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Measuring The Market Impact of Hedge Funds*

by

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Abstract

Hedge funds often employ opportunistic trading strategies on a leveraged basis. It is natural to find their footprints in most major market events. A "small bet" by large hedge funds can be a sizeable transaction that can impact a market. This study estimates hedge fund exposures during a number of major market events. In some episodes, hedge funds had significant exposures and were in a position to exert substantial market impact. In other episodes, hedge fund exposures were insignificant, either in absolute terms or relative to other market participants. In all cases, we found no evidence of hedge funds using positive feedback trading strategies. There was also little evidence that hedge funds systematically caused market prices to deviate from economic fundamentals.

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1. Introduction

The last decade witnessed a growing interest in hedge funds from investors, academics and regulators. Catering to the needs of wealthy individuals and institutional investors, hedge funds are typically organized as private vehicles outside the purview of financial markets regulators; see Fung and Hsieh (1999a) for a review of hedge fund organizations. By their very nature, hedge funds employ opportunistic trading strategies on a leveraged basis. It is natural to find their footprints in most major market event.

A case in point is the famous "attack" on Sterling by George Soros's funds in 1992. This was the high profile event that sparked much of the ensuing public interest in hedge funds. Reports of hedge funds involvements in major market events by the popular press continued throughout the 90s. However, it was not until the 1997 Asian Currency Crisis that regulators took an active interest in hedge fund activities. The International Monetary Fund (IMF) was called upon to study the impact of hedge funds on markets which led to a study by Eichengreen et al (1998). This study provided information on the activities of hedge funds and analyzed the policy implications with particular reference to the issue of market impact of hedge funds. Soon after the Asian crisis, the Russian government defaulted on their debt obligations. This and the ensuing global liquidity crunch contributed to the debacle of Long-Term Capital Management. It also led to a detailed study on the collapse of Long-Term Capital Management and its implications carried out by the President's Working Group on Financial Markets (1999).

Eichengreen et al (1998) noted that regulators expressed "some concern that hedge funds can dominate or manipulate particular markets." In particular, Eichengreen et al (1998) analyzed three scenarios: (a) a single hedge fund or a small group of hedge funds using leverage can singularly overwhelm a small market; (b) herding by other large investors following the lead of a few hedge funds can overwhelm a market; (c) positive feedback trading rules used by hedge funds can amplify a market move.

On the first issue, Eichengreen et al (1998) argued that there is little reason to believe that hedge funds are more likely to overwhelm a market than other large traders. In their study, the largest single hedge fund has less than $10 billion of assets under management and hedge funds as a group has only $100-$200 billion of capital. This is small compared to the risk capital available to other large investors such as commercial banks, investment banks, insurance companies, and corporations. Hedge funds are no more likely or able to manipulate a market than any of these other entities. On the second issue, Eichengreen et al (1998) argued that hedge funds are less likely to herd other investors. This is because hedge funds typically view their trading strategy as proprietary and take great pain to prevent disclosure of their positions. On the third issue, Eichengreen et al (1998) found no evidence that hedge funds used positive feedback trading strategies.

In this paper, we provide quantitative estimates on the market impact of hedge funds over a comprehensive set of market events, from the October 1987 stock market crash to the Asian Currency Crisis of 1997. Ex post analyses of market events are interesting because they yield many valuable lessons and insights. By integrating a series of market events into a single study, we provide a coherent overview on the role of hedge funds during the market events of the last decade.

A major difficulty with this kind of study is the fact that hedge fund positions are virtually impossible to obtain. Except for very large positions in certain futures contracts, foreign currencies, US Treasuries, and public equities, hedge funds are not obliged to and generally do not report positions to regulators. Most funds do not regularly provide detailed exposure estimates to their own investors, except through annual reports and in a highly aggregated format. It is therefore nearly impossible to directly measure the impact of hedge funds in any given market.

Eichengreen et al (1998) interviewed market participants to obtain estimates of hedge fund positions. As an alternative, we rely on empirical techniques to estimate hedge fund exposures using their performance data.

From publicly available sources, we obtained monthly returns and the amount of assets under management in hedge funds and, in a few instances, weekly or daily returns when available. The estimated hedge fund positions allowed us to provide direct and complementary answers to the market disruption issues raised by Eichengreen et al (1998).

The paper proceeds as follows. In the next section, we identify a sample of large hedge funds, each managing assets in excess of $1 billion at the end of 1997. In section three, we apply principal component analysis on their returns to identify hedge fund trading styles. In section four, we measure the market impact of hedge funds at various market events. Concluding remarks and policy implications are offered in section five.

