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Liquidity black holes: And why modern financial regulation in developed countries is making short-term capital flows to developing countries even more volatile

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Discussion Paper No. 2002/31

## **Liquidity Black Holes**

And Why Modern Financial Regulation in  
Developed Countries is making Short-Term  
Capital Flows to Developing Countries Even  
More Volatile

Avinash Persaud\*

March 2002

### **Abstract**

Modern financial regulation has been about the spread of market-sensitive risk-management systems for banks, the spill-over of this approach to other financial institutions and the retreat of regulatory ambition. There is evidence that these trends are leading to a more fragile financial system, more prone to concentration and 'liquidity black holes'. The most glaring effects of these trends are felt in the pro-cyclicality and volatility of capital flows to risky markets. The root of the problem is that the liquidity of financial markets requires diversity, but all these trends are serving to reduce the diversity of behaviour of market participants.

Keywords: financial regulation, liquidity black holes, investor behaviour

JEL classification: G14, G15, G18

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Modern financial regulation since the early 1990s has been about the spread of market-sensitive risk-management systems for banks, the spill-over of this approach to other financial institutions and, in general, the retreat of regulatory ambition. There is growing evidence that these trends are leading to a more fragile financial system, more prone to concentration, crisis and 'liquidity black holes'. This problem has not been sufficiently addressed because, although it is born of the regulation of financial institutions in developed countries, its most glaring effects are felt in the pro-cyclicality and volatility of capital flows to emerging markets (Griffith-Jones 1998, French-Davis and Reisen 1998). The root of the problem is that the liquidity of financial markets requires diversity, but all these trends are serving to reduce the diversity of behaviour of market participants. Regulators should have a more global perspective on the implications of their local regulation. In order to encourage, and perhaps impose, greater diversity in the financial system as a whole, regulators need to place less reliance on internal ratings-based approach to bank risk management, must encourage the adoption of alternative, contra-cyclical risk management systems by long-term investors and, within limits, should temper their discouragement of off-shore, leveraged, institutions.

## **1 What is liquidity?**

Confusingly, liquidity has many different though often related meanings. As an instrument of monetary policy, central banks influence the amount of liquidity in the money markets through the sale and repurchase of Treasury bills. In popular commentary on the equity market, liquidity conditions often refer to new demand for equities coming from the flow of savings from investors. In this paper we are *not* concerned with the grand subjects of monetary policy or the flow of private savings, but with liquidity conditions for trading in the capital markets. This liquidity is about the speed and cost of buying or selling loans, bonds, or equities (Bank of Japan 1999). If I were selling an instrument in a liquid market, I would not expect my selling by itself to lower the price I was paid. In an illiquid market, on the other hand, I may have to push the market price down in order to find a buyer. Investors try to avoid illiquid markets. Pushing the price up when you are buying and pushing it down when you are selling will erode your returns. Moreover, these trading costs are often variable, hard to measure and introduce uncertainty. As well as being a major obstacle to encouraging overseas capital, illiquid financial markets are bad at converting local savings into local investment. Liquidity matters more than the sparse literature on the subject would suggest.

Liquidity is under-researched because it is hard to measure the price impact of trading without detailed information on who sold what, when, and at which price. Consequently, most measures of liquidity in the securities markets focus on the size of the bid-ask spreads quoted by market-makers on electronic brokerage systems, and in the loan markets on the amount of new loans that are issued. Comprehensive loan issuance and turnover data are not very timely— often available only quarterly — and so when trying to understand the behaviour of liquidity most analysts study the time-series

