11-2008

Market Segmentation, Liquidity Spillover, and Closed-End Country Fund Discounts

Sai Pang (Justin) CHAN
Singapore Management University, jspczz@gmail.com

RAVI JAIN
National University of Singapore

YIHONG XIA
Wharton School, University of Pennsylvania

Available online at www.sciencedirect.com
ScienceDirect
ELSEVIER
Journal of Financial Markets 11 (2008) 377–399
Journal of FINANCIAL MARKETS
www.elsevier.com/locate/finmar

Market segmentation, liquidity spillover, and closed-end country fund discounts ☆

Justin S.P. Chan[a,1], Ravi Jain[b,*], Yihong Xia[c,2]

[a]Finance Department, Lee Kong Chian School of Business, Singapore Management University, 50 Stamford Road, Singapore 178899
[b]Department of Finance, National University of Singapore Business School, 1 Business Link, Singapore 117592
[c]Finance Department, The Wharton School, University of Pennsylvania, Philadelphia, USA

Available online 29 January 2008

Abstract

In a segmented international capital market, the illiquidity of a country fund in the market in which its shares are traded affects only the share price of the fund (*S*), while the illiquidity of its underlying assets in the market in which these are traded affects only the fund net asset value (*NAV*). In an integrated market, illiquidity in one market can easily spill over to another and affect both the fund share price and its underlying asset value. It follows that the closed-end country fund premium, $P \equiv \ln(S) - \ln(NAV)$, is negatively (positively) affected by the fund (underlying asset) illiquidity in segmented capital markets, but has only an ambiguous association with either fund or underlying asset illiquidity in an integrated market. Empirical evidence for the 8/1987 to 12/2001 period from

☆Some earlier drafts of this paper were circulated under the title "Illiquidity and Closed-End Country Fund Discounts." We are extremely grateful to Michael Brennan, Avanidhar Subrahmanyam (the editor), and an anonymous referee for many helpful comments and suggestions. We also thank Yakov Amihud, Doron Avramov, Marshall Blume, Jay Choi, Bhagwan Chowdhry, Craig Doidge, Andrew Karolyi, Karen Lewis, Kai Li, Francis Longstaff, D. K. Malhotra, Rossen Valkanov, Hong Yan, and seminar participants at the American Finance Association 2005 Annual Meeting, the Asian Finance Association 2005 Annual Meeting, Centre for Analytical Finance, Indian School of Business, Summer Research Conference 2005, Singapore Management University, University of California, Irvine, University of Toronto, and the Wharton Brown Bag Seminar for helpful comments. We thank Zhihua Qiao, Huarong Tang, and Sehyun Yoo for excellent research assistance and Lipper Funds for kindly providing relevant closed-end fund data. Jain gratefully acknowledges financial support from CIBER at Temple University. Xia gratefully acknowledges financial support from the Wharton-SMU Research Center of the Singapore Management University and the NASDAQ fellowship from the Rodney L. White Center at the Wharton School.

*Corresponding author. Tel.: +65 6516 7947; fax: +65 6779 2083.
E-mail addresses: justinchan@smu.edu.sg (J.S.P. Chan), bizrj@nus.edu.sg (R. Jain).
[1]Tel.: +65 6828 0718; fax: +65 6828 0777.
[2]Deceased.

1386-4181/$ - see front matter
doi:10.1016/j.finmar.2008.01.005

U.S.-traded single-country closed-end funds shows that the fund premium has a negative (positive) association with the fund (underlying asset) illiquidity, and the relation is much stronger for funds investing in segmented markets. The results suggest that illiquidity plays a significant role in explaining closed-end country fund premia.

JEL classification: G10; G12

Keywords: Closed-end funds; Fund premium; Liquidity; Asset pricing

1. Introduction

A closed-end fund is a firm that issues shares and uses the proceeds to invest in the shares of other firms. A closed-end *country* fund issues shares in one country such as the U.S. (the share or host market) and invests the proceeds in the shares of companies in a specific foreign country such as Korea (the asset, foreign, or home market). Closed-end funds typically issue and maintain a fixed number of shares. In general, these shares are traded at prices (S) different from the net asset value per share (NAV), which is announced at regular intervals (usually weekly or daily). Defining $P \equiv \ln S - \ln NAV$, the fund is said to sell at a premium (discount) when $P > 0$ ($P < 0$). In what follows, we shall refer only to the fund premium noting that a discount is a negative fund premium.

Closed-end fund premia are often cited as evidence of the limits to arbitrage and of investor irrationality. In an influential paper, Lee, Shleifer, and Thaler (1990) identify four empirical regularities associated with the fund premium: (1) closed-end fund shares are generally issued at a positive premium[3]; (2) they often trade at a negative premium; (3) the premium varies widely over time and across funds; and (4) the share price converges to NAV at liquidation or open-ending.

Theories based on frictions such as agency costs, taxes, market segmentation, and misvaluation of underlying assets have had some success in explaining the first two empirical regularities, but these theories cannot explain the wide variation of fund premia. For example, Bonser-Neal, Brauer, Neal, and Wheatley (1990) find a significant relation between premia on country funds and announcements of changes in foreign investment restrictions, but investment restrictions can explain only large positive premia. Ross (2002) argues that the fund premium is related to management fees and dividends, but Malkiel (1977) finds no correlation between U.S. closed-end fund premia and fund expense ratios. Barclay, Holderness, and Pontiff (1993) examine the relation between block ownership and premia, and Wermers, Wu, and Zechner (2004) investigate the dynamics of premia surrounding the event of management replacement, but neither study explains the wide variation of fund premia. Similarly, explanations based on the investor sentiment

[3]Weiss (1989) and Hanley, Lee, and Seguin (1994) provide empirical evidence of closed-end fund premium at the issuance, and initial price stabilization behavior provided by the lead underwriters. Cherkes (2003) argues that this special feature of buyers paying the IPO costs via IPO over-pricing with the underwriters providing prolonged after-market price support as a supplement to the IPO over-pricing is neither anti-competitive nor predatory. Cherkes, Sagi, and Stanton (2005) contend that the patterns observed in closed-end fund IPO behavior, and the observed behavior of the CEF discount, result from a tradeoff between the liquidity benefits of investing in the CEF and the fees charged by the fund's managers.

hypothesis have had some success in accounting for the co-movement of fund premia, but even these explanations do not explain the wide variation of fund premia.[4]

Thus, the wide variation in fund premia remains largely unexplained. In this paper, we provide a simple explanation that is based on the relative liquidity of the fund and its underlying assets. Liquidity is a multi-dimensional attribute of an asset that includes the cost of a transaction, the ability to trade promptly, the ease with which large quantities can be traded, and the impact of trading on prices. Financial assets with similar, or even identical, payoffs often differ in liquidity, and several studies have shown that illiquid assets tend to have lower prices and higher returns.

An important feature of closed-end funds is that the shares and the underlying assets are close but not perfect substitutes, and are typically traded with different levels of liquidity. To the extent that liquidity affects asset prices, we should expect fund premia to reflect the difference between the liquidity of the fund and that of its underlying assets, and to vary over time as their relative liquidity varies. The negative relation between illiquidity and asset prices found in U.S. bond and stock markets suggests that high fund illiquidity is likely to reduce the share price and thus decrease the fund premium while high underlying asset illiquidity is likely to reduce the net asset value and thus increase the fund premium.[5] Although this is true of domestic as well as country funds, we restrict our analysis to country funds because the effect of illiquidity on fund premia is clearer and easier to detect when the shares and the underlying assets are traded in different markets.

We do not claim that variation in liquidity is the *only* explanation for the wide variation of closed-end fund premia. Using closed-end fund data for the 8/1987–12/2001 period we show that the relative illiquidity of the fund and its underlying assets has a statistically significant and economically important relation to fund premia even after controlling for other variables that have been proposed in previous studies, such as the expense ratio, dividend yield, size, and age of the fund, as well as a proxy for investor sentiment. So it is unlikely that our illiquidity measures are proxying for other known determinants of premia or discounts.

The association between premium and illiquidity is affected by the degree of market segmentation and the ease with which liquidity shocks are transmitted between markets. We split the 41 country funds in our sample into two groups according to the degree of segmentation between the share (U.S.) market and the corresponding asset (foreign)

[4]The investor sentiment hypothesis is based on the notion that closed-end fund shares are mainly held by individual investors, many of whom are irrational and driven by sentiment. Theoretical models of this include DeLong, Shleifer, Summers, and Waldmann (1990) and Palomino (1996), among others. Lee, Shleifer, and Thaler (1991), Hardouvelis, La Porta, and Wizman (1994), Klibanoff, Lamont, and Wizman (1998), Bodurtha, Kim, and Lee (1995), and Pontiff (1996, 1997) provide empirical evidence that investor sentiment explains the co-movement in closed-end fund discounts. However, Elton, Gruber, and Busse (1998) and Gemmill and Thomas (2002) cast doubt on the investor sentiment explanation of closed-end fund premia or discounts. In addition, Dimson and Minio-Kozerski (1999) point out that the sentiment hypothesis is inconsistent with the empirical evidence on UK closed-end funds, which are largely dominated by institutional investors.

