Mutual Fund Redemptions: Liquidity Preferences in Fund Asset Sales

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Abstract

This study investigates whether mutual funds that experience redemptions preferentially sell their more-liquid stocks. Investors that remain in such funds may inherit portfolios of less-liquid stocks, with an associated transfer of wealth to redeemers. Using 626 mutual fund-periods between 1995 and 1999 we observe that funds do indeed have a systematic preference for selling their more-liquid stocks when they experience redemptions. Our findings question the efficacy of a buy-and-hold strategy where investors could be disadvantaged by managers preferentially selling their more-liquid assets.

Keywords: Mutual fund, liquidity, redemptions

JEL Classifications: G11, G14

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1. Introduction

Liquid assets can be easily traded without adversely impacting their price. Open-end mutual funds hold stocks that possess varying liquidity, whereas the funds that hold these stocks initially provide perfect liquidity to redeeming investors. This study investigates whether investors that remain in a mutual fund that is experiencing redemptions inherit a portfolio of less-liquid stocks.

The proposed mechanism is that the fund managers, motivated by a desire to report the highest valuation of the fund, (and thus return performance) avoid selling the funds' less-liquid stocks as these would face greater downward price-pressure than the ones they do sell, in order to repay the redeeming investors. Redeeming investors are therefore repaid using a valuation of the fund's asset portfolio that could not be sustained in the event that the remaining investors later chose to become redeemers. This follows because the valuation of the portfolio is based on the market price of its constituent assets, and sustained redemptions would require that eventually even the less-liquid stocks must be sold.

Implicitly, the mechanism requires that the (unknown) true value of a redeeming fund's asset portfolio is lower than the value received by redeeming investors for their share of the fund's assets. Hence, a transfer of wealth from remaining investors to redeemers occurs.

We assign stocks that are held and traded by each fund to liquidity categories, and employ regression analysis and non-parametric tests to investigate whether fund managers have a liquidity preference in trading stocks. We find that when funds experience redemptions, they have a systematic preference for selling their more-liquid stocks. In contrast, funds do not exhibit a similar liquidity preference when they experience inflows.

In the remainder of this paper, Section 2 presents a review of the literature. The data and methodology are discussed in Section 3 while the empirical results are detailed in Section 4. In Section 5 we offer our conclusions.

2. Literature review

According to Fortune (1997), when the stock market experiences a pronounced decline, fund managers facing redemptions may preferentially sell their more-liquid assets. During this decline, a transfer of wealth from remaining investors to redeeming investors occurs as redeeming investors are paid-out based on (calculated net asset) valuations that exceed the (unknown) 'true value' of their investment.

A pronounced market decline however is not a necessary condition for the transfer of wealth to redeemers, as demonstrated by Chalmers, Edelen and Kadlec. (2000 and 2001) and Boudoukh, Richardson, Subrahamanyam and Whitelaw (2000). By using a market indicator[1] as predictor of the future net asset value (NAV) of a fund's portfolio (since the current NAV is calculated using 'stale prices'), it is possible to construct a

[1] These authors have variously used the S&P500 index, S&P500 index futures, and Wilshire 5000 index futures as market indicators.

trading strategy that will benefit from both market increases and decreases. Generally, this involves buying into mutual funds immediately following a rise in the market indicator, and selling funds following a fall. Greene and Hodges (2001) find that traders exploit these opportunities in international funds, and that buy-and-hold investors have their return reduced as a consequence.

Price-pressure is where an attempt to buy or sell a quantity of an asset results in a change in the asset's price. As a consequence of price-pressure effects, the realised proceeds from the sale of a portfolio may be lower than its pre-sale total NAV. If price-pressure effects are greater for less-liquid assets, then a fund's calculated NAV will be a function of the liquidity of the assets that are sold.

The impact of price-pressure on the calculated NAV of a portfolio is demonstrated by the practice of 'portfolio pumping' in which funds preferentially purchase more of the small stocks they already own on the final trading day of the year. Zweig (1997) argues that by doing so, they increase their price, the apparent market value of the fund's portfolio, and consequently their reported performance. This effect is confirmed by Carhart, Kaniel, Musto and Reed (2002), and the practice highlighted by the censure of ABN Amro and Oechsle International Advisors by the Securities Exchange Commission (New York Times, August 11, 2001). Beckers and Vaughan (2001) suggest large traders such as mutual funds can also face detrimental price-pressure effects when they wish to unwind their positions.