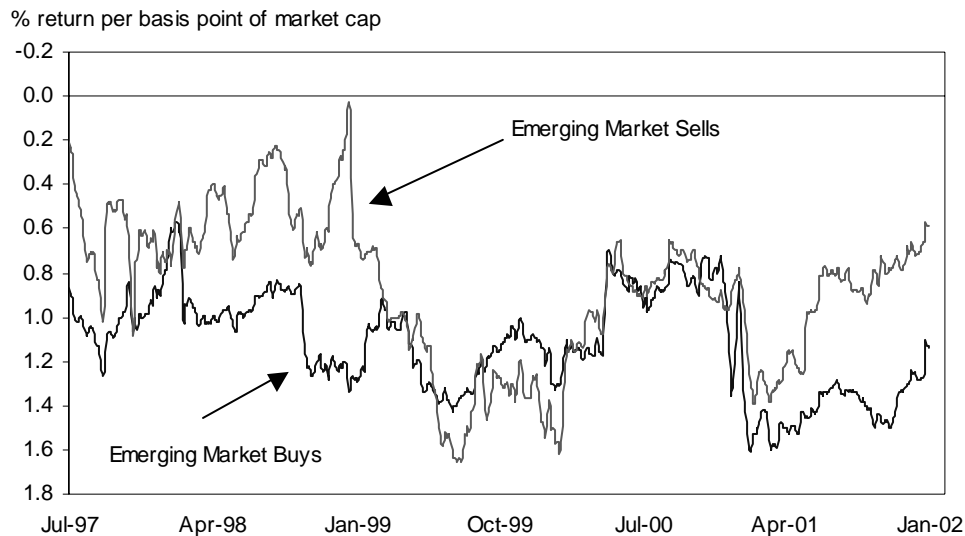
of bid-ask spreads in the foreign-exchange, equity or government-bond markets (Borio 2000, Engle and Lange 1997). In a competitive market this spread should represent the estimated cost to the market-maker of getting out of a position, which in turn should relate to the market's liquidity.

If a market maker begins by not having a position in a stock and she expects her buying of that stock to push its price up and/or to take time, she will try to pass on that future price, and the risks of being short the stock as she tries to buy it, to a client wishing to buy the stock from her. She will do this through the bid-price she quotes for the stock. Similarly if she believes that selling the stock will push the price down, she will want to pass on that new price and the risk of being long the stock to a client who wishes to sell the stock to her and she will do this through the ask price she quotes. Often a market-maker will already have a position and this will impact her preference for buying or selling more but on average, across market makers, the spread between the bid and ask price should reflect their forecasts of the price of getting out of a position in the stock, which in turn reflects underlying liquidity conditions (O'Hara 1995, Fleming and Remolona 1999). The problem with using reported bid-ask spreads, however, is that they are only quoted on small trades, and actual spreads widen substantially, the larger the size of trade and the more market conditions are under stress. Bid-ask spreads are a good measure of liquidity during good liquidity conditions, but not during poor conditions – which of course is exactly when a measure is needed.

One solution to this data problem is the growing use of custodial data bases which record both quantity and price information on the purchases and sales of investors. State Street is one of the world's largest custodians with approximately US\$6trn of assets under custody or 10 per cent of the world's tradable securities. Using this database at an aggregate level, Professor Ken Froot and Dr Paul O'Connell of Harvard University and State Street Associates (State Street Bank and FDO Partners 2000) have developed an index of the price impact faced by overseas investors when buying and selling equities across 42 markets.

Chart 1, shows the average percentage price impact faced by an overseas investor when buying or selling one basis point of the capitalization of an emerging equity market. This chart suggests that liquidity is returning. The bad news is that it took an extraordinarily long time for it to do so – 30 months – after series of liquidity draining events in 1998: the unwinding of the US\$/yen carry trade in July, the Russian default in August, and the collapse of LTCM, an overly leveraged hedge fund, in September. In 1999 liquidity was probably held down by two other factors. First, there was concern over the Y2K or millennium bug, which was considered to be potentially most threatening in emerging markets. Second, investment banks, hurt by the events of 1998, removed their trading infrastructure from many emerging markets. It was said that one large US investment bank had 400 staff in their Moscow office trading Russian debt and stocks in August 1998 just before the Russian default, and just four in August 1999.