[5]Datar (2001) makes a similar argument. Using closed-end fund data for 18 domestic equity funds and 90 bond funds in the 1988–1991 period, he shows that within each category of funds the closed-end fund premium increases as the liquidity of the funds' shares increases. However, he does not explicitly examine the liquidity of the underlying assets. Our analysis is more comprehensive because we control for both fund and underlying asset liquidity and empirically demonstrate that it is *relative* liquidity that affects fund premia. In a recent paper, Manzler (2005) also does an analysis similar to ours using data for 20 domestic equity funds in the 1995–2003 period. He shows that the fund premium is higher for funds with a managed distribution plan and it is increasing in the illiquidity of the fund relative to its portfolio illiquidity. However, he does not control for other factors that have been theoretically and/or empirically shown to affect closed-end fund discount behavior.

market. The first group consists of 15 funds that invest in open economies whose markets are likely to be integrated with the U.S. market, and the second group consists of 26 funds that invest in emerging markets that are mostly segmented from the U.S. market. We find that for the second group of funds, the fund illiquidity is negatively associated with the premium while the underlying asset illiquidity is positively associated with the fund premium, which is consistent with our hypothesis that if the asset market is segmented from the share market, high underlying asset illiquidity increases the fund premium and high fund illiquidity decreases the fund premium. On the other hand, the association between illiquidity and the fund premium is more mixed for funds investing in integrated markets in which investors are able to switch between the fund shares and its underlying asset portfolio, so that liquidity in one market can easily spill over to the other.

This study's results have implications that extend beyond closed-end country funds. They provide further evidence of the negative effect of illiquidity on asset prices, and they provide an explanation for the effect of location of trade on asset prices. For example, there are significant differences between the prices of different classes of shares used by "Siamese-twin" companies such as Royal Dutch and Shell[6] and also between ADRs and their corresponding asset market shares. Our results suggest that liquidity differences between the two markets may also explain these price differences. Indeed, Gagnon and Karolyi (2004) find that illiquidity in the U.S. and the foreign market is significantly related to the price difference between ADRs and their asset market counterparts.[7]

The remainder of the paper is organized as follows. In Section 2, we motivate the empirical analysis by linking fund liquidity in the share (U.S.) market and underlying asset liquidity in the asset (foreign) market to country fund premia. In Section 3, we provide detailed information on the construction of the illiquidity measures. In Section 4, we discuss the data on closed-end country fund premium and other control variables and report summary statistics. In Section 5, we report empirical findings and their implications. Section 6 summarizes and concludes the paper.

2. Market segmentation and the effect of liquidity on fund premium

The theoretical analyses of Constantinides (1986) and Vayanos (1998) show that illiquidity in the form of transactions costs has a large effect on asset turnover but only a very small effect on asset prices.[8] Empirical studies consistently find that illiquidity depresses asset prices and leads to higher asset returns. In the stock market, Amihud (2002) shows that the aggregate stock returns are higher when the market is less liquid, while Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996), and Brennan, Chordia, and Subrahmanyam (1998) show that less liquid stocks tend to have higher returns.[9] Finally, Pástor and Stambaugh (2003) find that stock returns are related, not only

[6]See Bedi, Richards, and Tennant (2003) and the references therein for evidence on the price difference in different classes of shares used by "Siamese-twin" companies.

[7]Gorton and Pennacchi (1993) argue that the liquidity of a fund may be different from that of its portfolio. This suggests that closed-end funds are arguably better vehicles than ADRs to check for the impact of liquidity on fund premia.

[8]Other theoretical studies include Kyle (1985), Allen and Gale (1994), Amihud and Mendelson (1986), Glosten (1989), Huang (2003), and Longstaff (2004a, b), among others.

[9]Other empirical studies include Datar, Naik, and Radcliffe (1998), Chordia, Roll, and Subrahmanyam (2000), and Lo and Wang (2000), among others.

to levels of liquidity, but also to the covariance of returns with measures of market liquidity. In the bond market, on-the-run Treasury bonds are more liquid and have higher prices than their off-the-run counterparts even though they have very similar cash flows and characteristics, and Longstaff (2004a, b) finds that Treasury bonds have higher prices and greater liquidity than similar government agency bonds even after controlling for coupon payment and default risk.

Consider now the effect of liquidity on the closed-end fund premium, which is defined as the difference between log fund share price S and log fund asset value NAV: $P \equiv \ln S - \ln NAV$. When the asset market is completely segmented from the share market, illiquidity in one market is confined to that market alone. Since illiquidity is associated with lower asset prices, high fund illiquidity implies a lower share price, S, but has no effect on asset value, NAV, which then leads to a lower fund premium, P. In the opposite case, high underlying asset illiquidity implies a lower asset value, NAV, but has no effect on the share price, S, which then leads to a higher fund premium, P.

The effect of illiquidity on P, however, is indeterminate if the share and the asset markets are integrated so that illiquidity can spill over from one market to another.[10] In reality, some degree of integration exists between markets and to some extent investors can substitute between investment in the closed-end fund and direct investment in the underlying asset. When one market suffers from high illiquidity, it is optimal for investors to divert some of their demand for (or supply of) liquidity to the other market; as a result, illiquidity in one market gets transmitted to the other market. Thus, both fund and underlying asset illiquidity can affect the fund price, S, and the fund asset value, NAV, leading to an ambiguous effect on the fund premium, P. We predict that the degree of liquidity spillover and its effect on close substitutes traded in different markets depends on the degree of integration between the two markets. In particular, we expect the clear-cut negative fund illiquidity effect and positive underlying asset illiquidity effect on P to hold only for funds investing in segmented markets, while the relation may be positive, negative, or zero for funds investing in integrated markets.

3. Measures of illiquidity

We follow Amihud (2002) who shows how to construct a Kyle (1985) type measure of illiquidity using only daily returns and dollar trading volume, which are readily available for almost every market.[11] $IL_{i,c,t}$, the Amihud (2002) illiquidity measure for stock i at month t in market c, is defined as the average ratio of the absolute returns to the dollar

[10]For example, Newman and Rierson (2004) find strong evidence that the illiquidity in one corporate bond spills over to other bonds in the same sector.

[11]Many different measures of illiquidity have been used in empirical studies. For example, Amihud and Mendelson (1986) use the quoted bid-ask spread on stock returns and Chalmers and Kadlec (1998) use the amortized effective spread as a measure of liquidity. Brennan and Subrahmanyam (1996) measure illiquidity with the price response to signed order flow and with the fixed cost of trading based on continuous data on transaction and quotes, and Pástor and Stambaugh (2003) estimate liquidity cost from *signed* volume related return reversals. Most of these liquidity measures require TAQ or equivalent data, which are not readily available for most foreign markets. Hasbrouck (2003) finds that the Amihud measure is highly correlated with the TAQ-based price impact measure in the U.S. market. In an examination of the relation between short-run reversals and stock return illiquidity, Avramov, Chordia, and Goyal (2006) report that they obtain similar results when they replace the Amihud measure of illiquidity with other measures of illiquidity.

trading volume:

$$IL_{i,c,t} = \frac{1}{D_t}\sum_{d=1}^{D_t} |R_{i,d}|/VOL_{i,d} \tag{1}$$

where D_t is the number of trading days in month t (approximated as 21 days), $R_{i,d}$ and $VOL_{i,d}$ are stock i's daily return and daily dollar trading volume in day d of month t, respectively. The measure of illiquidity for each individual stock is then scaled by multiplying it by 10^6. Unlike Amihud (2002), who calculates illiquidity annually for stocks with at least 200 daily observations each year, we use only 21 trading days to calculate illiquidity for each month so that we can relate it to fund premia at a monthly frequency. Daily data for prices, returns, and volumes on individual funds for the 8/1987 to 12/2001 period were collected from CRSP, while the corresponding data for the underlying assets in the foreign markets were collected from Datastream. Foreign market $R_{i,d}$ and $VOL_{i,d}$ are measured in U.S. dollars at the daily Datastream-reported foreign exchange rate.