2. Identifying Large Hedge Funds

In this study, we use the term "hedge funds" to include commodity funds. Traditionally, commodity funds were regarded as distinct from hedge funds based on a simplistic notion that commodity traders are limited to trading primarily futures contracts. However, the growth of financial futures and other derivatives has allowed commodity traders to take exposures in financial markets globally. At the same time, hedge fund managers have increased their usage of futures and derivatives to manage risks. These tendencies have blurred the distinction between hedge funds and commodity funds. Hence we broaden the term "hedge fund" to include commodity funds. When we need to separate the two types of funds, we will state so explicitly.

There are varying estimates of the size of the hedge fund industry. Fung and Hsieh (1997a) found total assets under management of $80 billion in 700 hedge fund programs and 240 commodity funds in 1995. The assets under management excluded funds-of-funds, while the number of programs excluded funds-of-funds and duplicate funds operated by the same management company. Other studies typically considered hedge funds and commodity funds separately. In terms of hedge funds (exclusive of commodity funds), Brown, Goetzmann, and Ibbotson (1999) found 399 offshore funds managing assets of $40.3 billion in

1995, including funds-of-funds. Eichengreen et al (1998) interviewed various hedge fund data vendors. (For a complete description of the vendors, see Eichengreen (1998), p. 5-6). They found, as of September 1997 and exclusive of funds-of- funds, MAR had 853 hedge funds managing $89.8 billion, HFR had 1,561 hedge funds with $189 billion, and Van Hedge had 1,990 hedge funds with $146 billion. As of year end 1997, Fung and Hsieh (1999) found that Tass had 987 hedge funds managing $65 billion. In terms of commodity funds, Billingsley and Chance (1996) found that MAR's commodity funds managed $23 billion in 1995. As of year end 1997, Fung and Hsieh (1999) found Tass had 291 commodity funds managing $17 billion of assets. Thus, the hedge fund industry (including commodity funds) had roughly 1,000-2,000 funds managing $100-$200 billion of assets at the end of 1997.

Given that hedge funds do not disclose their positions publicly, we measured their market impact by estimating their exposures based on their returns. This would be impossible to do so for each and every one of the 1,000-2,000 funds. Instead we focus on the largest funds, since the industry is highly concentrated, as shown below.

We identified large hedge funds by searching through various databases. This includes the databases from Tass, the Investment Fund Newsletter from the Republic National Bank (Suisse), the MAR hedge funds and commodity funds published in Barron's, and the internet information put out by Micropal and Nelson. Lastly, we added funds based on private sources.

Arbitrarily, we defined a large hedge fund to be a single fund or a group of funds operated by the same manager using substantially similar strategies, with more than $1 billion of assets under management.[1] For example, Soros Management operated seven funds at the end of 1997. Five funds had more than $1 billion of assets under management individually, so each one was included in the large fund sample. Two other funds were much smaller than $1 billion and had only a few months of return histories, so they were excluded from the analysis. In contrast, Bruce Kovner managed three funds at the end of 1997. Even though each fund managed less than $1 billion of

assets, together they managed more than $1 billion. The high correlations of their returns indicate that they are virtually duplicates of one another. Therefore we treated these three funds as a single large fund, using the returns of the fund with the longest history and having the combined assets under management. Care must be taken, however, to avoid aggregating funds from the same manager using different strategies.

Table 1 lists 19 individual funds, each having more than $1 billion of assets under management at the end of 1997. There are eight additional funds that qualified as large funds after aggregating the assets of 22 funds using the procedure described above. In total, these 27 large funds (41 if we count duplicate funds) managed $64 billion at the end of 1997. They accounted for at least one-third of the $100-$200 billion of assets managed by the industry. Thus, the market impact of all hedge funds can be approximated by the activities of these 27 large funds. The Appendix lists an additional three large hedge funds that had since been dissolved.

3. Style Classification

Following Fung and Hsieh (1997a), we applied principal component analysis on the monthly returns for 27 large funds to identify their styles. Table 2 reports the results for several different time periods. The first and second principal components consistently explained more than 33% and 10%, respectively, of the total cross sectional variation. The remaining principal components each explained less than 10%. To check if the results were dominated by the Quantum group of funds, we removed four funds operated by Soros Management leaving only the Quantum Fund. The results did not change substantially.

To identify the styles associated with these principal components, we grouped funds according to their correlation to the various principal components.

Twelve funds had returns strongly correlated to the first principal component. They are typically known as Global/Macro funds in the industry,

including Jaguar, Quantum, and the standard marquee names in the group. We therefore labeled their style "Global/Macro." The 12 funds managed roughly $30 billion of assets at year end 1997.

Three funds had returns strongly correlated to the second principal component. Their returns and the second principal component were correlated to the trend-following style in Fung and Hsieh (1997b). For this reason, we labeled their style "Trend-Following". They managed roughly $4 billion of assets at the end of 1997.

One fund managing $2.1 billion fund at the end of 1997 invested primarily in emerging market securities, so we labeled its style "Emerging Market".