At the individual stock level, evidence of a price-pressure effect comes from Lakonishok, Shleifer and Vishny (1992) who report that where institutions are net

buyers of a stock over a period, the price of the stock increases. Conversely, the price decreases for net sell trades, and the impact is greatest on smaller stocks with the largest excess of sell trades. The most direct evidence of price-pressure effects comes from the examination of individual trades and trades executed as a package. Studies by Chan and Lakonishok (1993) on individual trades, and Chan and Lakonishok (1995) and Keim and Madhavan (1998) on packages of trades, confirm that on average buy trades result in an increase in a stock's price, and sell trades a decrease, again with the greatest impact being on small capitalisation stocks.

Investor's funds flowing into mutual funds following a superior performance, and flowing out following an inferior performance,[2] demonstrates that investors (rationally or otherwise) believe in the persistence of a fund manager's performance. Since fund managers are commonly compensated for their services according to the total value of the assets under their management, their incentive is to increase their apparent performance in order to increase fund inflows and curtail fund outflows. Further, as Crossland and Moizer (1995) report, they are concerned by the prospect of their services being dispensed with, should their fund's performance deviate from that of the median fund.

Brown and Goetzmann (1997) and Kim, Shukla and Tomas, (2000) find that fund managers undertake investment strategies that differ from their stated objective. Kim, Shukla and Tomas suggest that they do this to increase their apparent return performance by undertaking a more risky strategy than the one they report and by

[2] Studies finding flows follow performance include: Ippolito (1992); Chevalier and Ellison (1995); Metrick and Zeckhauser (1996); Gruber (1996); Goetzmann and Peles (1997); Sirri and Tufano (1998); and Fant and O'Neal (2000). Studies finding poor performance precedes demise include: Brown and Goetzman (1995); and Blake and Timmermann (1997).

which they seek to be judged. There is also evidence that fund managers 'window dress' by selling poorly performing stocks and purchasing low-risk or recently superior performing securities prior to the year-end disclosure of their portfolios (Lakonishok Shleifer, Thaler and Vishny, 1991; Musto, 1997; Sias and Starks, 1997). Other strategies that are followed by mutual funds, which impose agency costs on investors are the churning of portfolios to reduce the capital gain overhang (Barclay, Pearson and Weisbach, 1998) and the incubation of new funds (Malkiel, 1995; Zweig, 1996; Goetzman and Peles, 1997).

It is evident that some fund managers act in a manner contrary to the best interests of investors in the fund. Since they have the incentive to be able to report the highest return performance, it would be surprising if they did not avoid selling stocks that would decrease their return performance most. This would be the stocks that are less liquid, and face the greatest downward price-pressure. Hence, faced with redemptions from the fund, it is anticipated that managers would preferentially sell the fund's more-liquid securities.

3. Data Description and Methodology

3.1. Data description

The database was compiled from data acquired from three major sources. Details of the stock holdings and transactions of all US equity mutual funds that were classified as 'growth' or 'aggressive growth' were purchased from Thomson Financial Services Ltd for the period January 1995 – September 1999. These data were combined with

stock turnover data that were acquired from Datastream and supplemented with Equis International Inc (MetaStock) data.

The following requirements restricted the size of the sample:

1. The sum of the value of a fund's asset holdings at the start of a period was within the range of 90% – 110% of the value of their reported assets[3].
2. Stock 'market capitalisation' data was available for stocks that represented at least 99% of the summed value of a fund's asset holdings.
3. Stock 'market turnover' data (from Datastream and Equis) was available for stocks that represented at least 75% of the summed value of a fund's asset holdings[4].
4. The period between successive reports was not less than 80 days and did not exceed 370 days[5].

The above restrictions reduced the sample size from 14,473 to 4,692 fund-periods.

3.2. *Method*

Initially we define a liquidity measure, and then identify redeeming or inflow mutual funds. Subsequently we use the liquidity measure to assign stocks that are held and traded by each fund, to liquidity categories. Finally we apply regression analysis and non-parametric tests to explore whether fund managers have a liquidity preference in trading stocks.

[3] Funds outside this range were excluded to avoid discrepancy caused by non-synchronous pricing of stocks and data omission. In addition, calculated asset holdings at the end of a period are required to be in the range of 75% - 125% of the value of their reported assets.
[4] Missing data were completed using a market capitalisation proxy for turnover.
[5] Funds are required to report holdings semi-annually, however Thomson commonly receives quarterly statements.