We calculate the illiquidity of the U.S.-traded shares of each fund in the same manner as for any other stock and denote the illiquidity of fund i at time t as $FIL_{i,t}$. However, the estimation of the illiquidity of the underlying assets is relatively less straightforward. Country closed-end funds do not typically report their portfolio holdings at a monthly frequency so it is not possible for us to calculate the monthly illiquidity of the underlying assets precisely. Moreover, even if the portfolio composition were known, the price, return, and volume data for all of the individual holdings are not generally available on Datastream as its coverage is not very extensive for many foreign countries. Because of these two data limitations, we estimate $CIL_{c,t}$, the illiquidity of a fund's underlying assets at time t in asset market c, by using a market-wide measure of illiquidity. This approach is used because the underlying asset portfolio of country funds typically has substantial overlap with the stocks that constitute a representative market index in that country. So $CIL_{c,t}$ is calculated as the equally weighted average of the illiquidity of all *qualifying* individual stocks in a representative stock index for that country:

$$CIL_{c,t} = \frac{1}{N_{c,t}}\sum_{i=1}^{N_{c,t}} IL_{i,c,t}, \tag{2}$$

where $N_{c,t}$ is the number of stocks in the index of country c in month t. The qualifying ostocks included in the above calculation satisfy two criteria: (i) they must have trading volume greater than 1000 shares and returns data available for at least 14 out of the 21 days in the month, and (ii) their estimated illiquidity measure is not at the highest or lowest 5% tails of the distribution among stocks satisfying criterion (i).[12]

4. Closed-end country fund data

4.1. Fund premium

We focus on U.S.-traded single country closed-end funds and, like most prior studies, exclude all 'international' funds that do not invest primarily in a single country. We also

[12] Criterion (ii) here is similar to criterion (iv) in Amihud (2002). Our screening criteria are generally less stringent than those in Amihud (2002) due to the need to calculate illiquidity for foreign and, especially, emerging markets.

exclude funds investing primarily in one sector (e.g., commodities). We collect data on the closing price, net asset value, and fund premium for all U.S.-traded country funds for the August 1987 to December 2001 period from Dow Jones Interactive for the last trading day of the month for which such data are reported in *The Wall Street Journal*. As *The Wall Street Journal* reports premium data only for the last trading day of the week, our premium data typically corresponds to the last Friday of the month. There were only seven country closed-end funds prior to August 1987 and only three prior to 1986, so the sample period used in this study is fairly comprehensive. There are altogether 47 single country funds trading in the U.S., and their underlying assets trade in 29 different countries. We exclude six funds for which there wasn't sufficient data available on Datastream to calculate the asset market illiquidity, so our sample contains the remaining 41 funds whose underlying assets trade in 24 different asset markets. Table 1 lists the 41 closed-end country funds in our sample and the dates for which we have the premium data available. However, for some emerging markets (e.g., Russia), our asset market illiquidity measure is available for a shorter period than the fund premium data.

To avoid distortions associated with the flotation and winding up of closed-end funds, we exclude data for the first six months after the fund's IPO[13] and for one month preceding the announcement of either a liquidation, open-ending, or change in investment objective.[14] The announcement date used for any such change is the day on which the fund's managers or board of directors propose a change in the structure or in the investment objective of the fund. If shareholders propose a change, then the announcement date is the date of approval by shareholders of such a change. This approach is used because shareholders frequently propose changes but are rarely successful. The announcement date is determined based on news announcements and/or SEC filings. After this adjustment, there are at least 58 monthly observations for all funds. A few funds, such as the Germany Fund, the First Australia Fund and the Taiwan Fund, have complete observations for the entire sample period.

The time series variation in fund premium is large, and it differs widely from fund to fund. The standard deviation of the premium ranges from a low of 5% for the United Kingdom fund (UKM) to a high of 28% for the Korea Fund (KF), for which the premium ranges from −41% to over 91%. During this period, the average premium is negative for 33 funds, and for most of these funds the average premium is less than −15%. For example, the New Germany (GF) and the First Philippine (FPF) funds have average premia of approximately −20%. Seven of the eight funds that have positive average premia invest in emerging markets, most of which are in Asia. Japan Equity (JEQ) is the only fund with a positive average premium that invests in a developed market. The Indonesia Fund (IF) has the largest average premium of about 18.2%, followed by the Korea Fund (KF) and the Thai Fund (TTF) which have an average premium of around 15%. These large fund premia, especially those observed in the early part of the sample period (before 1990), may be driven by the capital controls imposed in those countries, as suggested in Bonser-Neal, Brauer, Neal, and Wheatley

[13]Weiss (1989) finds that closed-end funds usually start out at a premium and that most of the price decline in closed-end funds occurs between 30 and 100 days after the issue. Hanley, Lee and Seguin (1994) find substantial evidence of price stabilization by lead underwriters during the first 100 days of issuance. Thus, in the initial trading period of a fund, the discount may have an obvious deterministic trend.

[14]Banerjee and Gangopadhyay (1997) report that when a closed-end fund approaches its windup date or turns open-ended, its price converges to its NAV and thus its discount shrinks in a trended way.

Table 1
Information on Closed-end Single Country Funds Traded in the U.S.

This table provides information on all the U.S.-traded single country closed-end funds (CEF) in our sample. Weekly data on each fund's closing price as of Friday (or the last trading day of the week), the net asset value (NAV), and the discount, are collected from the Wall Street Journal/Dow Jones Interactive Service for all dates beginning August 7, 1987. During the period analyzed, several funds announced that they were either open-ending or liquidating or merging with another fund or converting to a new closed-end fund with a different investment objective. The announcement date for these changes is the day on which the fund's managers or board of directors propose a change in the structure or investment objective of the fund. If a shareholder(s) proposes a change, then the announcement date is the date of approval by shareholders of such a change. The announcement date is determined from news announcement and/or SEC filings.

No.	Fund ticker	Fund name	IPO date	Raw data		Change of structure or investment objective	
				From	To	Nature of change	Announcement date
1	AF	Argentina	22/10/1991	25/10/1991	14/12/2001	Open-ending	11/6/2001
2	BZF	Brazil	31/3/1988	15/4/1988	28/12/2001		
3	BZL	Brazilian Equity	3/4/1992	10/4/1992	28/12/2001		
4	CH	Chile	26/10/1989	3/11/1989	28/12/2001		
5	FAK	Fidelity Advisor Korea	25/10/1994	4/11/1994	30/6/2000	Open-ending	17/3/2000
6	FPF	First Philippine	8/11/1989	1/12/1989	28/12/2001		
7	FRF	France Growth	10/5/1990	18/5/2990	28/12/2001		
8	FRG	Emerging Germany Fund	29/3/1990	20/4/1990	23/4/1999	Open-ending	6/11/1998
9	GER	Germany	18/7/1996	7/8/1987	28/12/2001		
10	GF	New Germany	14/1/1990	9/2/1990	28/12/2001		
11	GSP	Growth Fund Spain	14/2/1990	9/3/1990	11/12/1998	Open-ending	3/8/1998
12	IAF	First Australia[a]	12/12/1985	7/8/1987	28/12/2001		
13	IF	Indonesia	1/3/1990	16/3/1990	28/12/2001		
14	IFN	India	1/2/1994	18/2/1994	28/12/2001		
15	IGF	India Growth	12/8/1988	26/8/1988	28/12/2001		
16	IIF	MSDW India[b]	1/2/1994	11/3/1994	28/12/2001		
17	ISL	First Israel	1/10/1992	30/10/1992	28/12/2001		

18	ITA	Italy	26/2/1986	7/8/1987	28/12/2001	Liquidating	21/11/2002
19	JEQ	Japan Equity	24/7/1992	14/8/1992	28/12/2001		
20	JFI	Jardine Fleming India	1/3/1994	11/3/1994	28/12/2001		
21	JGF	Jakarta Growth	16/4/1990	20/4/1990	8/6/2001	Merging with another CEF	11/10/2000
22	JOF	Japan OTC Equity	14/3/1990	30/3/1990	28/12/2001		
23	KEF	Korea Equity	24/11/1993	3/12/1993	28/12/2001		
24	KF	Korea	22/8/1984	7/8/1987	28/12/2001		
25	KIF	Korean Investment	18/2/1992	13/3/1992	23/11/2001	Open-ending	14/9/2001
26	MEF	Emerging Mexico	8/10/1990	12/10/1990	1/4/1999	Liquidating	26/10/1998
27	MF	Malaysia	8/5/1987	7/8/1987	28/12/2001		
28	MXE	Mexico Equity and Income	14/8/1990	7/9/1990	28/12/2001		
29	MXF	Mexico	3/6/1981	7/8/1987	28/12/2001		
30	OST	Austria	21/9/1989	6/10/1989	28/12/2001		
31	PGF	Portugal	1/11/1989	29/12/1989	1/6/2001	Open-ending	20/8/1999
32	ROC	ROC Taiwan	19/5/1989	19/5/1989	28/12/2001		
33	SGF	Singapore	24/7/1990	3/8/1990	28/12/2001		
34	SNF	Spain	21/6/1988	22/7/1988	28/12/2001		
35	SWZ	Swiss Helvetia[c]	19/8/1987	28/8/1987	28/12/2001		
36	TC	Thai Capital[d]	22/5/1990	8/6/1990	28/12/2001		
37	TRF	Templeton Russia	1/6/1995	15/9/1995	28/12/2001	Converting to New CEF	12/2/2002
38	TTF	Thai	17/2/1988	26/2/1988	28/12/2001		
39	TWN	Taiwan	23/12/1986	7/8/1987	28/12/2001		
40	TYW	Taiwan Equity	1/7/1994	29/7/1994	5/5/2000	Liquidating	2/12/1999
41	UKM	United Kingdom	6/8/1987	7/8/1987	23/4/1999	Liquidating/Open-ending	15/9/1998

[a]Also known as Aberdeen Australia Equity.
[b]Also known as Morgan Stanley India.
[c]Also known as Helvetia fund.
[d]The Thai Capital fund changed its ticker symbol from TC to TF on 16/3/2001.