Chart 1  
Liquidity index for emerging equity markets



Source: State Street

This chart and the charts for the component markets show a striking variability in liquidity. The Froot/O'Connell methodology moderates this to some extent by measuring price impact across a period of over 100 days, but it is clear that sharp declines in liquidity were not just a feature of 1998. Over the past five years, there have been two occasions every year when the average price impact of selling emerging equity markets has risen sharply. This is an average: some markets suffer more than others. This variability is particularly troubling for investors. Indeed, there is evidence that the rude awakening to liquidity issues during 1998 led to an increased preference by investors for markets with high and stable liquidity. This has kept overseas investors out of emerging markets for an extended period, even though many of these markets have offered, on a historical basis, attractive investment yields, see Chart 2 (Ffrench-Davis and Griffith-Jones 2002).

## 2 Liquidity black holes

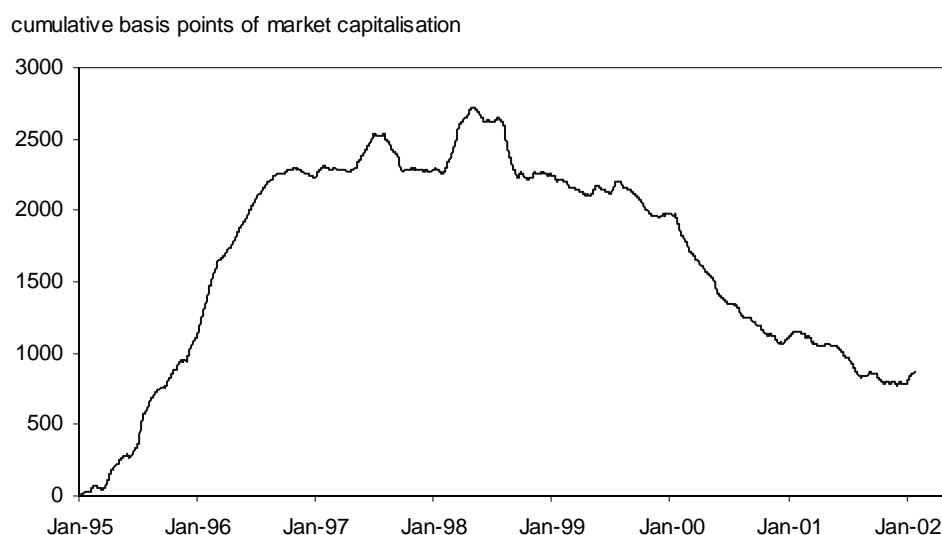
If a market was illiquid, but consistently and measurably so, then investors would demand a liquidity premium, but would probably not avoid the market altogether. A market that appears liquid, especially when you buy it, but becomes illiquid just when you want to sell it, generates a degree of uncertainty that investors and creditors strongly dislike, especially with the current emphasis on quantitative risk controls. Measurements of liquidity meaningful to market participants need to include not just the average level of liquidity, but also the volatility of liquidity. Of course, liquidity, especially when defined in terms of how much the price moves for a given flow is a measure of the volatility of price (and so in measuring the volatility of liquidity we are measuring the volatility of volatility – the third derivative of price). In this paper I have

termed those episodes where liquidity suddenly disappears as ‘liquidity black holes’, partly because liquidity appears to be sucked out of markets in the vicinity of the one at the centre of a liquidity event. Investors are concerned that while, in general, the level of liquidity has finally returned to levels last seen in 1996–97, the number of liquidity black holes may have increased.