3.2.1 *Liquidity Measure*

Falkenstein (1996) and Gompers and Metrick (1998) use logs of 'price', 'monthly turnover divided by the number of shares outstanding' (proportionate turnover), 'market value' and 'log market value squared' as independent regression variables to proxy for liquidity. We use 'stock liquidity' obtained as a multiplicative combination of 'market value' and 'proportionate turnover' to yield:

$$\text{Stock Liquidity}_i = \log(\text{Price}_i \times \text{Market Turnover Volume}_i) \qquad (1)$$

This measure is also used by Brennan, Chordia, and Subrahmanyam (1998) as an independent variable to proxy liquidity.

[Insert Table 1]

Table 1 presents pair-wise correlation of alternative stock liquid measures. It is evident that log market value, log market value squared and log price are all highly correlated and statistically significant at the 0.01 level. Proportionate turnover has a lower, but still significant correlation with these measures. Stock liquidity, the measure used in this study, is correlated with the alternative measures used in previous research.

3.2.2. *Redeeming and Inflow Fund Classification*

A fund's transactions during a period are reported by Thomson and we use the start of period stock price to define the value of these transactions. A fund is classed as a redeeming fund if the value of its transactions represents an outflow of greater than 10% of the start of quarter assets where the period is less than 100 days. If the period is between 100 and 190 days, outflows are required to be greater than 15%, and 20% if the period is greater than 190 days. A fund is classed as an inflow fund if the value of its transactions during the period represents an inflow that is greater than 10%,

15%, and 20% of the start of quarter assets, where the period is less than 100 days, between 100 and 190 days, and greater than 190 days respectively. Funds that apparently experience redemptions or inflows of more than 50% in a period are eliminated from the dataset as it is considered that the data are most likely in error.

3.2.3. *Liquidity category assignment*

The stocks held by a fund at the start of a period are ranked according to their liquidity. It is necessary to assign these stocks to portfolios (liquidity categories) of equal market capitalisation to ensure that there is no relation between value and liquidity. If trades are non-preferential with respect to liquidity, then this relation should persist. The stocks held by each fund at the start of a period are assigned to one of twenty 'liquidity categories', each containing 5% of the fund's holdings by value. The proportionate value of the stocks in each liquidity category that were subsequently traded during the period is determined in order to assess how the proportion traded differs from the proportion held.

To allocate stocks to liquidity categories, the stocks held by a fund at the start of the period, and those acquired during the period are jointly ranked according to their liquidity, from least to most liquid. The proportionate value of each stock held at the start of the period is calculated, and the cumulative proportion of 'stock held' calculated by summing the proportions with increasing stock liquidity. Stocks for which the cumulative proportion held is less than or equal to 0.05 are assigned to liquidity category 1, and those for which the cumulative proportion is between 0.05 and 0.10 are assigned to category 2, and so on. Finally, the stocks for which the cumulative proportion is greater than 0.95 are assigned to liquidity category 20.

Because the stocks held and traded are jointly ranked with respect to liquidity, stocks traded during the period can be assigned to a liquidity category using the 'cut-offs' determined from the proportionate holdings, even if they were not held at the start of the period. With the assignment of a negative value for a sell trade and a positive value for a buy trade, the proportionate value of all trades in each liquidity category is determined.

Ideally the portfolio would be partitioned to assign exactly 5% of the value to each liquidity category. This rarely occurs because a particular stock holding straddles the desired partition. To address this issue, half the value of the holding and half the value of the stock traded are assigned to the liquidity category on either side of the partition, and a lower limit of 75 stocks was set for the fund to remain in the sample. When it is not possible to assign the stocks to 20 equal value categories (such as when a single stock comprised more than 5% of the value of the fund's asset portfolio), stocks are instead assigned to ten equal value liquidity categories.

After eliminating funds with less than 75 stocks in their portfolios, and funds that were not classified as redeeming or inflow funds, the sample size was reduce from 4,692 to 626 fund-periods.

[Insert Table 2]

Table 2 presents descriptive statistics on the 626 fund-periods remaining in the sample after applying our screening and selection criteria. The funds are almost equally divided into redeeming and inflow funds both with respect to the number of funds and fund-periods which allows for funds to be represented in more than one period.

Inspection shows that the two groups exhibit similar characteristics with respect to fund market capitalisation, the number of stocks in their portfolios, the magnitude of redemptions and time-interval over which they are measured. The skewness of fund market capitalisation and the number of stocks, reflects the presence of a few very large funds and a few funds holding large numbers of stocks.