The remaining 14 funds (managing assets of $22.4 billion at the end of 1997) had no strong return correlation with the first two principal components, nor emerging market indices. We labeled them as "Unclassified" funds. They represented various "niche" styles according to classifications by various hedge fund consultants such as fixed income arbitrage.

These results are similar to the principal component analysis in Fung and Hsieh (1997a). There, the first five components explained less than 45% of the cross sectional variation in 409 funds. Here, the first two components explained roughly 40% of the cross section variation in 27 large funds. The latter sample contained fewer principal components because large funds are predominantly Global/Macro funds. The other styles, such as those used by value traders and distressed securities traders, tend to have smaller funds and are therefore under represented in the large fund sample here.

A comment regarding the conceptual difference between "herding" and "style" helps to clarify the subsequent analysis. "Herding" means that some funds mimic other funds' trades without having the same information. In contrast, two funds with the same "style" having the same information and employing similar trading strategy are likely to have the same trades. However, herding necessarily implies a lead-lag relationship between the trades of leaders and followers, whereas funds with the same style can have

the same trades without any lead-lag relationship between them.

While it makes sense to distinguish between "herding" and "style" conceptually, there may be no practical way to tell them apart using monthly returns. Hedge funds managers are considered nimble.[2] Unless a continuous record of all trades is available, it would be impossible to test for lead-lag relationships between the trades of different funds. For the purpose of this paper, we follow Fung and Hsieh (1997a, 1997b) and use the word "style" to describe funds with correlated returns without references to causality.

Returning to the principal component analysis, the most striking characteristic, both here and in Fung and Hsieh (1997a), is that the majority of hedge funds had low return correlation with the major styles or with each other. Herding (i.e. persistent imitation of positions), if present at all, is restricted to a subset of hedge funds. The more interesting issue from a market impact stand point is to identify the infrequent episodes of "style convergence" where different investment styles converge onto similar positions.[3]

4. Hedge Funds and Market Events

It is instructive to observe the similarity of the returns within styles, and the differences of the returns across styles, during various major market events in the recent past --- the 1987 stock market crash, the 1992 European Rate Mechanism (ERM) crisis, the 1993 global bond rally, the 1994 bond market turbulence, the 1994-5 Mexican crisis, and the 1997 Asian currency crisis. The returns of hedge funds and the relevant markets are given in Tables 3 through 8. The following subsections analyze these market events.

4.1. The 1987 Stock Market Crash

The first episode we examined is the 1987 stock market crash. At the time, a few Global/Macro funds were reportedly long US stocks and suffered substantial losses.[4] This is confirmed in Table 3, which provides the monthly returns for all the large funds with available data. In October 1987, three

Global/Macro funds had losses larger than the S&P 500 index. However, a fourth Global/Macro fund and five other funds fared substantially better than the S&P 500. In fact, two funds actually had big gains. The average returns of the 9 large funds in our sample is -0.2% in October 1987.

We estimated large hedge funds' positions in US equities as follows. Four large Global/Macro funds suffered large losses in October 1987. Assuming that the losses came entirely from long positions in US equities, these funds would have had an investment of $4.8 billion. One large fund had a substantial gain. Assuming that the gains came entirely from short positions in US equities, this fund would have to be short $0.9 billion of US equities. In aggregate, large hedge funds were long $3.9 billion in US equities.

As an aside, note that the typical hedge fund did not appear to have significant exposure to US equities. The average return for all Tass hedge funds was 1.2% during October 1987.

Hedge funds' $3.9 billion net long position in US equities represented less than 0.2% of the market value of US equities. Based on the Federal Reserve's Flow of Funds Accounts of the US, the market value of US corporate equities stood at $3,511 billion at the end of September 1987. The major owners were: households (49%), private pension funds (21%), mutual funds (7%), state and local government retirement funds (6%), bank personal trusts and estates (6%), foreigners (6%), insurance companies (5%). Brokers and dealers held less than 1%. Even if hedge funds liquidated their entire $3.9 billion net long position in the last quarter of 1987, this amount constituted less than 13% of the total net sales by all investors. The Federal Reserve showed that US corporations purchased $30.2 billion of equities back from investors in the last quarter of 1987. Household sold $19.6 billion, the rest of the world $7.5 billion, broker and dealers $4.8 billion, and mutual funds $3.0 billion.

The evidence is consistent with the view that hedge funds as a whole had little impact during the October 1987 crash. Rather, the crash appeared to have more to do with "portfolio insurance" as reported by the popular press at

that time.[5] The Presidential Task Force on Market Mechanisms (1988), headed by Nicholas Brady, reported the following statistics. Portfolio insurers sold, on net, $10.6 billion of stocks and stock index futures from October 15 to October 20, half of that occurring on October 19. Other pension funds were net buyers of stocks, totaling $1.7 billion during this period with $0.4 billion occurring on October 19. Trading-oriented investors (presumably including Global/Macro hedge funds) were net buyers on 3 of the 4 days, totaling $2.4 billion, with $1.5 billion on October 19. Mutual funds were net sellers on two days and net buyers on two days, selling $0.1 billion on net, with $97 million of net sales on October 19. Thus, the biggest sellers were portfolio insurers while the biggest net buyers were trading-oriented investors. Consequently, if hedge funds had any impact at all, they did so as providers of liquidity during the crash.

