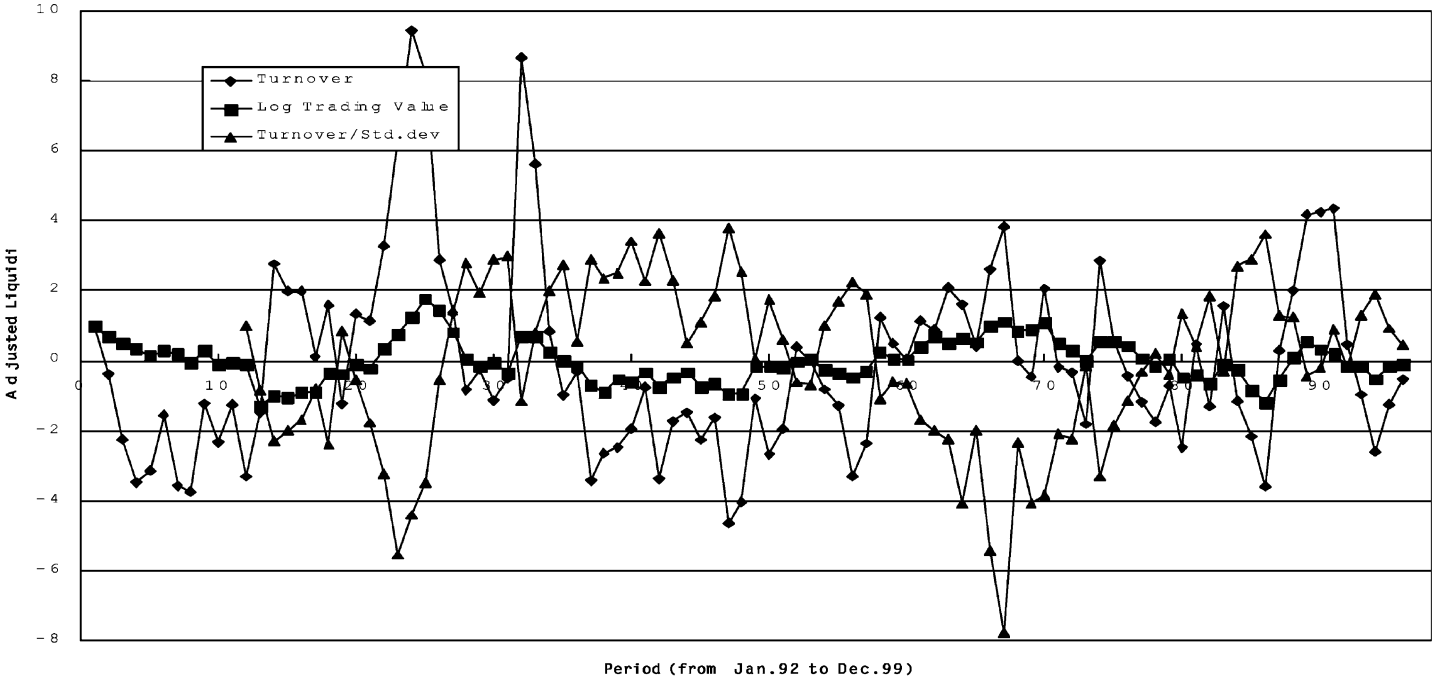

Fig. 2. Adjusted liquidity variables. This graph shows the de-trended liquidity variables averaged for all of the 27 emerging markets for the period January 1992 through December 1999. The three variables are filtered by regressing on a time trend, the square of a time trend, a financial crisis dummy and monthly dummies.

Table 6
Panel data regressions

	Dependent var. = Stock returns			Dependent var. = Market model adj. returns		
	M1	M2	M3	M4	M5	M6
Intercept	−0.587 (0.507)	−1.544 (−1.294)	−1.567 (−1.24)	0.735 (0.644)	−0.162 (−0.137)	−0.512 (−0.417)
MSCI	0.477** (11.215)	0.507** (11.569)	0.531** (11.719)			
Turnover	0.703** (14.262)			0.688** (14.147)		
Log trading value		1.750** (6.542)			1.679** (6.357)	
Turnover/S.D.			2.841** (6.350)			2.739** (6.178)
Exchange rate	0.097** (4.000)	0.109** (4.348)	0.089** (3.563)	0.105** (4.398)	0.116** (4.679)	0.096** (3.867)
Country dummies	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
Adj. *R*-squared	0.164	0.109	0.119	0.074	0.013	0.016
No. observations	2433	2433	2163	2433	2433	2163