One simple measure of the frequency of liquidity black holes is to count the number of times there is a spike in volatility. In Chart 3, we count the number of days in a quarter that the broad market indices for US, UK and Japanese stocks (S&P 500, FTSE, Topix respectively) have moved by 2 standard deviations more than the average daily market move. To capture the trend better we have plotted a five-year moving average of this quarterly tally, while replacing the outliers – the three largest and three smallest readings – with the average reading. There appears to be a regular cycle to this measure of volatility, but both the quarterly bars and the smoothed average also suggest that the number of extreme events or liquidity black holes have risen significantly since the mid-1990s. It is reasonable to ponder how much this is a trend and how much it is related to the great run-up and then run-down in equity prices between 1998 and 2001. It is hard to be sure though it is equally reasonable to ask whether liquidity factors themselves helped to produce this great surge and subsequent collapse of equity prices. It is also interesting to observe that the upward trend in black holes continued beyond the peak and bottom in equity prices in March and September 2000, respectively. Moreover, a similar trend in black holes can be seen outside the equity markets in the US\$/yen foreign exchange market, see Chart 4.

Chart 2

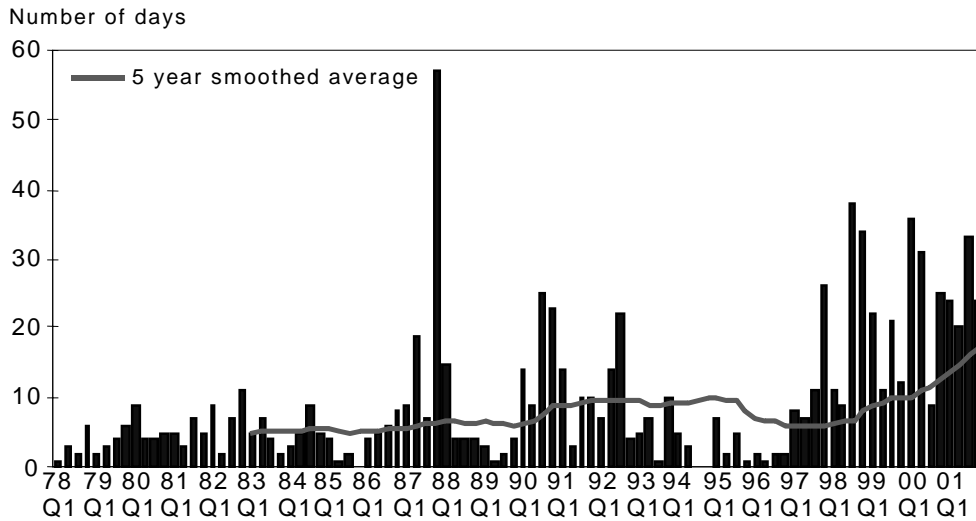
Cross-border portfolio flows to emerging equity markets (excluding Hong Kong, Korea, Taiwan and Singapore) since 1995 as a proportion of the market capitalization



Source: State Street

Chart 3

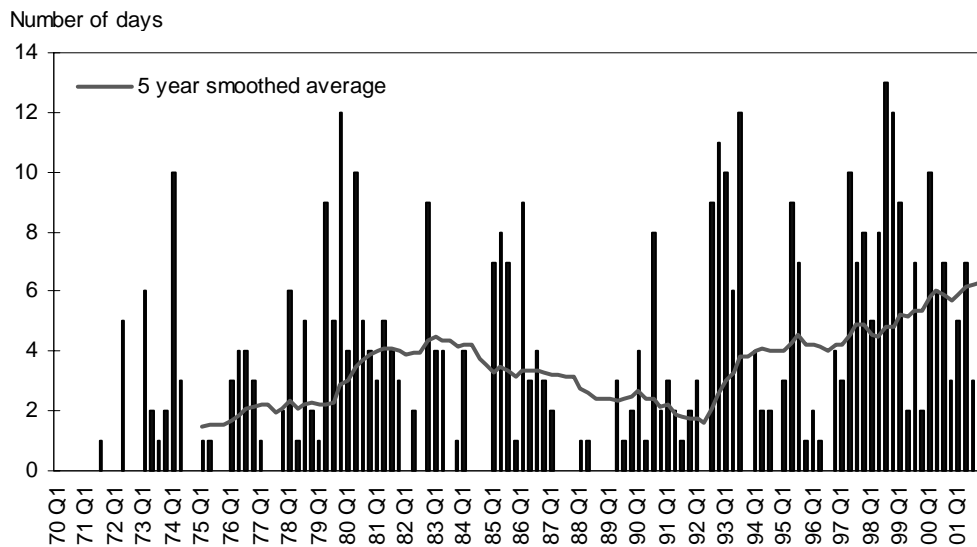
Liquidity black holes: number of days per quarter that the US, Japanese and UK broad stock indices have moved by 2 standard deviations more than the average daily price move