Table 2
Summary Statistics
This table reports the average value of the fund premium, illiquidity measures, and control variables for the sample of all funds, and separately for the sample of funds investing in segmented and integrated markets.

Variables	All funds	Funds Investing in	
		Segmented Markets	Integrated Markets
Number of funds	41	26	15
Fund Premium (%)	−6.37	−3.70	−11.01
Log Average Fund Illiquidity	−2.19	−2.08	−2.43
Log Average Asset Market Illiquidity	9.45	8.79	10.05
U.S. Market Return (% per month)	0.78	0.78	0.78
Foreign Market Average Return (% per month)	1.63	2.37	0.75
Foreign Exchange Appreciation Rate (% per month)	0.89	1.49	0.18
Edison-Warnock Capital Control Measure	0.32	0.50	0.00
Market Capitalization (millions $)	157.82	170.53	135.78
Dividend Yield (% per year)	1.77	1.31	2.57
Expense Ratio (% per year)	1.83	1.98	1.59
Institutional Ownership (%)	15.14	16.61	12.60
Age (years since IPO)	5.91	5.81	6.16

(1990).[15] On the other hand, three funds (Emerging Germany, New Germany, Growth Fund Spain), all of which invest in European countries with virtually no capital controls, traded at discounts throughout the period.

4.2. Control variables

We also collect data on the following fund- and country-specific variables that have been found in prior studies to be important determinants of the fund premium (see Table 2 for summary statistics):

- Expense ratio (ExpRatio): Lipper reports the expense ratio (total annual expense divided by NAV) of each fund at an annual frequency. We use the latest expense ratio available at the end of each month as the expense ratio for that month. The average expense ratio ranges from 1% for the Japan Equity Fund (JEQ) to a high of almost 2.8% for the Thai Capital Fund (TC).
- Size (lnCap): The fund's market capitalization (in millions of dollars) is obtained from CRSP. Because this variable is highly skewed, we use its natural log in all of the empirical tests. The average market capitalization ranges from a low of $35.6 million for the Jakarta Growth Fund (JGF) to a high of $581.4 million for the Mexico Fund (MXF). 22 of the 41 funds have an average market capitalization greater than $100 million.
- Age (lnAge): At the end of each month, each fund's age is calculated as the natural log of the number of years from its IPO date.

[15]We do not explicitly consider the effect of capital controls using government policy announcements as event dates. Instead we use the Edison-Warnock (2003) measure of capital control intensity as a control variable in our empirical analysis.

- Dividend yield (Divyld): The dividend yield is calculated as the CRSP reported dividends (excluding capital gains dividends) paid by the fund in the prior 12-month period scaled by the end of month NAV. Thirty-eight out of the 41 funds paid some dividends during this period, and the average dividend yield across all 41 funds is about 1.77% with the highest yield at 7.64% for the Mexico Equity and Income Fund (MXE).
- Institutional ownership (InstOwn): Thomson Financial reports institutional ownership for closed-end funds at the end of each quarter based on 13(f) filings by institutions. We use the latest available ownership data at the end of each month. The time series average institutional ownership ranges from 4.2% (GER) to about 28.6% (IIF). This suggests that the vast majority of country fund shares is held by individual investors.
- Edison-Warnock measure of capital controls (EW): Edison and Warnock (2003) construct measures of the intensity of capital controls across 29 emerging markets based on restrictions on foreign ownership of equity.[16] They provide information on the extent and evolution of financial liberalization with 1 denoting complete capital control and 0 denoting the absence of capital control. Twenty-six of the funds that invest in 13 different asset markets, all of which are in emerging economies, have EW measures greater than zero throughout the period and are classified as funds investing in segmented markets. The remaining 15 funds that invest in 11 different asset markets, all of which are in developed economies, have EW measures equal to zero and are classified as funds investing in integrated markets. The time series average EW measure for the 13 segmented markets ranges from a low of 0.11 for Argentina to a high of 0.84 for India. For all countries except Russia, the measure exhibits a strong negative trend, indicating that capital controls have been gradually reduced in all emerging asset markets except for Russia.
- Share (U.S.) market factor (USMKT): The concurrent monthly CRSP value weighted average return for all NYSE, AMEX and NASDAQ stocks is used to control for the market risk factor in the share market.
- Asset (foreign) market factor (CMKT): The concurrent monthly total market index returns in local currency for the 24 asset markets obtained from Datastream are used to control for the market risk factor in the asset market.
- Foreign exchange appreciation rate (FXCHG): The concurrent monthly change in the foreign exchange rate between the U.S. and the foreign country is measured as units of foreign currency per U.S. dollar and obtained from Datastream. This captures any movement in the fund premia caused by the change in the foreign exchange rates.
- Average fund premium (AVGPrem): Following Bodurtha, Kim, and Lee (1995), in each month we calculate the arithmetic average premium of all the sample funds. This variable is often used in the literature as a proxy for small investor sentiment. The average fund premium exhibits a clear time trend during the period. A regression of AVGPrem on time yields a significantly negative coefficient and a large R^2 (33%). Fig. 1 plots the average fund premium from August 1987 to December 2001. The premium fluctuates substantially: at the start of the sample period, it is almost 13% but then drops rapidly in 2 months to almost −13% at the time of the stock market crash of October 1987. In January 1990, the average fund premium reached a high of over 28%. The large average premium in the early period (when there were few country funds) was

[16]We thank Craig Doidge for suggesting this measure to us and Edison and Warnock for making this measure available on the web page of the Federal Reserve Board—http://www.federalreserve.gov/pubs/ifdp/2001/708/default.htm.

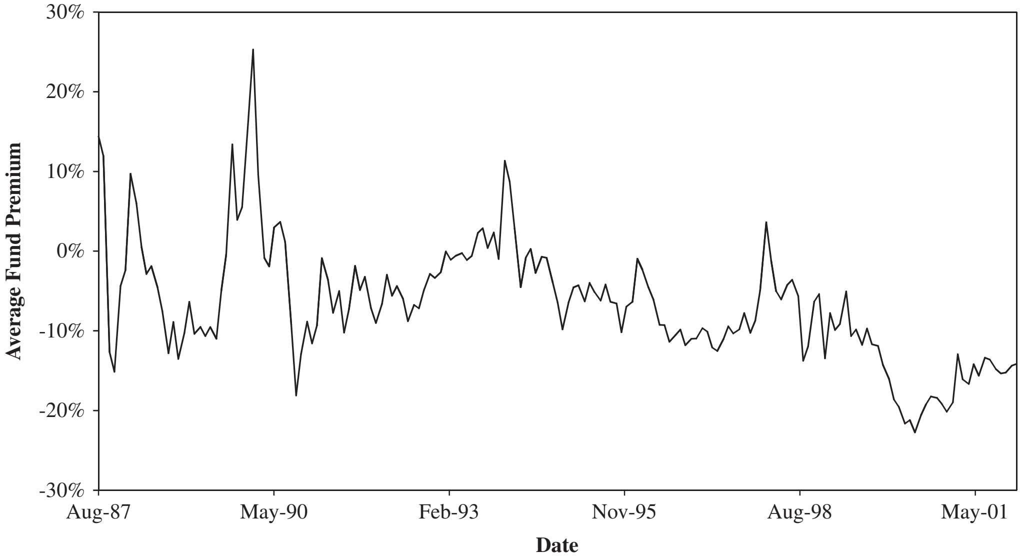

Fig. 1. Time series of average fund premium. This figure plots the end-of-month average fund premium (AVGPrem) of closed-end country funds from August 1987 to December 2001.

driven mainly by the large premia of the two Asian country funds: the Korea fund and the Taiwan fund.

Table 2 reports summary statistics of the average fund premium, the natural log of the fund illiquidity, the natural log of average foreign market illiquidity and the control variables. The average fund premium is about −6.37%; it is around −3.70% for funds investing in segmented markets and −11.01% for funds investing in integrated markets. The average age of the funds is around 6 years. The average EW capital control measure for the 13 segmented markets is 0.50. The average fund has a market capitalization of \$157.82 million. The average market capitalization is greater for funds investing in segmented markets (\$170.53 million) than for funds investing in integrated markets (\$135.78 million). The average dividend yield across all 41 funds is 1.77%, and it is 1.31% (2.57%) for the 26 (15) funds investing in segmented (integrated) markets. The average expense ratio across all 41 funds is 1.83%, and it is 1.98% (1.59%) for the 26 (15) funds investing in segmented (integrated) markets. Institutional investors own 15.14% of the country funds on average, and around 16.61% (12.60%) of the funds investing in segmented (integrated) markets. In summary, funds investing in segmented markets generally have lower dividend yields, higher expense ratios, higher institutional ownership, and larger premia than those investing in integrated markets.