The liquidity of each stock in a fund's portfolio is measured by the log of 'market capitalisation' and by the log of 'market value turnover'. Accordingly, 'portfolio liquidity' is derived by weighting these measures by the proportion that each stock comprises of the total value of a fund's portfolio. It is apparent from Table 2 that the redeeming fund and inflow fund groups exhibit similar portfolio liquidity.

3.3. *Statistical tests*

The focus of our tests is to determine whether there is a liquidity preference for the stocks traded by a fund. We perform regression analysis and a non-parametric test of the association between the proportion traded and liquidity. For the regression analysis, an insignificant coefficient on liquidity indicates that trades are not motivated by the liquidity of the stock. The Kolmogorov-Smirnov (KS) test directly compares the proportions traded with expected proportions (which reflect the proportions that each liquidity category comprises of a fund's start of period holding).

3.3.1 *Regression analysis*

We regress the proportion (by value) of stocks in a liquidity category that are traded by a fund during a period, on the liquidity of the category:

$$\text{TradeProp}_j = \alpha + \beta\ \text{Liquidity}_j + \varepsilon_j \qquad (2)$$

$$\text{where TradeProp}_j \equiv \frac{\text{Value stock category}_j \text{ traded}}{\left|\sum_{j=1}^{20} \text{Value of stock category}_j \text{ traded}\right|}$$

$$\text{and Liquidity}_j \equiv \sum_{i=1}^{n} (\text{Stock liquidity}_i \times \frac{\text{Value stock}_i \text{ traded}}{\text{Value stock category}_j \text{ traded}})$$

$$\text{with Stock liquidity}_i \equiv \log(\text{Price}_i \text{ x Market turnover volume}_i).$$

These are performed on 626 fund-periods in which the funds were classified as redeemers or inflow funds at some time during the period December 1995 – September 1999. By construction, similar regressions of the proportion (by value) of stocks in a liquidity category that were held by a fund at the start of a period, on the liquidity of the category would indicate that there is no relation. Accordingly, for each fund, the regression (equation 2) will isolate any liquidity preference in trading during a period when the respective betas are significantly negative or positive.

In these regressions, a beta that is significantly different from zero could have occurred as a random event. To determine whether the count of significant betas from 319 regressions performed for redeeming funds and 307 for inflow funds could have occurred by chance, the observed count is compared with critical values obtained from the cumulative binomial distribution.[6] We use the number of regressions as the

[6] The cumulative binomial distribution is the appropriate test because the liquidity betas from the regression analyses have a binary outcome (significant or not significant).

number of trials, the level of significance at which we find the regression betas to be positive or negative as the probability of a success, and generate the critical number of successes corresponding to a cumulative binomial probability of 1%.

3.3.2 *Non-parametric tests*

Our grouping of stocks into increasing liquidity categories of equal market value provides an opportunity to compare the cumulative proportions held at the start of a period with the cumulative proportions traded, using the Kolmogorov-Smirnov (KS) test. By construction, the distribution of proportions of stocks in each liquidity category is uniform at the start of a period, and this is used as the 'expected distribution' where stocks were traded without preference for liquidity. We compare this with the distribution of proportions we observe from the stocks traded during a period.

We calculate the number of KS test statistics that exceed critical values corresponding to various levels of significance for 20 liquidity categories. The test statistic (KS) is generated from:

$$KS = \max\left|F_o - F_e\right| \tag{3}$$

where F_o = Observed cumulative proportions traded and

F_e = Expected cumulative proportions traded.

These are calculated over all 20 liquidity categories that are arranged in ascending order. That is, for each value of k where k=1,2,3,...,20, the observed cumulative proportion from liquidity category 1 to k is defined as

$$\sum_{j=1}^{k} \frac{\text{Value stock category}_j \text{ traded}}{\left|\sum_{j=1}^{20} \text{Value of stock category}_j \text{ traded}\right|}$$

and the expected cumulative proportion is -0.05, -0.10, -0.15,...,-1.00 for redeeming funds and 0.05, 0.10, 0.15,...,1.00 for inflow funds.

The KS test statistic is arbitrarily defined as negative or positive to be consistent with the nomenclature in the linear regression model. Negative denotes a preference for redeeming funds to sell more-liquid stocks and for inflow funds to buy less-liquid stocks. In each case the likelihood of obtaining KS statistics as a random occurrence with respect to each level of statistical significance is tested. We use the number of KS tests as the number of trials, the level of significance corresponding to the KS critical values at which we find the KS statistic to be positive or negative as the probability of a success, and generate the critical number of successes corresponding to a cumulative binomial probability of 1%.

