kets or nascent markets can be highly dangerous. That is true not just in the currency markets, but also in small cap stocks and in convertible markets. It is true wherever the volume of trading is low relative to the amount of capital poured into the area.

We should look to the industry for greater regulation. This industry should take note of what the mutual funds have done. We need to have a body of hedge funds saying that they are going to regulate themselves. That should happen in the next ten years.

We also should educate investors more and more about the true risk associated with certain strategies. What surprised people with regard to Long-Term Capital Management (LTCM) was the amount of leverage, and therefore the amount of risk that was being taken, not the type of trades. We need to make sure that investors understand the risks to letting managers do anything they want.

Finally, I wish to address the capital requirements of high-level transactions. If we want to regulate hedge funds, let us start with the people who lend the money. A regulatory structure is in place with banks, and the capital requirements for highly leveraged transactions were changed back in the early 1990s. Hedge funds are highly leveraged portfolios, and we ought to look at ways of applying similar requirements to them. We need close monitoring of borrowing by sophisticated creditors, meaning banks. Banks have the responsibility to ask for information in return for credit.

The bailout of LTCM could be viewed not as a bailout but as the Federal Reserve doing its job. The greatest disasters in the last five years have occurred in fixed-income and credit-related instruments. In 1994 it was in mortgage backs. Last year, it was in a variety of credit spread issues from high-yield debt to distressed securities to emerging-market debt. The establishment of global standards for banks will address all of these problems, and that perhaps is a better way to regulate an industry requiring a great deal of credit to function.

Do I think that hedge funds disrupt markets? Perhaps. But other, bigger, speculative positions of participants also may have a great impact. Hedge funds play a very important role and should continue to play a very important role in the future.

Comment by Franklin R. Edwards and Mustafa O. Caglayan: Fung, Hsieh, and Tsatsaronis address the controversial issue of whether specu-

lation by hedge funds caused or exacerbated the Asian currency crisis during the last half of 1997, when most Asian currencies lost between 44 and 56 percent of their value against the U.S. dollar. The sharp devaluation of these currencies resulted in the bankruptcies of many Asian corporations and banks and was a major factor in the subsequent economic contraction in Asian economies.

After the fact, hedge funds came under attack as a major cause of the collapse of the Asian currencies. The prime minister of Malaysia, Mahathir Mohammad, for example, accused them of being the modern equivalent of "highwaymen" in breaking the Asian currencies.[1] He argued that, by accumulating huge short speculative positions, hedge funds made it impossible for the Thai central bank to maintain the baht at a fixed rate versus the U.S. dollar. Further, he contended that when the value of the baht plummeted on July 2, 1997, this precipitated the sharp devaluations of the Malaysian ringgit, the Indonesian rupiah, and the Korean won. Prime Minister Mohammad is not alone in this view. Prominent economists, such as Joseph Stiglitz, have also singled out volatile international capital flows as a major cause of the economic instability that rocked the economies of many East Asian countries in 1997.[2]

The policy issue that underlies this controversy, of course, is whether trading by hedge funds and other international speculators should be curbed, perhaps by regulatory restrictions on hedge funds or by explicit capital controls. At the very minimum, critics contend, hedge funds should have to report their portfolio positions and trading activities either publicly or to specified regulators, who, knowing these positions, could presumably act to head off the kind of market turmoil experienced by Asian countries in 1997.

The controversy about the role of speculators and in particular hedge funds in the Asian currency crisis is difficult to resolve empirically because of the difficulty of directly observing the position of hedge funds. Hedge funds are largely unregulated and therefore do not have to disclose their portfolio positions publicly. Hedge funds consider position information to be proprietary and are reluctant to disclose it for fear of losing their competitive advantage. Indeed, even highly regulated financial institutions, such as mutual funds,

1. Mahathir Mohammad, "Highwaymen of the Global Economy," *Wall Street Journal*, September 23, 1997, p. C1.

2. Joseph Stiglitz, "Boats, Planes, and Capital Flows," *Financial Times*, March 25, 1998, p. 32.

are required to report their portfolio positions only semi-annually, so that information in the kind of detail necessary to evaluate even their role in the collapse of the Asian currencies is typically not available.