5. Empirical analysis

In this section, we examine the relation between the level of the closed-end country fund premium and the illiquidity of the fund and its underlying assets. An interesting example of

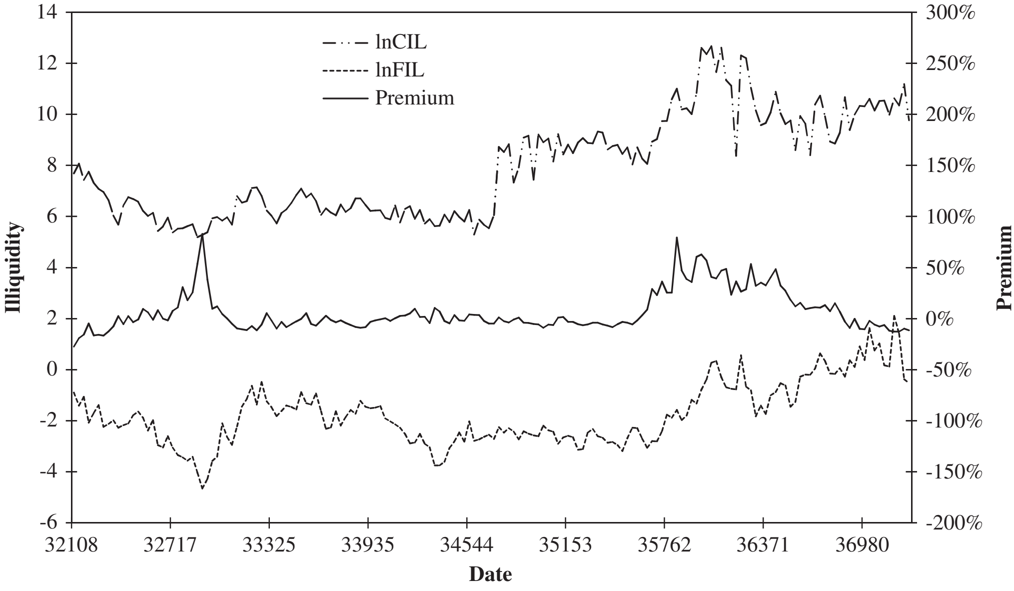

Fig. 2. Average fund premium and average liquidity of funds impacted by Asian financial crisis. This figure plots the natural logarithm of the monthly Amihud country illiquidity, lnCIL, the natural logarithm of the monthly Amihud fund illiquidity, lnFIL, and the average fund premium of the closed-end country funds corresponding to countries that were severely affected by the Asian Financial Crisis in mid-1997. These funds include the First Philippine Fund (Philippines), the Indonesia Fund and Jakarta Growth Fund (Indonesia), the Malaysia Fund (Malaysia), and the Thai Fund and Thai Capital Fund (Thailand).

the effect of illiquidity is provided by the movement of the fund premium around the Asian financial crisis of 1997–1998 and the Russian financial crisis of 1998. During these episodes, the asset markets in several Asian countries and in Russia experienced liquidity crises and the average premium of funds that had invested in these countries increased dramatically, whereas most other funds invested in developed or other emerging markets were trading at discounts, and were relatively unaffected. Subsequent to the crisis we observe that the asset markets of the countries affected by the crisis became more liquid and that the average premium of the corresponding funds declined.[17]

Fig. 2 plots the natural logarithm of the monthly Amihud country illiquidity, lnCIL, the natural logarithm of the monthly Amihud fund illiquidity, lnFIL, and the average fund premium of the closed-end country funds corresponding to countries that were most severely affected by the Asian Financial Crisis in mid-1997. These funds include the First Philippine Fund (Philippines), the Indonesia Fund and Jakarta Growth Fund (Indonesia), the Malaysia Fund (Malaysia), and the Thai Fund and Thai Capital Fund (Thailand). As the figure shows, the asset market illiquidity, lnCIL, of these funds increased dramatically after July 1997, and so did the average fund premium. Although the fund illiquidity,

[17]Cohen and Remolona (2001) report that the prices of funds investing in Russia and in countries affected by the Asian financial crisis moved from a discount before the crisis to a premium when the crisis started, and the premium rose for all the funds during the crisis and then declined gradually after the crisis was over.

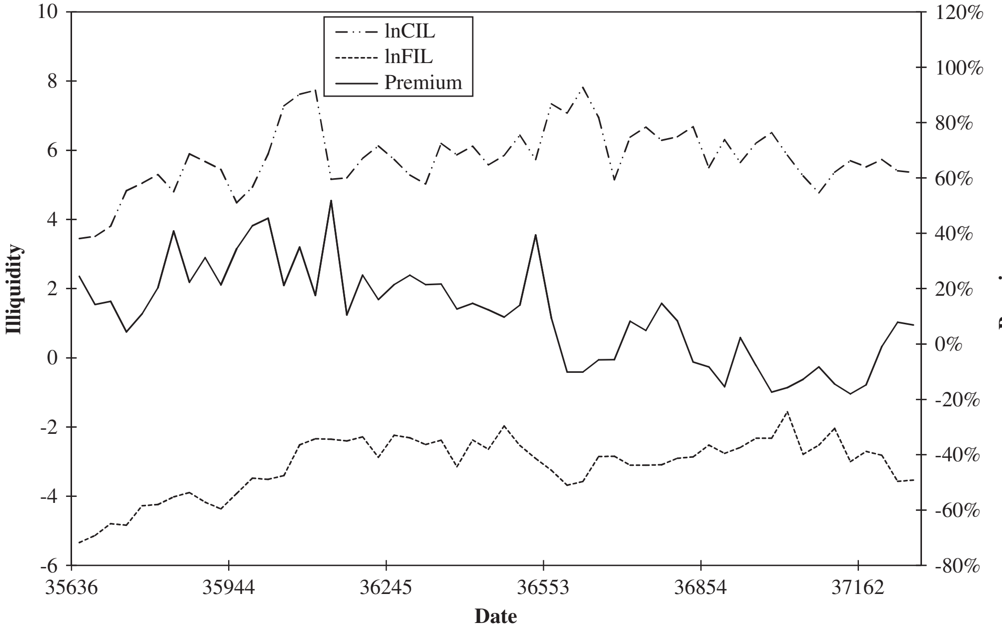

Fig. 3. Average fund premium and average liquidity of templeton russia fund. This figure plots the natural logarithm of the monthly Amihud country illiquidity, lnCIL, the natural logarithm of the monthly Amihud fund illiquidity, lnFIL, and the fund premium of the Templeton Russia Fund, which was severely affected by the Russian Financial Crisis in 1998.

lnFIL, also increased during this period, its increase was not as much as the increase in the asset market illiquidity. More generally, the figure shows that in the early portion of our sample period (end-1987 to 1989), lnCIL and average fund premium declined whereas lnFIL increased. A similar pattern is evident in the late portion of our sample period, i.e., in the period after the Asian crisis and up to December 2001. The results are consistent with our central point that the closed-end country fund premium is negatively (positively) related to the fund (underlying asset) illiquidity in segmented capital markets.

Next, we examine the illiquidity–premium relation around the Russian financial crisis of 1998. In Fig. 3, we plot the natural logarithm of the monthly Amihud country illiquidity, lnCIL, the natural logarithm of the monthly Amihud fund illiquidity, lnFIL, and the fund premium of the Templeton Russia Fund, which is the only closed-end fund that invests primarily in Russia. As the figure shows, the fund's asset market illiquidity, lnCIL, increased dramatically in 1998, and so did the fund premium. Although the fund illiquidity, lnFIL, also increased during this period, its increase was not as much as the increase in the asset market illiquidity. After the crisis, and up to the end of the sample period, lnCIL and fund premium generally declined whereas lnFIL was mostly unchanged. Once again, the results are generally consistent with our central point that the closed-end country fund premium is negatively (positively) affected by the fund (underlying asset) illiquidity in segmented capital markets.