4. Results

4.1. *Regression analyses results*

To determine if there is a relation between the proportion of stocks traded during a period and the stock's liquidity, 626 separate univariate linear regressions are performed. The resulting coefficients are termed 'liquidity betas'. Table 3 reports the number of liquidity betas generated from these regressions that are significantly different from zero, for various levels of significance. A negative beta denotes a reduction of the liquidity of a fund's portfolio. Redeeming funds with a negative beta are preferentially selling their more-liquid stocks, while inflow funds are purchasing less-liquid stocks. The binomial distribution was used to confirm that the counts of the liquidity betas exceed that expected by a random occurrence.

[Insert Table 3]

Panel A shows the count of liquidity betas for 319 redeeming fund-periods, which increases as the level of statistical significance is relaxed. Fund-periods with a negative liquidity beta are approximately three times more prevalent than fund-periods with a positive liquidity beta. This is consistent with the interpretation that there is a systematic tendency for redeeming funds to preferentially sell their more-liquid stocks.

Panel B considers 307 inflow fund-periods. It is apparent that negative and positive liquidity betas are approximately in balance for each significance level. This is consistent with the interpretation that while individual funds may exhibit a preference for buying either more or less-liquid stocks, there is no systematic tendency across inflow funds for them to do so. The count of liquidity betas in Panel B is similar to that of the positive liquidity betas reported in Panel A. This adds to the interpretation by suggesting that while individual funds may be cognisant of the liquidity of the stocks they trade; these funds represent no more than a base-level proportion.

There are strong non-systematic influences on a fund's choice of which stocks to trade which may show as a preference for liquidity and account for the base-level proportion. Table 3 however, highlights a systematic preference for funds facing redemptions to preferentially sell their more-liquid stocks in order to meet these redemptions.

Table 4 presents a time-series analysis of the liquidity betas previously pooled and reported in Table 3. For each quarter, the number of funds is reported along with the

percentage of associated liquidity betas that are significantly negative or positive at the various levels. It is evident that the number of funds increases over time irrespective of whether it is a redeeming or inflow fund, reflecting both an increase in the number of funds and an improvement in the quality of the data.

[Insert Table 4]

Panel A demonstrates that for redeeming funds, there is variability in the count of liquidity betas over time. In the period June-December 1998 the proportion of significantly negative liquidity betas is below the pooled count of liquidity betas for the sample period. However, a supplementary investigation shows that market conditions during this period may have resulted in funds selling low capitalisation stocks irrespective of any concern for liquidity. Conversely, eliminating this period from the pooled count would have strengthened the result of Table three.

The period June-December 1998 coincides with a major correction in small capitalisation stock prices. This may be confirmed by perusal of Figure 1, which illustrates the Wilshire Small Cap price index (less-liquid stocks) and the S&P500 price index (more-liquid stocks) after re-basing them to 100 on January 1st, 1995. Also shown to assist comparison, is the difference between these re-based series.

[Insert Figure 1]

The Wilshire Small Cap price index declined by 41% between April and October 1998[7], while the S&P 500 price index exhibited a much smaller (19%)[8] and lagged decline around the same period.

[7] The Wilshire Small Cap price index stood at 701.90 on April 22nd, 1998 and fell to 417.23 on October 8th, 1998.
[8] The S&P500 price index stood at 1186.75 on July 17th, 1998 and fell to 957.28 on August 31st, 1998.

A possible explanation may be that funds experiencing redemptions sought to re-position their portfolios away from small stocks in which sentiment had become bearish to make themselves more attractive to investors (consistent with window-dressing).

Panel B demonstrates that for inflow funds, the count of negative and positive betas is essentially time invariant in a statistical sense. However, when a slightly lower criterion for statistical significance is used, these funds exhibit a stronger than average preference for purchasing less-liquid stocks during the June-December 1998 period. In view of Figure 1, it is possible that they may have availed themselves of the opportunity to bargain-hunt in the (less-liquid) small capitalisation stocks.