Fung, Hsieh, and Tsatsaronis attempt to overcome this data deficiency by inferring from data on hedge fund returns during the Asian currency crisis the speculative positions the funds must have held in Asian currencies. In particular, they use data on the monthly returns of twenty-seven large hedge funds and data on the weekly returns of ten of these twenty-seven hedge funds to infer the positions that these funds must have had in Asian currencies during the last six months of 1997. They then compare those inferred positions with the total capital flows for the Asian countries (from balance-of-payments accounts) to determine if the hedge funds' positions were large enough, in their opinion, to have caused the collapse of the Asian currencies.

The authors conclude that hedge funds were not the main culprits in the 1997 Asian crisis and that their speculative bets against the Asian currencies were small. Nevertheless, they identify excessive speculation as a factor and believe that all financial institutions, including hedge funds, should be required to report their positions on a timely basis to an impartial regulating body that could use this information to assess the market's exposure and signal impending trouble. Thus Fung, Hsieh, and Tsatsaronis envision regulators as standing ready to impose additional constraints on financial institutions should they believe that either a currency crisis is fomenting or some other financial crisis is, in their view, impending.

Some of these conclusions and policy recommendations go well beyond the empirical work in this paper and, in our opinion, are highly controversial. What do Fung, Hsieh, and Tsatsaronis mean by excessive speculation? How do they determine that speculation is excessive? How would a regulator use the information they believe should be reported, and in what circumstances would a regulator act? The authors do not address any of these questions. We believe their paper would be improved either by omitting any discussion of these policy issues or by discussing the pros and cons of adopting such policies.

There are several problems with the methodology that Fung, Hsieh, and Tsatsaronis use to infer the portfolio positions of hedge funds from their return data. First, reported hedge fund returns are the returns on a hedge fund's entire portfolio. Thus to isolate the impact of changes in Asian currency values on a particular hedge fund's returns, as Fung, Hsieh, and

Table 1. Hedge Fund Returns and Asian Currency Changes: Model 1, Time-Series, Cross-Section, Pooled Regressions of Hedge Fund Returns on Four Asian Currencies

$R_i = b_0 + b_1$*(Thailand Cur) + b_2*(Malaysia Cur) + b_3*(Indonesia Cur) + b_4*(Korea Cur)
Period, 1997:07–1997:12

Explanatory variables	*All hedge funds*	*Global macro funds*	*Global funds*	*Market-neutral funds*	*Currency CTAs*
Constant term	–2.343*	–2.782*	–4.289*	0.744*	1.509*
CUR-THAILAND	0.191*	0.255*	0.254*	0.037*	0.189*
CUR-MALAYSIA	0.516*	0.613*	0.779*	0.067	0.074
CUR-INDONESIA	–0.245*	–0.356*	–0.299*	–0.024	–0.418*
CUR-KOREA	–0.018*	0.009	–0.036*	–0.023*	0.067*
Total panel observations	4,948	423	2,673	1,372	458
Adjusted R^2	0.061	0.103	0.101	0.016	0.167
Number of funds	827	73	448	224	82
Total money under management (millions of U.S. dollars)	76,754.7	22,246.8	31,662.5	16,919.8	5,925.6

* Significant at the 1 percent level.

Tsatsaronis attempt to do, it may be important to account for other factors that may affect a hedge fund's returns. In particular, if the fund is holding other assets (or positions) that also change in value when the Asian currencies change in value, it is not possible to estimate the impact of the change in these currency values on the hedge fund's returns without controlling for the effects of changes in the other asset values on returns. But since information on hedge funds' portfolios is not available, it is not possible to do this directly. Fung, Hsieh, and Tsatsaronis attempt to address this problem by including returns on the S&P 500 index as an explanatory variable in their estimating equations, but this simple procedure is unlikely to capture the complexity of the returns-generating process for hedge funds. In our empirical work, we show that estimates of the relationship between hedge fund returns and Asian currency values are quite sensitive to the returns-generating factors included in the estimating equation.

Second, Fung, Hsieh, and Tsatsaronis examine only twenty-seven hedge funds and estimate separate equations for each of these funds over the six-month period from July 1, 1997, through December 31, 1997. This procedure leaves them with very few degrees of freedom, so that they are not able to include other explanatory factors in their estimating equations.