5.1. Regression results

To estimate the effect of fund illiquidity and asset market illiquidity on country fund premia, controlling for the effects of the other variables, we estimate the following panel regression of fund premium:

$$\begin{aligned} P_{f,c,t} = {} & \alpha_f + \beta_1 \ln FIL_{f,t} + \beta_2 \ln CIL_{c,t} + \beta_3 USMKT_t + \beta_4 CMKT_{c,t} + \beta_5 FXCHG_{c,t} \\ & + \beta_6 EW_{c,t} + \beta_7 \ln Cap_{f,t} + \beta_8 Divyld_{f,t} + \beta_9 ExpRatio_{f,t} + \beta_{10} InstOwn_{f,t} \\ & + \beta_{11} \ln Age_{f,t} + \beta_{12} AVGPrem_t. \end{aligned} \quad (3)$$

In this case, the residuals are correlated across funds as well as across time. As we have more time periods (months) than funds, we cluster by time to absorb the time effect and include dummy variables for each fund to absorb the fund effect (the individual fund dummies are denoted by α_f). Petersen (2005) recommends that such an approach be used in panel regressions to control for correlation across time and across firms in the presence of both a time and a firm effect, and he shows that the heteroscedasticity-consistent clustered (Rogers) standard error estimates obtained are unbiased. The (fund invariant) average fund premium, AVGPrem, captures the investor sentiment. The equation is estimated with and without the control variables.[18]

Table 3 reports the average values (across all funds) of the time series correlations of the variables used in the empirical analysis. There is a strong co-movement in the premia of different funds, as suggested by the correlation of 0.47 between the individual and average fund premium. On average, the individual fund premium is negatively correlated with institutional ownership (−0.45), age (−0.22) and the Amihud fund illiquidity measure (−0.09), positively correlated with the Edison-Warnock asset market capital control measure (0.25), the expense ratio (0.31), and asset market illiquidity (0.07). The positive correlation between EW and the average fund premium is consistent with the notion that restrictions on direct investment in some foreign markets make the corresponding closed-end country funds attractive to investors. The large negative correlation of −0.65 between the fund illiquidity and fund size is consistent with the expectation that larger funds are more liquid. The returns in the foreign and the U.S. markets are positively correlated (0.40). The EW capital control measure has a strong negative correlation with fund age (−0.69). Fund size and institutional ownership are negatively correlated with expense ratios. Finally, the large negative correlation between the average fund premium and fund age implies that, on average, funds get deeper into discounts with the passage of time.

Table 4 shows the regression results for the sample of all funds. As shown in specification (1), when we regress the fund premium on the fund and the asset market illiquidity (and fund dummies), high fund illiquidity is significantly associated with a lower fund premium and high asset market illiquidity is significantly associated with a higher premium. This result is consistent with the negative illiquidity-asset price relation found by previous authors for individual markets.

[18]To address the concern that the series may be nonstationary, we carry out unit root tests for residuals from the panel regression. All the panel unit root tests strongly reject the null of unit root, no matter whether it is assumed to be specific to an individual series or to be common across all residual series. Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (2003) suggest that panel-based unit root tests have more power than unit root tests based on an individual time series.

Table 3
Time Series Correlation of Premium, Illiquidity, and Control Variables

This table reports the average of the time series correlation between the fund premium (Premium), the fund illiquidity (lnFIL), the asset market illiquidity (lnCIL), and control variables, which include U.S. and foreign market index return (USMKT and CMKT), the foreign exchange appreciation rate (FXCHG), the Edison-Warnock measure of capital control (EW), size (lnCAP), dividend yield (Divyld), expense ratio (ExpRatio), institutional ownership (InstOwn), the average fund premium across all funds which represents small investor sentiment (AVGPrem), and fund age (lnAge). The pairwise correlations reported here are obtained in two steps. The time series correlation between any two variables is calculated first for each fund, and then averaged across the 41 funds in the second step.

	lnFIL	lnCIL	USMKT	CMKT	FXCHG	EW	lnCAP	Divyld	ExpRatio	InstOwn	AVGPrem	lnAge
Premium	−0.09	0.07	0.06	0.08	0.09	0.25	−0.04	0.07	0.31	−0.45	0.47	−0.22
lnFIL		0.37	−0.09	−0.11	0.01	−0.11	−0.65	0.11	0.40	−0.02	−0.27	0.06
lnCIL			−0.05	−0.09	0.09	−0.32	−0.48	0.03	0.25	−0.15	−0.13	0.26
USMKT				0.40	−0.05	0.02	0.10	−0.01	−0.04	0.00	0.12	−0.03
CMKT					−0.05	0.07	0.12	−0.03	−0.01	0.02	0.19	−0.03
FXCHG						−0.02	−0.08	0.02	0.02	0.00	−0.01	0.03
EW							0.01	0.18	0.10	−0.20	0.32	−0.69
lnCAP								−0.06	−0.53	0.26	0.10	0.10
Divyld									0.09	−0.01	−0.01	−0.06
ExpRatio										−0.36	0.09	−0.20
InstOwn											−0.23	0.29
AVGPrem												−0.44

In specification (2), we include all control variables except AVGPrem. Both lnFIL and lnCIL remain significant with the right sign. The other significant explanatory variables are CMKT, FXCHG, EW, Divyld, ExpRatio, and InstOwn. The fund premium is not significantly related to the share market factor but it is positively and significantly related to the asset market factor. It is also positively and significantly related to the appreciation rate of the dollar. Funds investing in markets with stronger capital controls tend to have a higher premium, which is consistent with limited direct investment increasing the demand for the country funds. Funds with higher premia are also associated with higher dividend yields, higher expense ratios, and lower institutional ownership. The significantly positive relation between fund premium and dividend yield is consistent with the implication of the simple model proposed by Ross (2002). Although the positive relation between fund premium and the fund's expense ratio is difficult to reconcile with the simple static expense-based explanation for fund discounts, it is potentially consistent with the dynamic model of Berk and Stanton (2006) in which managers whose funds are trading at a premium or a smaller discount have more bargaining power, which they use to increase their compensation, and therefore, the expense ratio. The negative relation between fund premium and institutional ownership is consistent with two possible explanations: either institutional investors are value investors who tend to buy "cheap" funds at deep discounts or, as suggested by Barclay, Holderness, and Pontiff (1993), they are simply friends of entrenched managers and thus enable the existence of deeper discounts.[19]

[19]A simple regression analysis shows that the change in fund premium is positively and significantly related to lagged institutional ownership, providing support for the first hypothesis, that institutional investors are likely to be value investors.

Table 4
Panel Data Regression of Fund Premium
This table reports the results of panel regressions of fund premium on the fund and asset market illiquidity as well as other control variables. The results are shown for the sample of all funds. DUMSEG (DUMINT) is a dummy variable that is equal to 1 if the country that the fund invests in is segmented (integrated) with the U.S. To account for across time and across fund correlations of the residual, the panel regressions are run using time clustering (where each month is a cluster) and using dummy variables for each fund to absorb the fund effect. The heteroscedasticity consistent clustered (Rogers) standard errors are used to calculate the *t*-statistics (reported in parentheses).

Indep. Variables	(1)	(2)	(3)	(4)	(5)	(6)
lnFIL	−0.017	−0.014	0.004			
	−(3.69)	−(2.88)	(0.98)			
lnFIL*DUMSEG				−0.025	−0.017	0.001
				−(4.73)	−(3.01)	(0.32)
lnFIL*DUMINT				−0.001	−0.011	0.008
				−(0.12)	−(2.11)	(2.13)
lnCIL	0.018	0.010	0.011			
	(4.14)	(2.80)	(3.76)			
lnCIL*DUMSEG				0.025	0.023	0.021
				(3.79)	(4.11)	(4.60)
lnCIL*DUMINT				0.011	−0.006	0.000
				(5.19)	−(3.02)	−(0.21)
USMKT		0.112	0.079		0.099	0.078
		(0.98)	(1.39)		(0.88)	(1.44)
CMKT		0.099	0.014		0.100	0.017
		(1.96)	(0.38)		(2.04)	(0.48)
FXCHG		0.287	0.263		0.266	0.250
		(3.99)	(4.26)		(3.9)	(4.19)
EW		0.190	0.178		0.206	0.186
		(12.93)	(14.15)		(14.19)	(14.85)
lnCap		0.029	0.036		0.036	0.042
		(2.53)	(4.04)		(3.11)	(4.8)
Divyld		0.387	0.382		0.367	0.369
		(7.67)	(7.54)		(7.39)	(7.38)
ExpRatio		0.085	0.078		0.082	0.077
		(9.68)	(11.29)		(9.56)	(11.11)
InstOwn		−0.684	−0.614		−0.702	−0.620
		−(21.72)	−(23.61)		−(21.35)	−(22.42)
lnAge		−0.005	0.028		−0.006	0.030
		−(0.81)	(7.60)		−(0.99)	(8.06)
Avgprem			0.835			0.839
			(23.18)			(22.06)
Adj. R^2	36.88	58.32	64.17	37.16	58.82	64.57
No. of obs.	4603	4241	4241	4603	4241	4241

In specification (3), we also include AVGPrem as a control variable. Consistent with Bodurtha, Kim, and Lee (1995), the coefficient estimate of 0.835 for AVGPrem is close to one and highly significant. While this suggests a strong co-movement among all country funds, it is not conclusive that this co-movement necessarily reflects small investor sentiment. When AVGPrem is included in the regression, the coefficient on fund illiquidity is no longer significant although it has the expected negative sign. The coefficient estimates and statistical significance of most of the other variables remain virtually unchanged but the asset market factor is no longer significant and fund age becomes significant.