4.2. *Non-parametric test results*

To determine if there is a relation between the proportion of stocks traded during a period and the stock's liquidity, 626 separate non-parametric Kolmogorov-Smirnov tests are performed. For each fund-period, we report in Table 5 the number of KS test statistics that exceed critical values corresponding to the levels of statistical significance. We define a KS test statistic to be 'negative' when the cumulative proportion of stocks (ranked by ascending liquidity) that are traded, exceed the expected cumulative proportions. Hence, a negative KS test statistic indicates a preference for redeeming funds to preferentially sell more-liquid stocks and for inflow funds a preference to buy less-liquid stocks. The binomial distribution was used to confirm that the counts of funds satisfying the KS test exceed those expected by a random occurrence.

[Insert Table 5]

Panel A indicates that for redeeming funds there are approximately 2.5 times more fund-periods in which funds exhibit a preference for selling more-liquid stocks. This supports the earlier finding of the regression analysis that there is a systematic preference for funds facing redemptions to sell their more-liquid stocks, but without the requirement that the relation be linear. In Panel B it is apparent that the KS statistics indicating a preference for funds to buy less-liquid stocks is only marginally higher than the preference to buy more-liquid stocks. Comparison of funds with a positive KS test statistic between Panel A and Panel B shows funds have a similar preference for weighting their portfolios towards more-liquid stocks.

5. Conclusions

Open-end mutual funds hold stocks with varying liquidity. However, redeeming investors are provided with perfect liquidity. Redeemers also benefit if incorrect net asset valuations reflecting stale prices cause a transfer of wealth to redeemers, a problem that is further exacerbated if managers defer price-pressure effects on the valuation of the portfolio by preferentially selling more-liquid stocks.

By assembling portfolios of varying liquidity, we are able to observe whether trades by a fund show a preference for liquidity. We find that funds have a systematic preference for selling their more-liquid stocks when they experience redemptions. In contrast, funds experiencing inflows do not exhibit a similar liquidity preference. These results are apparent from regression analyses and confirmed by non-parametric tests. Supplementary empirical tests show these results to be robust over time.

Our findings question the efficacy of a buy-and-hold strategy where fund investors could be disadvantaged by managers preferentially selling their more-liquid assets. By preferentially selling the more-liquid stock in redeeming funds, managers artificially support the fund's NAV and their own apparent performance. This is consistent with evidence of opportunistic behaviour by managers identified in other studies, which impose costs on fund investors.

When investors buy the shares of an open-ended fund, they purchase a portfolio of stocks with inherent return and liquidity characteristics. Traditionally, when assessing a fund's performance the focus has only been on the collective returns of the stocks. However, this ignores consideration of the liquidity of the stocks in a fund's portfolio, and the extent this impacts the fund's future performance is an area for future research.

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Table 1

Stock liquidity measures correlation matrix

The matrix is based on 5,385 stocks held in June 1999 by mutual funds used in this study. We define stock liquidity as: Stock Liquidity$_i$ = log(Price$_i$ x Market Turnover Volume$_i$).

Liquidity measures	Ln MV	LnMVSq	PropTO	LnPrice	Stock Liquidity
Log (market value) [LnMV]	1.00				
[Log (market value)]^2 [LnMVSq]	0.91	1.00			
Proportionate turnover [PropTO]	0.06	0.05	1.00		
Log price [LnPrice]	0.73	0.70	0.09	1.00	
Stock liquidity	0.60	0.53	0.40	0.74	1.00

All correlations are significant at the 0.01 level (1-tailed).

Table 2

Descriptive statistics

Descriptive statistics for 626 fund-periods in which the funds were classified as redeemers or inflow funds at some time during the period December 1995 – September 1999. The Number of fund-periods includes funds that were redeemer or inflow funds for more than one period between December 1995 and September 1999; Redemptions, the percentage of fund assets redeemed during the period where a negative value represents an inflow fund; Portfolio liquidity, the proportionate holding (by value) of each stock held in a fund's portfolio weighted by the corresponding stock liquidity.

	Redeeming fund-periods			Inflow fund-periods		
Number of fund-periods		319			307	
Number of funds		207			189	
	Mean	Median	Std Dev	Mean	Median	Std Dev
Market capitalisation ($ million)	645	208	1706	764	183	1945
Number of stocks in portfolio	185	138	220	240	159	220
Redemptions (%)	19.8	17.8	8.2	-22.5	-20.4	9.5
Interval (days)	125	92	51	120	92	45
Portfolio liquidity						
- Log market capitalisation	21.4	21.3	1.3	22.3	22.5	1.6
- Log market value turnover	13.5	13.4	1.21	14.0	14.1	1.55