To demonstrate the instability of estimates of the relationship between hedge fund returns and changes in Asian currency values depending on which explanatory factors are included in the estimating equations, we estimate new pooled, time-series, cross-section returns equations for the July–December 1997 period using monthly returns for 827 hedge funds (including Commodity Trading Advisors). The hedge funds in our sample employed four different trading strategies: global macro, global, market neutral, and currency funds. Monthly returns equations are estimated using two models: one using only the four Asian currencies used by Fung, Hsieh, and Tsatsaronis as the explanatory variables and one employing a six-factor return model and regressing six-factor return residuals on the same four Asian currencies.[3] The estimates for the first model, using time-series, cross-section, pooled regressions for the last six months of 1997, are reported in table 1. Estimates are shown for each of the four investment styles of hedge funds as well as for all hedge funds taken together.

3. For a discussion of our multifactor returns models, see Edwards and Caglayan (2000). See also Fama and French (1995, 1996) for a discussion of multifactor returns models.

Estimates for the second model are derived as follows. First, we estimate the following pooled, time-series, cross-section, six-factor regression model to account for the effect of other factors on hedge fund returns:

$$R_i = a + b*(\text{S\&P500} - R_f) + h*(\text{HML}) + s*(\text{SMB}) + w*(\text{WML}) + g*(\text{TERM}) + k*(\text{DEF}) + e_i \quad (1)$$

where R_i is monthly hedge fund returns; R_f is the thirty-day Treasury bill rate; HML is monthly returns on a portfolio of high book-to-market stocks minus the monthly returns on a portfolio of low book-to-market stocks; SMB is the monthly returns on a portfolio of small stocks minus the monthly returns on a portfolio of large stocks; WML is the monthly returns on a stock portfolio of past year's winners minus the monthly returns on a portfolio of past year's losers; TERM is the monthly returns on long-term government bond portfolio minus the monthly returns on thirty-day Treasury bills, measured at the end of the previous month; DEF is monthly returns on a portfolio of long-term corporate bonds minus the monthly returns on long-term government bonds; and e_i is the usual error term (or residual return). This equation is estimated separately for each of the four hedge fund styles as well as for all hedge funds for the nine-year period 1990:01 through 1998:08. All hedge funds in existence for at least twelve months during this period are included in the sample. The estimates for this equation are reported in table 2.

Second, we regress the monthly residuals of equation 1 for the six months from July through December 1997 on the four Asian currency variables used in model 1, once again for each style of hedge fund and for all hedge funds together, using time-series, cross-section, pooled data:

$$e_i = a + \beta_1^*(\text{Thailand Cur}) + \beta_2^*(\text{Malaysia Cur}) + \beta_3^*(\text{Indonesia Cur}) + \beta_4^*(\text{Korea Cur}) + \varepsilon_i \quad (2)$$

where currency variables are expressed in units per U.S. dollar. This procedure controls for other factors that may affect hedge fund returns other than changes in the values of Asian currencies, isolating the relationship between hedge fund returns and the Asian currencies. The estimates for this equation are reported in table 3.

The results in table 1 show a significant relationship between the Asian currencies and returns for all hedge funds. In particular, the coefficients for all four currencies are significant at the 1 percent level. However, only two

Table 2. Six-Factor, Time-Series, Cross-Section, Pooled Regressions of Hedge Fund Returns

$R_i = a + b^*(\text{S\&P500} - R_f) + h^*(\text{HML}) + s^*(\text{SMB}) + w^*(\text{WML}) + g^*(\text{TERM}) + k^*(\text{DEF}) + e_i$
Period: 1990:01–1998:08

Explanatory variables[a]	*All hedge funds*	*Global macro funds*	*Global funds*	*Market-neutral funds*	*Currency CTAs*
Constant term	0.799*	0.747*	0.708*	0.941*	0.978*
S&P500 – R_f	0.298*	0.282*	0.525*	0.062*	–0.125*
HML	–0.033**	0.159*	–0.070*	0.035	–0.142*
SMB	–0.269*	–0.134*	–0.501*	–0.064*	0.181*
WML	0.047*	0.147*	0.007	0.023	0.241*
TERM	0.157*	0.088	0.070*	0.156*	0.483*
DEF	0.694*	–0.076	0.639*	0.573*	1.441*
Total panel observations	51,930	5,690	26,025	11,885	8,330
Adjusted R^2	0.071	0.051	0.161	0.028	0.018