As we have emphasized previously, we expect the effect of fund and asset market illiquidity on the fund premium to be different depending on whether or not a fund invests in a market that is segmented or integrated with the U.S. So, in specifications (4)–(6), we allow for different slopes for the two illiquidity variables for segmented and integrated market funds. We define DUMSEG (DUMINT) as a dummy variable that is equal to 1 if the country that the fund invests in is segmented (integrated) with the U.S. Then the interaction terms lnFIL∗DUMSEG and lnFIL∗DUMINT capture the effect of fund illiquidity on fund premium for segmented and integrated market funds, respectively. Similarly, the interaction terms lnCIL∗DUMSEG and lnCIL∗DUMINT capture the effect of asset market illiquidity on fund premium for segmented and integrated market funds, respectively. The results of specifications (4) and (5) indicate that fund premium is significantly negatively related to fund illiquidity and positively related to asset market illiquidity for country funds that invest in segmented markets. In specification (6), when we include AvgPREM, the positive and significant relation between fund premium and asset market illiquidity continues to hold but the negative relation between fund premium and fund illiquidity no longer holds. For integrated market funds, there is no consistent pattern to the results for the illiquidity measures.

Although specifications (4)–(6) of Table 4 allow us to examine the effect of the illiquidity measures on fund premium separately for segmented and integrated market funds, these specifications do restrict the slope coefficients of the other explanatory variables to be the same across the two groups of funds. So, in Table 5, we repeat the regression analyses of Table 4 using separate regressions for funds investing in segmented (see the first four specifications) and integrated markets (see the last four specifications).

In general, the results for segmented market funds are fairly similar to those for the full sample. The coefficient on lnFIL is negative in specifications (1)–(3) and statistically significant in two of the three cases, and the coefficient on lnCIL is positive and highly statistically significant in all three cases. Overall, the results are consistent with our hypothesis that the fund premium should be negatively related to fund illiquidity and positively related to asset market illiquidity for country funds that invest in segmented markets. In the case of integrated markets, liquidity may spill over from one market to another so we expect a weak relation between fund premium and measures of illiquidity. Indeed, as shown in specifications (5)–(7), the coefficient on lnFIL is negative in two cases and positive in one and statistically significant in only one of the three cases, and the coefficient on lnCIL is positive in all cases but statistically significant in only two of the three cases.

Finally, we test for the robustness of our results by using an alternative measure of fund illiquidity instead of the Amihud fund illiquidity measure. Although finer measures of illiquidity are not generally available for all foreign markets, especially emerging markets, such measures can be estimated for the U.S. market where the fund's shares are traded. We use the average proportional spread (SPREAD) as our measure of fund illiquidity.[20] We estimate SPREAD for the 41 closed-end country funds using the NYSE Trade and Quote

[20]Many different estimates based on bid and ask quotes have been used in the literature as proxies for a firm's liquidity (for some examples, see Chordia, Roll, and Subrahmanyam, 2000). One advantage of using the proportional spread measure is that it is comparable across different funds that are priced at different levels.

Table 5
Panel Regression of Fund Premium for Segmented and Integrated Market Funds

This table reports the results of panel regressions of fund premium on asset market illiquidity, lnCIL, two measures of fund illiquidity, lnFIL and lnSPREAD, as well as other control variables. The results are shown separately for funds investing in segmented markets and for funds investing in integrated markets. To account for across time and across fund correlations of the residual, the panel regressions are run using time clustering (where each month is a cluster) and using dummy variables for each fund to absorb the fund effect. The heteroscedasticity consistent clustered (Rogers) standard errors are used to calculate the *t*-statistics (reported in parentheses).

Independent variables	Segmented market funds				Integrated market funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnFIL	−0.025	−0.022	−0.007		−0.001	−0.004	0.016	
	−(4.73)	−(3.72)	−(1.49)		−(0.12)	−(0.68)	(3.82)	
lnSPREAD				−0.347				0.032
				−(4.87)				(1.28)
lnCIL	0.025	0.019	0.017	0.025	0.011	0.003	0.007	0.001
	(3.79)	(3.41)	(3.56)	(4.78)	(5.19)	(1.34)	(3.46)	(0.59)
USMKT		0.144	0.125	0.168		0.034	0.031	0.031
		(1.21)	(1.65)	(1.61)		(0.29)	(0.43)	(0.46)
CMKT		0.096	0.021	0.061		0.110	−0.028	−0.023
		(1.92)	(0.51)	(1.42)		(1.57)	−(0.63)	−(0.49)
FXCHG		0.276	0.247	0.226		0.138	0.197	0.178
		(3.64)	(3.65)	(3.37)		(1.31)	(2.23)	(1.62)
EW		0.177	0.158	0.126				
		(10.13)	(9.98)	(7.32)				
lnCap		0.010	0.009	−0.036		0.055	0.064	0.014
		(0.64)	(0.69)	−(3.41)		(4.32)	(5.55)	(1.44)
Divyld		0.278	0.243	0.194		0.435	0.475	0.645
		(3.66)	(3.22)	(2.61)		(6.77)	(7.32)	(11.09)
ExpRatio		0.074	0.071	0.077		0.074	0.055	0.098
		(8.00)	(9.14)	(8.76)		(5.55)	(4.85)	(7.34)
InstOwn		−0.832	−0.725	−0.640		−0.398	−0.407	−0.253
		−(20.17)	−(19.44)	−(15.38)		−(8.94)	−(10.85)	−(6.82)
lnAge		−0.011	0.018	−0.056		−0.024	0.013	−0.013
		−(1.36)	(2.98)	−(4.77)		−(3.06)	(2.14)	−(1.12)
Avgprem			0.833	0.620			0.800	0.802
			(18.65)	(9.44)			(13.73)	(12.96)
Adj. R^2	36.23	61.19	65.45	68.08	30.94	44.84	56.98	62.16
No. of obs.	2822	2507	2507	2127	1781	1734	1734	1376

(TAQ) database. Since TAQ data starts from January 1993, a drawback of using SPREAD is that our sample period is now considerably shorter relative to our earlier analysis in which we use Amihud fund illiquidity (FIL). Our sample period now begins in January 1993 instead of August 1987. For each fund, on each trading day, we first extract the quoted spread and the associated mid-quote price on a trade-by-trade basis. We then calculate the daily proportional spread for each fund by dividing the quoted spread by the mid-quote price. Finally, the daily proportional spread for each fund is averaged into monthly measures in order to combine with our existing data (which are all monthly quantities).

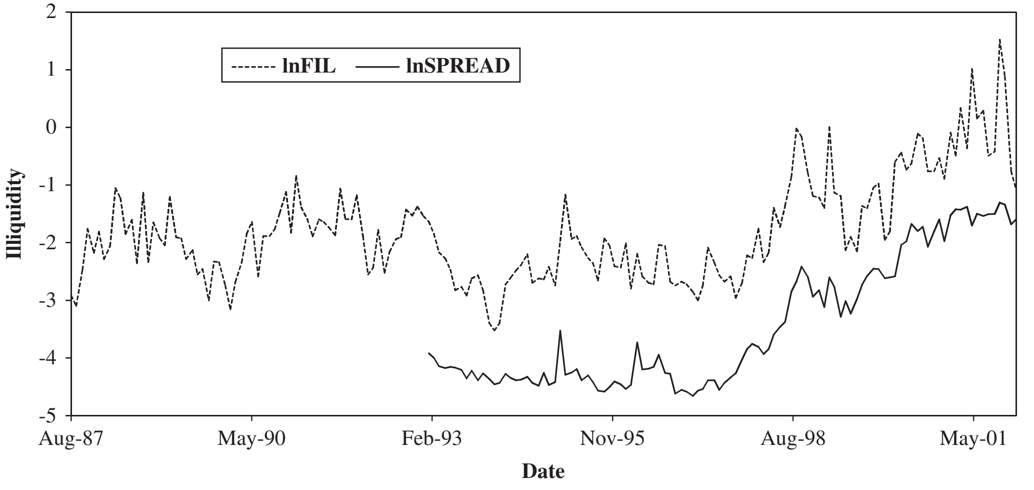

Fig. 4. Time series of illiquidity measures. This figure plots the natural logarithm of the average monthly Amihud fund illiquidity (FIL) and the natural logarithm of the average monthly proportional spread (SPREAD) of all sample closed-end country funds at the end of each month from August 1987 to December 2001. The SPREAD data, which are obtained from the TAQ dataset, are available only from January 1993.

To examine the relationship between Amihud fund illiquidity (FIL) and SPREAD, we calculate the correlation between each fund's time series of these two measures. There is some variance in the individual correlation coefficients but these two series are fairly highly correlated, and the overwhelming majority of correlation coefficients are in the 0.50 to 0.80 range, with a median correlation of 0.64. We also do the same analysis using the average of the time series of all funds' Amihud fund illiquidity and proportional spread. The average measures of these two series are very highly correlated with a correlation of 0.90. The close association between these two series can also be observed in Fig. 4, which plots the series of all funds' average lnFIL and average lnSPREAD. (For ease of exposition, we plot the natural logarithm of each series instead of the raw series.) Taken together, these results support the use of the Amihud measure for fund illiquidity, as it is fairly highly correlated with SPREAD, a commonly used proxy for illiquidity.