Source: State Street

Chart 4

Liquidity black holes: number of days per quarter that US\$/yen has moved 2 standard deviations more than the average daily price move



Source: State Street



I have focused on evidence of liquidity black holes in the major markets because their presence there, in large, growing markets is most striking. If we had only found liquidity black holes in emerging markets it might have been put down to the problems of small, shrinking markets. There is certainly evidence of liquidity black holes in emerging markets too, (Persaud 2001b). The question remains, why are liquidity black holes becoming more frequent in general?

### **3 Liquidity is about diversity, not size, and the two are not synonymous**

The assumption that the bigger a market is, the more liquid it is, is so prevalent that turnover and liquidity are often seen as synonymous. In fact, the two are only indirectly related. Imagine a market place with two assets (government bonds and cash) and just two players (Anish and Ishan), and imagine that whenever Anish wanted to buy bonds with his cash, Ishan wanted cash for his bonds and vice versa. This would be a very liquid market with the price impact of trading being nil for both Anish and Ishan. Now imagine that Anish, bored with such provincial bliss, moves to a bigger market place with 10,000 players, but that now whenever he wanted to buy bonds for cash so did the other 9,999 and whenever he wanted to sell, so did the other 9,999. When buying, Anish would have to bid up the price of bonds a long way to turn one of the other buyers into a seller. The same would be true when he tried to sell. The price impact of buying or selling would be high. The market may have been bigger in terms of the number of players and the amount of bonds and cash being managed and even in the turnover, but it was less liquid in terms of the price impact of trading. Markets can be bigger and yet thinner: liquidity requires diversity.

Of course, this is an extreme example and it would appear sensible to assume that the more market players there are, the more likely there would be a diversity of opinions and desired trades. The link between liquidity and size may be indirect, but it surely exists. The problem is that although markets are generally getting bigger, a number of separate forces have conspired to reduce diversity. These forces have grown strongly since the mid-1990s, a period over which, according to the data we have just looked at, many markets appear to be getting bigger and yet thinner, or at least more volatile. The three main forces reducing diversity are (i) the collapse of information costs, (ii) the consolidation of market players and (iii) modern risk-management and regulatory practices. This paper will touch on the first two forces and dwell on the last.

## **4 Forces reducing the diversity of behaviour in financial markets**

### **4.1 The collapse of information costs**

In the past, one source of diversity of views related to the diversity of information. The higher the cost of obtaining information the greater the diversity of views, especially between market ‘insiders’ and ‘outsiders’. A number of factors such as the exponential rise in the computing power of a computer chip, the arrival of mass access to the internet and the deregulation of the airwaves and telecommunications networks have led to the collapse of information costs, which in turn has dramatically reduced the diversity of information. Armed with the new technology, regulators have accelerated this

process through initiatives such as the US SEC's Regulation Fair Disclosure which requires that companies broadcast price-sensitive information to everyone at the same time (in practice, via the internet) and no longer give preferential treatment to a small community of professional analysts.

The 'encouragement' of developing countries to meet specific codes and standards is also leading investors to have and use similar information sets (see Archarya 2001). Thanks to such regulations and popular financial news broadcasters such as Bloomberg, CNBC and CNN, the outsiders have, to a large extent, stepped inside. If there is a favourable piece of information about a company's stock or a country's fundamentals and this is made available to everyone at the same time, everyone will want to buy at the same time and the price of the stock has to rise a long way to convince some buyers to be sellers (Wermers 1998). In the bad old days the insiders would have bought the stock cheaply off the blissfully ignorant outsiders. The markets are more equitable and transparent today – and less liquid for it.