Using monthly return observations for 27 emerging countries over the period January 1992 through December 1999, we regress returns and market-model-adjusted returns on three liquidity measures, turnover, trading value and turnover/S.D. The first three columns are the estimated parameters for three regression models (M1, M2 and M3) each using monthly returns as the dependent variable. The second set of three regression models (M4, M5, M6) differ from the earlier three models only in the use of world market beta adjusted returns as the dependent variable instead of monthly returns. Significance at the 1% and 5% level is indicated by ** and *, respectively.

for each month t for each country i, where the parameters α_i and β_i are estimated by the market model in Eq. (1).

The regression results show that all three liquidity variables have a positive correlation with stock returns even after controlling for world market returns and exchange rates. The estimated regression coefficients for all of the three liquidity measures are positive and statistically significant at the 1% significance level. In the panel data regressions, we did not include the price to book ratio or market capitalization, because these variables are implicitly incorporated in stock prices and thus will cause spurious correlation with stock returns.[13]

The estimated coefficients using the risk-adjusted returns are similar to the estimates using market returns. As shown in Table 6, the estimated parameters for models M4, M5 and M6 indicate that market-model adjusted returns are positively correlated with all measures of market liquidity. The estimated coefficients are all significant at the 1% level. Among the three measures of market liquidity used, the turnover ratio is shown to be the most effective explanatory variable for stock market returns.

4.2. Across-country effects: period-by-period regressions

Having established a positive relation between stock returns and liquidity, we now focus on the question of whether this positive correlation between stock returns and market liquidity is driven by cross-sectional effects or by time-series effects. To examine whether countries with higher levels of market liquidity would also have higher stock valuation, we conducted Fama and MacBeth (1973) regressions for each month. The Fama–MacBeth estimation procedure should reduce the problem of serial correlation in the residuals of the OLS regression. For each of the 96 months in our sample period, we regressed stock returns on the liquidity measures.

Table 7 provides the average regression coefficients and the adjusted R-squared values for all of the six regression models discussed above. The t-values for the coefficients are estimated by

$$t = \frac{\bar{\beta}}{\sigma/\sqrt{N-1}}$$

where $\bar{\beta}$ and σ is the mean and S.D. of the regression coefficients, respectively, and N is 96, the total number of months in the sample.

The regression coefficients in Table 7 show that in general, stock market returns are positively correlated with all three measures of market liquidity. Similar results are also obtained for the relation between the liquidity variables and market-model adjusted returns. It is important to note that while all three liquidity measures are

[13] Those variables are included in cross-sectional Fama–MacBeth regressions, which are reported in Table 7.

Table 7
Period-by-period regressions (across-country effect)

	Dependent var. = Stock returns			Dependent var. = Market model adj. returns		
	M1	M2	M3	M4	M5	M6
Intercept	−1.327 (−0.661)	−0.676 (−1.330)	−0.233 (−0.439)	−0.362 (−0.856)	−0.383 (−0.887)	−0.274 (−0.593)
Turnover	0.180** (3.074)			0.149** (2.632)		
Log trading value		0.664* (2.355)			0.361 (1.354)	
Turnover/S.D.			0.253 (0.559)			0.711 (1.609)
Market cap.	−0.265 (−1.398)	−0.971* (−2.178)	−0.020 (−0.106)	−0.413* (−2.267)	−0.714 (−1.645)	−0.359* (−2.095)
P/B ratio	0.553* (2.187)	0.622** (2.474)	0.531 (1.859)	0.735** (3.153)	0.815** (3.518)	0.679** (2.590)
Exchange rate	0.243** (2.699)	0.218* (2.344)	0.171 (1.732)	0.009 (0.095)	−0.015 (−0.161)	−0.053 (-0.513)
Adj. R-squared	0.183	0.176	0.149	0.153	0.142	0.130

For each of the 96 months in our sample period, we conduct Fama–MacBeth regressions of stock returns on the liquidity measures. This table provides the mean regression coefficients and the adjusted R squared values for all of the six regression models that are explained in Table 6. Significance at the 1% and 5% level is indicated by ** and *, respectively.

positively related with returns, only the turnover ratio variable is statistically significant at the 1% level for both returns and adjusted returns.