Table 3

Significant liquidity betas across redeeming and inflow funds

The table reports the number of statistically significant liquidity betas generated from linear regressions of: $\text{TradeProp}_j = \alpha + \beta\,\text{Liquidity}_j + \varepsilon_j$

where

$$\text{TradeProp}_j \equiv \frac{\text{Value stock category}_j \text{ traded}}{\left|\sum_{j=1}^{20} \text{Value of stock category}_j \text{ traded}\right|}$$

$$\text{Liquidity}_j \equiv \sum_{i=1}^{n} (\text{Stock liquidity}_i \times \frac{\text{Value stock}_i \text{ traded}}{\text{Value stock category}_j \text{ traded}})$$

$$\text{Stock liquidity}_i \equiv \log(\text{Price}_i \text{ x Market turnover volume}_i)$$

These were performed on 626 fund-periods in which the funds were classified as either redeeming or inflow funds at some time during the period December 1995 – September 1999.

Panel A: Redeeming funds – 319 fund-periods

	Liquidity beta			
Significance	Negative		Positive	
	Count	Percentage	Count	Percentage
1% level	39	12%	11	3%
5% level	72	23%	25	8%
10% level	97	30%	35	11%

Panel B: Inflow funds – 307 fund-periods

	Liquidity beta			
Significance	Negative		Positive	
	Count	Percentage	Count	Percentage
1% level	14	5%	12	4%
5% level	38	12%	29	9%
10% level	52	17%	36	12%

All values are statistically significant at the 0.01 level.

In each case the likelihood of obtaining liquidity betas as a random occurrence with respect to each level of statistical significance was tested. The cumulative binomial critical values at 1% are 5, 15 and 26 (2-tailed).

Table 4

Time-series of significant liquidity betas across redeeming and inflow funds.

Panel A: Redeeming funds							
Period	Number of funds in period	Negative liquidity beta Significance			Positive liquidity beta Significance		
		0.10	0.05	0.01	0.10	0.05	0.01
Mar-95	2	*100%	*100%	50%	0%	0%	0%
Jun-95	6	0%	0%	0%	0%	0%	0%
Sep-95	8	25%	25%	13%	0%	0%	0%
Dec-95	8	*63%	*50%	13%	13%	13%	0%
Mar-96	6	17%	17%	0%	33%	*33%	0%
Jun-96	4	0%	0%	0%	0%	0%	0%
Sep-96	4	25%	25%	25%	25%	25%	25%
Dec-96	9	11%	11%	11%	11%	0%	0%
Mar-97	12	*58%	*50%	17%	0%	0%	0%
Jun-97	16	25%	19%	13%	6%	6%	0%
Sep-97	10	30%	20%	20%	0%	0%	0%
Dec-97	26	*65%	*46%	*23%	*0%	0%	0%
Mar-98	17	35%	35%	24%	12%	12%	6%
Jun-98	16	31%	25%	19%	19%	13%	6%
Sep-98	47	*13%	*6%	*2%	*19%	*15%	6%
Dec-98	31	*16%	*3%	*3%	*23%	13%	*10%
Mar-99	45	33%	22%	*4%	11%	9%	4%
Jun-99	32	*47%	*38%	*28%	3%	*0%	0%
Sep-99	20	*10%	10%	10%	10%	5%	0%
Total	319	30%	23%	12%	11%	8%	3%

Table 4 *(continued)*

Panel B: Inflow funds							
Period	Number of funds in period	Negative liquidity beta Significance			Positive liquidity beta Significance		
		0.10	0.05	0.01	0.10	0.05	0.01
Mar-95	3	0%	0%	0%	0%	0%	0%
Jun-95	5	20%	20%	0%	0%	0%	0%
Sep-95	6	0%	0%	0%	33%	33%	17%
Dec-95	8	0%	0%	0%	*38%	25%	0%
Mar-96	5	0%	0%	0%	20%	20%	20%
Jun-96	5	0%	0%	0%	0%	0%	0%
Sep-96	8	0%	0%	0%	13%	13%	0%
Dec-96	22	9%	9%	5%	23%	18%	5%
Mar-97	11	9%	9%	9%	9%	9%	0%
Jun-97	11	27%	18%	9%	9%	0%	0%
Sep-97	21	19%	14%	5%	5%	5%	5%
Dec-97	22	*32%	23%	9%	5%	0%	0%
Mar-98	28	*29%	14%	7%	11%	4%	4%
Jun-98	27	11%	7%	4%	7%	7%	0%
Sep-98	21	19%	19%	10%	14%	10%	5%
Dec-98	37	24%	19%	5%	11%	11%	8%
Mar-99	24	21%	13%	0%	8%	8%	4%
Jun-99	23	13%	13%	4%	17%	17%	0%
Sep-99	20	10%	5%	0%	10%	10%	10%
Total	307	17%	12%	5%	12%	9%	4%

* denotes percentage is statistically different from the pooled (total) at the 0.10 level.