## **4.2 Market consolidation**

Even before the 1999 Gramm-Leach-Bliley Act, which repealed the 1933 Glass-Steagall Act, the attempt by US Senator Carter Glass and Representative Henry Stegal to separate different financial activities into separate firms had been watered down. Consolidating different but related financial activities, often with the same clients, led to substantial savings and positive synergies (which is why an act had been required to enforce the earlier separation), and served as a strong incentive for consolidation. Diversity has been reduced by there being fewer, more vertically integrated players in the market.

This consolidation can be seen clearly in the foreign-exchange market. In the 1995 BIS survey of foreign-exchange activity, some 2,417 banks participated from 26 countries. In 2001, this number had dropped by 20 per cent to 1,945. In the US In 1995, 20 of these banks accounted for 75 per cent of forex transactions. By 2001, only 13 banks accounted for 75 per cent of forex transactions. The foreign-exchange market remains the 'largest' with a daily turnover of US\$1.5trn, but in 2001 only 20 banks around the world quoted two-way prices on a wide range of currency pairs (Bank of International Settlements 2001).

## **4.3 Market sensitive risk-management systems**

There is an interesting discrepancy between the large degree to which financial crises are external and systemic and relate to the herd behaviour of creditors in developed countries, and the focus of policy-makers on the need for domestic reforms (Eatwell 1997). It is argued by many developed country policy makers and is currently perhaps most strongly espoused by the United Kingdom, that if banks and countries adopted tighter prudential, supervisory and risk-management controls, liquidity or solvency crises would not happen and if there was no initial crisis, there would be no subsequent contagion – whatever the flaws in the current financial architecture. This may be true. The real problem comes with the attempt to improve these controls by stepping away from, the previous system of a few regulatory risk-buckets outlined in the original Basle Capital Adequacy Accord (1988) and the stride to market sensitive risk-management systems.

This has been motivated by a number of factors. First, there is concern that using a few broad categories of risk when regulating the activities of participants in financial markets is prone to regulatory arbitrage through the innovation of financial instruments which appear to sit in a low-risk category but have the characteristics of a high-risk instrument. Second, the previous broad risk-buckets approach failed to capture the growing complexities and range of new financial instruments even when regulatory arbitrage was not a motive for their innovation. Third, there is a belief that has spilled over from other walks of life that public officials cannot presume to know more than the market when assessing risk. While this may indeed be true generally, it is least applicable to the work of the regulators of financial markets. After all, financial crises occur because markets fail, and this is why the increasing use of market-sensitive risk-management systems has not led to a more robust and efficient financial system, but one that is more prone to financial crisis and induces more concentration of financial risks, (Persaud 2000).

## **5 Modern risk-management theory: value at risk and daily earnings at risk**

In essence, value-at-risk (VaR) systems estimate the amount of a bank's daily earnings that are at risk, at a given probability, using the distribution of the volatility and correlation of the portfolio of assets and liabilities with which the bank has exposure. The more volatile an asset the greater the likelihood of a loss, unless it is inversely correlated with another asset in the portfolio. Lower volatility of assets, and correlation between assets, reduce daily earnings at risk (DEAR). A rise in volatility and correlation does the opposite. Most often the bank's risk-management process is to set a limit for DEAR and, if the limit is reached, to take action to reduce DEAR, by selling the most volatile or most highly correlated assets.

The intrinsic problem with market-sensitive risk-management systems – a problem that cannot be solved by ever increasing sophistication of the statistical models and the use of stress tests – is that they assume that banks and market participants act independently and that the positions of one bank are independent of another. In a world of independent market players, there is a good probability that the selling of securities by one bank could be met by the purchases of another. Reality, of course, is different. Market participants and banks behave in strategic relation with one another. Often they herd into one or a similar set of markets or instruments. There are a number of individually rational reasons for herding behaviour, not least because there is safety in numbers, both financially and in reputation terms (Shiller 1990). If one bank makes an investment mistake the regulators may let it go under, as in the case of Barings in the UK. If all banks make the same mistake, the regulators will bail them out in order to preserve the financial system. Moreover, in a world of uncertainty, the cheapest strategy for catching up with those you think are better informed is by following them.