*Significant at the 1 percent level.
**Significant at the 10 percent level.
a. R_i, hedge fund returns; R_f, thirty-day Treasury bill rate; HML, returns on a portfolio of high book-to-market stocks minus portfolio of low book-to-market stocks; SMB, returns on a portfolio of small stocks minus portfolio of large stocks; WML, returns on a portfolio of past year's winners minus portfolio of last year's losers; TERM, long-term government bond returns minus thirty-day Treasury bill rate measured at the end of the previous month; DEF, long-term corporate bond returns minus the long-term government bond returns.

of the coefficients (Thailand and Malaysia) are positive, indicating the presence of a net short hedge fund position in those currencies. The negative coefficients for Indonesia and Korea indicate that hedge funds were net long in those currencies and therefore lost money when the currencies devalued. These results, therefore, present a mixed picture of the effects of hedge fund trading on the currencies: they may have destabilized the currencies of Thailand and Malaysia but may have stabilized those of Indonesia and Korea.

After controlling for other factors, however, these results change significantly. Table 3 shows that for all hedge funds there is a significantly positive coefficient only for Indonesia and a significantly negative coefficient only for Korea. Further, the coefficients are quite different for different styles of hedge funds. For example, for the Malaysian currency, global macro and currency funds have significantly positive coefficients, while market-neutral funds have significantly negative coefficients.

Without laboring our results any further, two things seem clear. First, the estimated relationship between the Asian currencies and hedge fund returns are highly sensitive to what other returns factors are included in the

Table 3. Hedge Fund Returns and Asian Currency Changes: Model 2, Time-Series, Cross-Section, Pooled Regressions of Six-Factor Return Residuals on Four Asian Currencies

(1) $R_i = a + b^*(\text{SP } 500 - R_f) + h^*(\text{HML}) + s^*(\text{SMB}) + w^*(\text{WML}) + g^*(\text{TERM}) + k^*(\text{DEF}) + e_i$

Period: 1990:01–1998:08

(2) $e_i = a + \beta_1^*(\text{Thailand Cur}) + \beta_2^*(\text{Malaysia Cur}) + \beta_3^*(\text{Indonesia Cur}) + \beta_4^*(\text{Korea Cur})$

Period: 1997:07–1997:12

Explanatory variables	*All hedge funds*	*Global macro funds*	*Global funds*	*Market-neutral funds*	*Currency CTAs*
Constant term	–0.981*	–2.999*	–1.338*	0.758*	–0.116
CUR-THAILAND	0.017	0.109*	–0.012	–0.031*	0.168*
CUR-MALAYSIA	0.033	0.393*	–0.082	–0.124*	0.401*
CUR-INDONESIA	0.065*	–0.160	0.228*	0.097*	–0.548*
CUR-KOREA	–0.029*	–0.006	–0.045*	–0.030*	0.046*
Total panel observations	4,948	423	2,673	1,372	458
Adjusted R^2	0.008	0.027	0.019	0.013	0.111
Number of funds	827	73	448	224	82
Total money under management (millions of U.S. dollars)	76,754.7	22,246.8	31,662.5	16,919.8	5,925.6

* Significant at the 1 percent level.

estimating equations and, second, the estimated relationships are very different for different styles of hedge funds. Thus attempting to infer the Asian currency positions of hedge funds from a very small sample of selected hedge funds, as Fung, Hsieh, and Tsatsaronis do, seems highly risky and may lead to erroneous policy implications.

Even presuming that it can be unambiguously inferred from hedge fund returns that hedge funds had net short positions in the Asian currencies, it is a leap of faith to conclude that hedge funds "caused" the collapse of the Asian currencies. The Asian currency crisis was first and foremost the result of problems in the real economy: excess capacity and increasing costs that led to a sharp fall in profitability. The Asian currencies were pegged principally to the dollar, despite the fact that a substantial proportion of their external trade was with countries in the Asian region. These currency pegs became unsustainable for real economic reasons: the sharp fall in the growth of exports from the region—caused in part by an appreciation in the real exchange rate of the Asian countries relative to that of other Asian countries and to Japan, the weak Japanese economy, increasing competition in export markets from China and Mexico, and excess capacity in many exporting industries. By 1996 the current account deficit in the five most affected Asian countries had reached $55 billion.[4]

It was the crisis in the real economies of the Asian countries that precipitated the flight of capital by investors, causing asset prices to fall and financial institutions to fail. The financial effects of the capital outflows were particularly severe for the Asian countries because both the governments and most of the banks in these countries had borrowed heavily in short-term dollars to invest in longer-term domestic currency loans, creating currency and interest rate risks that they could not support. In summary, the economic policies and the financial structures of the Asian countries were fundamentally incompatible with the policy of pegging their currencies to the U.S. dollar.