4.3. Within-country effects: country-by-country regressions

We now examine the within-country effects of liquidity. For each of the 27 emerging countries, we regressed the monthly time-series stock returns on the three alternative liquidity measures. Table 8 reports the mean regression coefficients and the adjusted R-squared values for all of the six regression models.

The estimated regression coefficients in Table 8 show that all three measures of market liquidity are positively correlated with stock returns as well as with market-model adjusted returns. While all three liquidity measures show a positive relation to stock returns, only the turnover ratio and the turnover–volatility ratio are statistically significant at the 1% level for both market returns and adjusted returns. The trading value measure does not exhibit a statistically significant relation with returns, most likely because of the significant differences in the size of these markets.

Table 8
Country-by-country regressions (within-country effect)

	Dependent var. = Stock returns			Dependent var. = Market model adj. returns		
	M1	M2	M3	M4	M5	M6
Intercept	2.008 (0.740)	−4.097* (−2.233)	0.896 (0.512)	1.381 (0.575)	−4.347** (−2.938)	0.103 0.059
MSCI	0.626** (6.575)	0.635 (6.474)	0.640** (7.345)			
Turnover	1.533 (5.194)			1.508** (5.504)		
Log trading value		3.616** (5.453)			3.470** (6.108)	
Turnover/S.D.			5.582** (4.222)			4.168** (3.325)
Exchange rate	−2.626 (−1.667)	−5.014** (−3.185)	−1.485 (−1.141)	−2.594 (−1.688)	−5.068** (−3.750)	−1.709 (−1.303)
Adj. *R*-squared	0.180	0.181	0.169	0.113	0.119	0.121

For each of the 27 emerging countries, we regressed the monthly time-series stock returns on the three alternative liquidity measures. This table reports the mean regression coefficients and the adjusted *R* squared values for all of the six regression models. Significance at the 1% and 5% level is indicated by ** and *, respectively.

4.4. Robustness tests: causality analysis and regional classification

While we document a strong contemporaneous relation between measures of market liquidity and equity returns, we do not in any way suggest that there is a causal relation between the two variables. To examine if there might be a causal relation between these two variables and what the direction of the causality might be, we conduct a multivariate Granger (1969) causality test between liquidity and stock returns using a VAR model comprised of liquidity, stock return, price-to-book, market capitalization, regional MSCI, and exchange rate change. We average these variables across countries in each of the four regions, and then perform separate multivariate VARs for each region.

Let $x_t = (\textit{return, liquidity, MSCI, Mkt Cap, PB, exchange rate Change})'$. Then a general VAR ($p$) representation can be expressed as

$$x_t = c + \Phi_1 x_{t-1} + \Phi_1 x_{t-2} + \cdots + \Phi_1 x_{t-p} + e_t \tag{3}$$

where

$$\Phi_j = \begin{bmatrix} \phi_{11j} \cdots \phi_{1nj} \\ \vdots \quad\quad \vdots \\ \phi_{n1j} \cdots \phi_{nnj} \end{bmatrix}, \quad j = 1,2,\ldots,p$$

$$c = (c_1, c_2, \ldots, c_n)'$$

$$e_t = (e_{1t}, e_{2t}, \ldots, e_{nt})'$$

$$E(e_t) = 0; \; E(e_t e'_s) = \begin{cases} \Omega, & t = s \\ 0, & t \neq s \end{cases}$$

Each of the three liquidity variables along with both the market returns and abnormal returns are alternatively used in the analysis. When the abnormal returns are used in the model, we exclude the regional MSCI in the x_t vector because the effect of world market is already reflected in estimating abnormal returns. We choose two lags ($p = 2$, 2 months) for our analysis. The results of the VAR causality analysis are reported in Table 9.

The results in Table 9 shows that trading values (natural log of trading values in $) Granger-cause stock returns in Asia, and that stock returns Granger-cause trading values in all regions. The abnormal returns, however, are Granger-caused by trading values only in Middle East and Africa. Furthermore, turnover ratio or turnover-to-volatility measure does not have any significant causality relationship with either returns or abnormal stock returns. The result implies that the causality relationship between liquidity and stock return is not significant, and that the positive relationship between liquidity and stock return comes from a contemporaneous relation between the two variables.