When volatility rises in one market, increasing daily earnings at risk and prompting a bank to sell its risky assets, it is likely that DEAR limits are being reached by many banks. The dynamics then go from bad to worse. As many banks try to sell the same asset at the same time, there are few or no buyers and so the price gaps lower and volatility rises further – which increases DEAR again, triggering further sales. Faced with a gaping market, some banks will try to reduce DEAR by selling another asset which the herd holds partly because it was uncorrelated with the first. However, this not

only increases volatility in the second asset, it increases correlation. Higher volatility, and now correlation too, not only raise DEAR at the first set of banks, but also at a second set of banks that may not have had the first asset, and so more banks and more markets are sucked into the process. The resulting contagion of selling mystifies most analysts because the markets that are hit are fundamentally unrelated. The stepping stones of the Asian financial crisis from Thailand to Indonesia and Malaysia, then to Korea and on to Russia and then finally to Brazil, were not laid out along the path of trade flows, but along the path of shared creditors and bankers (Persaud 2001a).

## **6 A perplexing paradigm**

In the context of uncertainty and investor behaviour, the value-at-risk approach does not only lead to contagion when it combines with a herd, but it contributes to herding in the first place. VaR systems will highlight those sets of markets which currently offer low volatility and low correlation and thus ‘safe’ returns, which will prompt many players to switch into these markets over time, until at some point there is a large consolidation of positions – a herd. The opposite also occurs. VaR systems will highlight the current set of markets which offer high volatility and correlation and as a consequence investors will stay clear of these markets making them less correlated and less volatile over time and less prone to contagion. Here is a perplexing paradigm: the observation of safety creates risk (as the herd chases after what was safe and investors become overly concentrated) and the observation of risk creates safety (as the herd avoids what was risky). In this way, market-sensitive risk management systems dangerously add to the pro-cyclicality of capital flows (Persaud 2000, Turner 2000).

We are in the latter environment today. Looking through a five-year window of returns, volatilities and corrections, emerging markets still appear to be the last places on earth an investor would want to be with their low to negative returns, high risks and volatility, and high correlation. Consequently, investors have abandoned this space and so, when ‘accidents’ happen, such as in Turkey in December 2000 and February 2001, or Argentina in December 2001, there is no contagion. The regulators think this is a sign of a more robust system, but they are mistaken. The five-year window will soon show emerging markets to be safer, less correlated and more profitable, and the herd will return. Already in 2001 the advance party, emerging-market hedge funds, posted the best investment performances out of a broad range of investment sectors and styles. Far from robust, the international financial system appears to deliver either too much capital to emerging markets or too little (Gurría 1995, Griffith-Jones 1998). This neither supports economic development or the necessary reform process in many emerging financial markets (Williamson 1993).

## **7 The creeping influence of bank regulation**

Throughout this paper we have lumped the behaviour of banks with other creditors and investors in general. However, the Basle Capital Adequacy Accord is designed for the regulation of banks, not all investors. Why is the herding of banks not offset by longer-term investors looking to pick up a bargain in the wake of the forced selling triggered by VaR models? The problem is that the vast majority of investors and creditors now use

the VaR approach. This is not entirely out of free choice. To begin with, there is regulatory creep. Regulators are cajoling other financial institutions, especially insurance companies and fund managers, to adopt the VaR approach in the mistaken belief that common standards are good. Where herding is prevalent, high standards are good; common standards are bad.