In specifications (4) and (8) of Table 5 we replace lnFIL with lnSPREAD for the sample of segmented and integrated market funds, respectively. As expected, the results of specifications (4) and (8) are fairly similar to those of specifications (3) and (7), respectively. In particular, the results for segmented funds show that the fund premium is significantly negatively related to lnSPREAD. Because our regression uses the natural logarithm transformation of both the fund premium and the proportional spread, the slope coefficient of −0.347 on lnSPREAD has a straightforward 'elasticity' interpretation. So an increase in the proportional spread of the fund's shares by 1% leads to a decrease in the fund premium by 0.347%, other things constant. As before, the illiquidity–premium relation is weak for the subsample of integrated funds.

In summary, our findings show that relative illiquidity plays an important role in explaining the variation in the fund premium. Similar to the negative association between illiquidity and bond/stock prices that has been documented in single markets, the results for funds investing in segmented markets are consistent with the hypotheses that asset market (fund) illiquidity negatively affects fund NAV (price) and positively (negatively) affects fund premium. On the other hand, results for funds investing in integrated markets are consistent with the notion that illiquidity can easily spill over borders and lead to an ambiguous effect on fund premium.

6. Conclusion

Closed-end country fund shares and underlying assets are close substitutes but are traded in different markets with different illiquidity. To the extent that illiquidity affects asset prices, the time varying deviation of fund price from fund NAV may well be driven by time varying illiquidity of the fund and its underlying assets. Using price and NAV data for 41 U.S.-traded single country closed-end funds for the August 1987 to December 2001 period, we examine if the variation in fund premium can be explained by the illiquidity of the fund and its underlying assets (proxied by the aggregate market illiquidity of the asset market).

Empirical results show that the fund premium has a significant and negative relation with fund illiquidity, and a significant and positive relation with the asset market illiquidity for country funds investing in segmented markets. The results for funds investing in integrated markets are more mixed. This is consistent with the notion that in an integrated market the illiquidity in one market can easily spill over to another and affect both the fund share price and its underlying asset value. The effect of fund and underlying asset illiquidity on fund premium generally remains significant in the presence of control variables that have been proposed in previous studies to explain closed-end fund premia; besides, we further show that our results are valid (in some cases, even stronger) when we use an alternative illiquidity measure (i.e., the proportional spread instead of Amihud fund illiquidity). This suggests that the relative liquidity of the fund and its underlying assets provides a new and economically important explanation for the wide variation in fund premium.

References

Allen, F., Gale, D., 1994. Limited market participation and volatility of asset prices. American Economic Review 84, 933–955.

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

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

Avramov, D., Chordia, T., Goyal, A., 2006. Liquidity and autocorrelations in individual stock returns. Journal of Finance 61, 2365–2394.

Banerjee, S., Gangopadhyay, G., 1997. Discounts in closed-end funds with fixed windup dates: evidence from Thailand's stock markets, mimeo, Brunel University.

Barclay, M., Holderness, C.G., Pontiff, J., 1993. Private benefits from block ownership and discounts on closed-end funds. Journal of Financial Economics 33, 263–291.

Bedi, J., Richards, A., Tennant, P., 2003. The characteristics and trading behaviour of dual-listed companies, Working Paper, Reserve Bank of Australia.

Berk, J., Stanton, R., 2006. Managerial ability, compensation, and the closed-end fund discount. Journal of Finance, forthcoming.

Bodurtha, J., Kim, D., Lee, C., 1995. Closed-end country funds and U.S. market sentiment. Review of Financial Studies 8, 879–917.

Bonser-Neal, C., Brauer, G., Neal, R., Wheatley, S., 1990. International investment restrictions and closed-end country fund prices. Journal of Finance 45, 523–547.

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

Brennan, M., Chordia, T., Subrahmanyam, A., 1998. Alternative factor specification, security characteristics, and the cross-section of expected stock returns. Journal of Financial Economics 49, 345–373.

Cherkes, M., 2003. A positive theory of closed-end funds as an investment vehicle. Working Paper, Princeton University.

Cherkes, M., Sagi, J., Stanton, R., 2005. Liquidity and closed-end funds. Working Paper, Princeton University.

Chordia, T., Roll, R., Subrahmanyam, A., 2000. Commonality in liquidity. Journal of Financial Economics 56, 3–28.

Cohen, B., Remolona, E., 2001. Information flows during the Asian crisis: evidence from closed-end funds. Working Paper, Bank for International Settlements, Switzerland.

Constantinides, G., 1986. Capital market equilibrium with transaction costs. Journal of Political Economy 94, 842–862.

Datar, V., 2001. Impact of liquidity on premia/discounts in closed-end funds. The Quarterly Review of Economics and Finance 41, 119–135.

Datar, V., Naik, N., Radcliffe, R., 1998. Liquidity and asset returns: an alternative test. Journal of Financial Markets 1, 203–219.

DeLong, J., Shleifer, A., Summers, L., Waldmann, R., 1990. Noise trader risk in financial markets. Journal of Political Economy 98, 703–738.

Dimson, E., Minio-Kozerski, C., 1999. Closed-end funds: a survey. Financial Markets, Institutions & Instruments, Vol. 8, No. 2, New York University Salomon Center.

Edison, H., Warnock, F., 2003. A simple measure of the intensity of capital controls. Journal of Empirical Finance 10, 81–103.

Elton, E., Gruber, M., Busse, J., 1998. Do investors care about sentiment? Journal of Business 71, 477–500.

Gagnon, L., Karolyi, G., 2004. Multi-market trading and arbitrage. Working Paper, Ohio State University.

Gemmill, G., Thomas, D., 2002. Noise trading, costly arbitrage, and asset prices: evidence from closed-end funds. Journal of Finance 57, 2571–2594.

Glosten, L., 1989. Insider trading, liquidity, and the role of the monopolist specialist. Journal of Business 62, 211–235.

Gorton, G., Pennacchi, G., 1993. Security baskets and index-linked securities. Journal of Business 66, 1–27.

Hanley, K., Lee, C., Seguin, P., 1994. The marketing of closed-end fund IPOs: evidence from transaction data. Working Paper 94-21, Financial Institutions Center, The Wharton School, University of Pennsylvania.

Hardouvelis, G., La Porta, R., Wizman, T., 1994. What moves the discount on country equity funds? In: Frankel, J.A. (Ed.), The Internationalization of Equity Markets. University of Chicago Press, pp. 345–397.

Hasbrouck, J., 2003. Trading costs and returns for U.S. equities: the evidence from daily data. Working Paper, New York University.

Huang, M., 2003. Liquidity shocks and equilibrium liquidity premia. Journal of Economic Theory 109, 104–129.

Klibanoff, P., Lamont, O., Wizman, T., 1998. Investor reaction to salient news in closed-end country funds. Journal of Finance 53, 673–699.

Kyle, A., 1985. Continuous auctions and insider trading. Econometrica 53, 1315–1335.

Im, K., Pesaran, M., Shin, Y., 2003. Testing for unit roots in heterogeneous panels. Journal of Econometrics 115, 53–74.

Lee, C., Shleifer, A., Thaler, R., 1990. Closed-end mutual funds. Journal of Economic Perspectives 4, 153–164.

Lee, C., Shleifer, A., Thaler, R., 1991. Investor sentiment and the closed-end fund puzzle. Journal of Finance 46, 75–109.

Levin, A., Lin, C., Chu, C., 2002. Unit root tests in panel data: asymptotic and finite sample properties. Journal of Econometrics 108, 1–24.

Lo, A., Wang, J., 2000. Trading volume: definitions, data analysis, and implications of portfolio theory. Review of Financial Studies 13, 257–300.

Longstaff, F., 2004a. The flight-to-liquidity premium in U.S. treasury bond prices. Journal of Business 77, 511–526.

Longstaff, F., 2004b. Financial claustrophobia: asset pricing in illiquid markets. Working Paper, UCLA.

Malkiel, B., 1977. The valuation of closed-end investment-company shares. Journal of Finance 32, 847–858.

Manzler, D., 2005. Liquidity, liquidity risk and the closed-end fund discount. Working Paper, University of Cincinnati.

Newman, Y., Rierson, M.A., 2004. Illiquidity spillovers: theory and evidence from European telecom bond issuance. Working Paper, Stanford University.

Palomino, F., 1996. Noise trading in small markets. Journal of Finance 51, 1537–1550.

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

Petersen, M., 2005. Estimating standard errors in finance panel data sets: comparing approaches. Working Paper, Northwestern University.

Pontiff, J., 1996. Costly arbitrage: evidence from closed-end funds. Quarterly Journal of Economics 111, 1135–1151.

Pontiff, J., 1997. Excess volatility and closed-end funds. American Economic Review 87, 155–169.

Ross, S., 2002. A Neoclassical look at behavioral finance: closed end funds. European Financial Management 8, 129–137.

Vayanos, D., 1998. Transaction costs and asset prices: a dynamic equilibrium model. Review of Financial Studies 11, 1–58.

Wermers, R., Wu, Y., Zechner, J., 2004. Closed-end fund governance, portfolio performance, and the discount. Working Paper, University of Vienna.

Weiss, K., 1989. The post-offering price performance of closed-end funds. Financial Management, Autumn 1989, 57–67.