The second robustness test was done for regional classifications. There is reason to suspect that there might be some regional or geographical similarities or associations within markets. For instance, one might expect that emerging markets that are within a particular region such as Latin America or Europe to have similar characteristics. In this subsection we examine this proposition. In the interest of brevity, and also because it proved to be the most significant variable in earlier regressions we shall report results only for the turnover ratio as the liquidity measure in this segment of the analysis.

For each emerging market, Table 10 reports the regression coefficients for Model 1 and Model 4, which use the turnover ratio as the liquidity measure. The first entry of each cell is the regression coefficient, followed by the *t*-value, and then the adjusted *R*-squared value. The estimates in Table 10 show that the positive correlation

Table 9
Multivariate Granger causality test

Region	Liquidity	Return	Liquidity causes return		Return causes liquidity	
			Test stat.	*P*-value	Test stat.	*P*-value
Asia	Turnover	Return	1.671	0.194	1.195	0.308
		Abnormal	1.565	0.215	0.298	0.743
	Trade	Return	4.056	0.021*	3.479	0.035*
		Abnormal	0.960	0.387	2.296	0.107
	Turnover/S.D.	Return	0.766	0.468	0.028	0.973
		Abnormal	0.681	0.509	0.322	0.726
M. East and Africa	Turnover	Return	0.989	0.376	2.836	0.064
		Abnormal	1.106	0.335	0.997	0.373
	Trade	Return	0.804	0.451	5.130	0.008**
		Abnormal	1.060	0.351	3.376	0.039*
	Turnover/S.D.	Return	0.255	0.776	0.863	0.426
		Abnormal	0.483	0.619	0.426	0.655
Latin America	Turnover	Return	0.441	0.645	1.131	0.327
		Abnormal	0.367	0.694	0.764	0.469
	Trade	Return	0.578	0.563	6.381	0.003**
		Abnormal	1.043	0.357	4.156	0.019
	Turnover/S.D.	Return	0.626	0.538	0.610	0.546
		Abnormal	0.046	0.956	0.871	0.422
Europe	Turnover	Return	1.927	0.152	0.821	0.443
		Abnormal	1.177	0.313	0.340	0.713
	Trade	Return	0.972	0.382	3.619	0.031*
		Abnormal	1.195	0.307	1.799	0.171
	Turnover/S.D.	Return	0.030	0.971	1.017	0.366
		Abnormal	0.020	0.980	1.442	0.243

This table reports results of multivariate Granger causality tests between liquidity and stock returns using a VAR model comprised of liquidity, stock returns, price-to-book, market capitalization, regional MSCI, and exchange rate change. We implement the VAR by averaging these variables across countries in each of the four regions, and then perform separate VARs for each region. Significance at the 1% and 5% levels are indicated by ** and *, respectively.

between market liquidity and stock returns are not driven by any one specific country or geographical region. There are no apparent patterns within or across regions with respect to either the significance of the coefficients or the strength of the relation as measured by *R*-squared.

5. Summary and conclusions

Using data for 27 emerging equity markets for the period January 1992 through December 1999, we find that stock returns in emerging countries are positively correlated with market liquidity as measured by turnover ratio, trading value as well as turnover–volatility multiple. The results hold in both cross-sectional and time-series analyses, and are quite robust even after we control for world market beta,

Table 10
Country-by-country regressions with geographical classification

Region	Country	M1	M4
Asia	China	0.272*	0.307**
		2.345	2.769
		0.140	0.148
	India	2.635**	2.707**
		3.898	4.037
		0.122	0.152
	Indonesia	1.562**	1.601**
		2.625	2.740
		0.170	0.090
	Korea	0.474**	0.441**
		3.969	3.837
		0.396	0.167
	Malaysia	1.235**	1.122k**
		3.568	3.241
		0.286	0.157
	Pakistan	0.494**	0.544**
		3.116	3.407
		0.066	0.085
	Philippines	2.973**	2.739**
		2.751	2.549
		0.246	0.072
	Sri Lanka	5.487**	5.511**
		3.218	3.252
		0.166	0.154
	Taiwan	0.551**	0.480**
		5.231	4.560
		0.344	0.215
	Thailand	0.969**	1.082**
		3.983	4.526
		0.252	0.191
M. East and Africa	Jordan	0.628*	1.060**
		2.054	3.670
		0.053	0.163
	Nigeria	1.660	1.888*
		1.951	2.271
		0.084	0.086
	S. Africa	2.366	0.465
		1.432	0.275
		0.371	0.046
	Turkey	1.307**	1.301**
		3.209	3.102
		0.205	0.174
	Zimbabwe	2.906*	3.032*
		2.052	2.179
		0.111	0.066
Latin America	Argentina	−0.564	−0.323
		−1.462	−0.841
		0.352	0.099
	Brazil	5.516**	5.015**