However, even where regulators are not breathing down the necks of investors, many choose to follow the VaR approach. Why? In a world of uncertainty with a long history of financial crises and rogue traders, it is hard for investors to tell their trustees that they are using a risk-management system that nobody else uses. Investors generally approve of experimentation, but only with other peoples' money. The irony, of course, is that a diversity of risk-management systems with long-term investors and creditors following a risk-management approach more suitable to their objectives would not only reduce the number of liquidity black holes, but would better enable long-term investors to profit. The following example illustrates this point. Imagine a long-term investor called Felicity Foresight. Every year Felicity knows which are the ten best currency trades for the year and she puts them on at the beginning of the year and uses a state-of-the-art, daily mark-to-market, value-at-risk, risk-management system. Over the past ten years she would have lost money in almost every year, stopped-out by her risk-system when the trades had gone against her. Whatever you think your investment style is, it really is largely determined by your risk-management system. Investors proudly proclaim a raft of different styles, models, approaches, but the vast majority adopt the same risk-management approach and so they behave like everybody else, leading to little diversity and many black holes.

## **8 What are the solutions?**

Having analysed the problems, three solutions come to mind. First, regulators need to highlight as a risk the duration-mismatch between long-term investment objectives and short-term, risk-management systems. They can facilitate a narrowing of this gap and in so doing encourage a greater diversity of behaviour by giving their considered stamp of approval to a few and varied risk management approaches. For example, in the attempt to be the first to get out of assets being dragged down in a crisis, risk management systems are becoming increasingly focused on very short-run correlations and volatilities and when these rise risk limits are hit triggering further sales. However, a bank managing short-term liabilities may be more interested in the rise in short-run correlation of assets during a crisis than a long-term investor, who may be content to assume that current correlations will fall back to their long-run average. A risk-management system for the long-run investor may therefore be less sensitive to short-run changes in volatility and correlation and more sensitive to the underlying, perhaps 'fundamental', correlation. There is the potential for a virtuous cycle. The more short-run and long-run investors behave differently, the shorter market disruptions will be and the more this different behaviour would be profitable for long-run investors. Giving a stamp of approval to a variety of risk management systems designed for different types of investors would solve a co-ordination problem: it would become easier for fund managers to go to their trustees and say that they are not following a short-term, market-sensitive risk-management system, but another, along the lines proposed by the regulators specifically for long-term investors.

Second, there needs to be less reliance on market-sensitive measures of risk. Regulators should pursue research into contra-cyclical or structural measures of risk such as the degree of diversity or fragmentation in a financial market as well as the degree of duration and currency mismatch of assets and liabilities. Markets which are not volatile or highly correlated with others but where there is a high concentration of positions by one type of player in one instrument should be viewed as risky and require more regulatory capital than historic volatilities and correlations might suggest. The large concentration of foreign currency lending to the property and banking system in Asian markets is a case in point (Perry and Lederman 1998).

Third, although much regulation is about limiting losses, liquidity needs losers. If a market is to be liquid, there needs to be a buyer when everyone else is selling and the price is falling. Initially, the buyer will lose, but she will hope to profit when the market turns around and she will be more inclined to take this gamble if she is not worried that her risk-management system will take her out of the trade just as it is going to make money. Regulators need to address this problem by regulating who the unregulated investor can be. You want to limit the losses of retail investors for fear that they will be abused for their relative lack of information, and to encourage them to save for their future. Financial instruments used by retail investors should be strictly regulated – as they are – and losses limited through short-term risk systems. Financial instruments used by professional investors, however, should be lightly regulated and their ability to be buck-the-trend should be facilitated.

This framework provides a different perspective on hedge funds, investment vehicles designed for investment professionals with wealth to lose. Hedge funds will sometimes lose money, sometimes blow up and sometimes be part of the herd, but they are also best suited to the role of the unregulated investor, who can buy when everyone else is selling and in the process make the financial market liquid. The cost of making it hard for them to do this through regulation of their leverage and their credit is a reduction in market liquidity. Regulation of hedge funds and their requirements of disclosure to their counter-parties should therefore be governed by tough questions such as: would a fund with this amount of leverage endanger the financial system? This would catch an LTCM without leading the others to withdraw from providing the necessary liquidity.

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