Table 5

Significant Kolmogorov-Smirnov (KS) test statistics across redeeming and inflow funds

The table reports the number of KS test statistics that exceed critical values corresponding to the levels of significance in the left-hand column for 20 liquidity categories. The test statistic (KS) is generated from $KS = \max\left|F_o - F_e\right|$ where F_o is the observed cumulative proportion and F_e is the expected cumulative proportion. The cumulative proportions are calculated over all 20 liquidity categories which are arranged in ascending order. That is, for each value of k where k=1,2,3,...,20. The observed cumulative proportion from liquidity category 1 to k is defined as $\sum_{j=1}^{k} \frac{\text{Value stock category}_j \text{ traded}}{\left|\sum_{j=1}^{20} \text{Value of stock category}_j \text{ traded}\right|}$ and the expected cumulative proportion is -0.05, -0.10, -0.15,...,-1.00 for redeeming funds and 0.05, 0.10, 0.15,...,0.10 for inflow funds. The KS test statistic was arbitrarily defined as negative or positive to be consistent with the nomenclature in Table 3 for the linear regression. Negative denotes a preference for redeeming funds to sell more-liquid stocks and for inflow funds to buy less-liquid stocks. The KS test was performed on 626 fund-periods in which the funds were classified as redeemers or inflow funds at some time during the period December 1995 – September 1999.

Panel A: Redeeming funds – 319 fund-periods

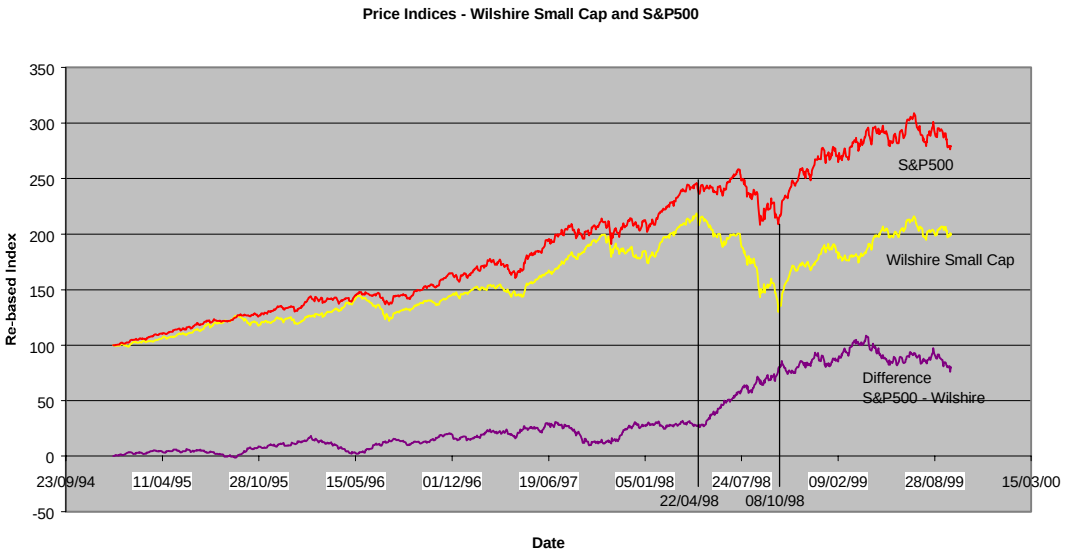
	KS test statistic			
Significance	Negative		Positive	
	Count	Percentage	Count	Percentage
1% level	97	30%	42	13%
5% level	118	37%	46	14%
10% level	124	39%	51	16%

Panel B: Inflow funds – 307 fund-periods

	KS test statistic			
Significance	Negative		Positive	
	Count	Percentage	Count	Percentage
1% level	54	18%	42	14%
5% level	68	22%	50	16%
10% level	77	25%	54	18%

All values are statistically significant at the 0.01 level.

In each case the likelihood of obtaining KS statistics as a random occurrence with respect to each level of statistical significance was tested. The cumulative binomial critical values at 1% are 5, 15 and 26 (2-tailed).



Source: Datastream

Figure 1

Small and large capitalisation stock price indices