Table 10 *(Continued)*

Region	Country	M1	M4
		3.595	3.196
		0.325	0.298
	Chile	−0.224	0.467
		−0.249	0.517
		0.149	0.033
	Colombia	0.928	1.362
		0.790	1.129
		−0.012	−0.013
	Mexico	0.835	0.776
		1.401	1.345
		0.323	0.038
	Peru	−0.033	−0.044
		−0.041	−0.055
		0.096	0.065
	Venezuela	2.443	2.331
		1.915	1.849
		0.130	0.083
Europe	Czech	1.403*	1.313*
		2.040	1.979
		0.063	0.014
	Greece	1.686**	1.494**
		3.547	3.197
		0.266	0.179
	Hungary	1.221	1.098
		1.878	1.696
		0.235	0.047
	Poland	2.691**	2.581**
		3.773	3.665
		0.285	0.227
	Portugal	−0.022	0.360
		−0.054	0.968
		0.425	0.172

For each emerging market, this table reports the regression coefficients for Model 1 and Model 4 in Table 8, which uses the turnover ratio as the liquidity measure. The first entry of each cell is the regression coefficient followed by the *t*-value, and then the adjusted *R*-squared. Significance at the 1% and 5% levels are indicated by ** and *, respectively.

market capitalization and price-to-book ratio. The positive correlation between stock returns and market liquidity in a time-series analysis is consistent with the findings in developed markets. However, the positive correlation in the cross-sectional analysis appears at odds with market microstructure theory that has been empirically supported by studies on developed markets.

The positive correlation found between stock returns and liquidity in the cross-sectional analysis is also supportive of the view that emerging equity markets have a lower degree of integration with the global economy. The degree of integration of a given equity market with the global economy has important implications for international portfolio diversification. Bekaert and Harvey (1997) provide evidence

on the degree of integration of emerging equity markets with the world economy, and note that this degree of integration varies significantly over time.

An important component of our study was to examine the time-series behavior of liquidity for emerging equity markets. We document a significant rise in the overall level of liquidity of emerging equity markets over the period 1992–1999. If enhanced market liquidity is tantamount to increased economic development and hence a stronger relationship to the global economy, our findings are consistent with previous literature that suggests an increasing correlation structure between emerging equity markets and the global economy.

Whereas our study focuses on *long-run* effects of emerging stock markets, which cannot be solely attributed to information effects from trading activity, our overall findings are consistent with the high-liquidity return premium hypothesis in stock prices, originally suggested by Ying (1966) and later extended by Gervais et al. (2001). They show that increases (decreases) in daily trading volume tend to be followed by a rise (fall) in the stock price. Their results imply that trading activity contains new information about the future evolution of stock prices.

While we document a strong contemporaneous relation between measures of market liquidity and equity returns, this does not imply that there is a causal relation between the two variables. To examine if there might be a causal relation between liquidity and stock return, and what the direction of the causality might be, we conducted a Granger causality test using a multivariate VAR model for four regions pertaining to emerging equity markets. Neither of the variables examined was found to significantly Granger cause the other variables in any consistent way across all markets.

Our findings have important implications to both policy makers and portfolio managers. The direct and highly significant relationship between equity returns and liquidity in emerging markets should prompt policy makers to implement policies that will enhance liquidity and promote growth. Portfolio managers on the other hand, should incorporate the liquidity characteristics of individual markets as they consider their global portfolio allocation strategies.

Acknowledgments

We thank Lester Hadsell, Javier Estrada (the editor), David Smith and an anonymous referee for helpful comments and suggestions on earlier drafts of this manuscript.

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