To the extent that hedge funds and other financial institutions bet on the depreciation of the Asian currencies, these institutions were the messengers rather than the cause of the Asian currency crisis. They merely exposed the weaknesses in the Asian economies. In today's world of nearly uninhibited international capital flows, it is far-fetched to think

4. Brealey (1999).

that speculators will not bet against countries that fix their exchange rates but then pursue economic policies that are unsustainable under fixed-rate regimes. Thus it is not as clear to us as it is to Fung, Hsieh, and Tsatsaronis that excessive speculation led to the Asian currency crisis of 1997. Indeed, we might even argue that the substantial capital outflows from Asian countries in 1997 have forced these countries to make the policy and structural changes that they eventually would have had to make in any case. It is not obvious that putting off these changes to a later time would have enhanced international financial stability.

General Discussion: Bryan MacDonald opened a general discussion of hedge funds by asserting that as hedge funds get larger, they tend to migrate to global markets for currencies, fixed-income instruments, and other credit instruments because the markets in which they traditionally operated have become less liquid. Franklin Edwards agreed with the paper's conclusion that the problems surrounding the Asian financial crisis were due not to hedge fund activity, but instead to excessive lending by foreign banks in foreign currency or, conversely, to excessive borrowing by banks and corporations in the region. Edwards added that the pegged, but adjustable, exchange rate regimes being used by the affected countries also encouraged unwise lending and borrowing. Indeed, Edwards asked why some countries, knowing this to be the case, persist in maintaining fixed exchange rates.

Litan answered that the conventional answer to that question is that pegging exchange rates is generally justified as a means to control domestic inflation. However, as all nations should have learned from the Asian crisis, potentially very large costs also are associated with maintaining fixed exchanges.

Daniel Tarullo asked MacDonald whether the disclosure concern addressed in his presentation refers to a type of disclosure that is close to real time and reveals a particular trade or whether it refers to a significantly lagging disclosure that reveals a fund's overall trading strategy. MacDonald responded by asserting that a one-time snapshot of a fund's positions may not reveal much and that a stream of complex data is probably necessary to produce full disclosure. However, he cautioned that such data may be difficult to analyze within a reasonable time period.

More broadly, MacDonald argued that too much disclosure may not necessarily be in the best interest of investors. Information is power in the capital markets. Disclosure of sizably leveraged positions to other market participants, such as banks with similar positions, can be dangerous. For instance, it is not necessarily advantageous to shareholders of these funds for the public to know that their fund is short 4 million shares of a stock traded at 10,000 shares a day, because such information can be extracted and manipulated in the marketplace.

David Hsieh explained that the kind of disclosure suggested in his paper is not a full public disclosure of the positions held by an individual fund, but rather some measure of aggregate exposure of all institutions to a particular kind of trade. He acknowledged, however, that the question of to whom the hedge funds should report is a difficult and sensitive one to answer.

Robert Litan questioned whether Hsieh's suggested disclosures would be effective in markets that are as dynamic as those in which hedge funds participate and where the amounts at risk change frequently on a daily basis. In addition, he noted that there most likely would be a huge lag in whatever disclosures the investors get. Litan argued that the real problem posed by hedge funds lies in excessive leverage by a few (such as LTCM) and that the best approach to handling excessive leverage is through effective regulation of banks that provide credit to the funds. Franklin Edwards agreed.

Calomiris also argued that the key variables triggering the economic downfalls in the 1980s and 1990s in Chile, Mexico, Russia, and Brazil and the problem with LTCM were not the hedge funds, but rather weaknesses in domestic financial systems and improper incentives for foreign banks to lend excessively in foreign currencies. Accordingly, in his view, establishing effective market discipline—perhaps through a subordinated debt requirement for large banks—is key to preventing financial crises in the future. Indeed, with a subordinated debt requirement, banks should have greater solutions to obtain more adequate disclosure from hedge funds. Alternatively, in the absence of such a requirement, it might be appropriate to prohibit banks from lending at all to hedge funds unless those funds provide banks with sufficiently transparent information that can be evaluated. Still another alternative would be for banks to establish hedge fund operations themselves, but to operate them as separately capitalized subsidiaries.