Table 3 reports a good example of style divergence. Out of nine large funds, three appeared to be long the stock market, and the rest seemed to have no positions in the stock market. For example, one of the Trend-Following funds that had large gains in the last quarter of 1987 appeared to have been short the Deutsche Mark. Not only did different hedge funds have opposite performance during extreme market environments, their returns came from different markets. Thus, while some hedge funds were not "hedged" against declines in stocks, others were trading in completely different markets. In addition, this episode illustrated that hedge funds did not follow buy-and-hold trading strategies. Two of the three funds that had big losses in October 1987 fared much better than the S&P 500 index in November 1987. In contrast, US equity mutual funds (typically following buy-and-hold strategies) suffered losses of 20.8% in October and another 6.0% in November, as reported by the Investment Company Institute.

4.2. The 1992 ERM Crisis

The 1992 ERM crisis was an episode in which hedge fund activities were prominent in the financial press. Reportedly, George Soros’s funds had a $10

billion short position on Sterling (the term used in the foreign exchange market to refer to the British Pound), and made $1 billion during the September devaluation of Sterling.[6]

A detailed documentation and analysis of the 1992 ERM crisis as well as the preceding macroeconomic events can be found in IMF (1993a, 1993b). Basically, the IMF (1993a, p. 8) characterized the prelude to the 1992 crisis as a "convergence play" on European monetary union:

> "...there was the growing perception by international investors that the member countries of the EMS were on a continuous convergence path towards European Monetary Union (EMU), under which interest rate differentials in favor of the high-yielding ERM currencies would increasingly overestimate the actual risk of exchange rate depreciation."

The amounts involved in such convergence play "could have been as high as $300 billion" (IMF, 1993a, p. 10). However, the confluence of subsequent events led to a "one-way" bet that some of the high inflation countries (e.g. Italy, Portugal, Spain, UK) would have to realign their currencies. This caused substantial capital movements, which included speculative bets as well as the unwinding of the "convergence play." These one-way capital flows away from the high yield currencies overwhelmed European central banks, causing the UK and Italy to pull out of the ERM.

Here we concentrated on the activities of hedge funds. Table 4 lists the monthly returns of the large funds during the last four months of 1992. Out of 22 sizable hedge funds with available data, eight funds collectively managing over $10 billion of assets had unusually large returns (defined as more than 1 standard deviations from its history prior to the event). Four were from the Quantum Group. During this period, the United Kingdom and Italy suspended their membership to the ERM in the fateful month of September. Both currencies experienced significant losses in excess of two standard deviations from their respective price histories. As the event revolved around the integrity of the ERM, we used the exchange rate between these countries to the

Deutsche Mark, which is often regarded as the "anchor currency" of the ERM, to proxy the value of the respective currency. The abnormal hedge fund returns are consistent with sizeable short positions in these currencies.

To measure the market impact of hedge funds, we estimated the positions of hedge funds in these currencies as follows. From the press reports, we can place the Quantum Group of funds with roughly a $10 billion short position in Sterling. For the other funds that experienced abnormal returns, we attributed their performance to a short Sterling position. This meant that eight other Global/Macro funds (which collectively managed over $6 billion of assets) had an additional $1.7 billion short position in Sterling. Since the large Global/Macro funds had positive returns in September 1992, we interpreted their $11.7 billion short Sterling position as a "speculative bet" (designed to profit from a Sterling devaluation) rather than a "hedge" (designed to offset losses from other positions resulting from a Sterling devaluation).

The first question that needs to be addressed is "How big a risk does a position of this magnitude represent to the hedge funds?" In terms of risk capital, we estimated that the assets managed by the large Global/Macro funds to be $15.8 billion in 1992. A $11.7 billion position was less than one time leverage on the assets under management. This was not considered a particularly risky bet, as the perceived chance of Sterling strengthening was quite small. The speculator had to pay the interest differential for carrying the short Sterling position, but stood to gain handsomely if the devaluation occurred.

An alternative gauge of risk is to estimate the margin needed to cover the potential losses on this position. It is common practice for hedge funds to initiate a foreign exchange position through the use of the interbank "forward market" for the currency. Essentially, the interbank forward market functions in much the same way as the futures exchanges but for the way credit risk is assessed and managed. The margin requirements for forward contracts are comparable to or higher than that of the "clearing corporation" for a

typical futures exchange. The minimum margin for currency futures contracts that trade at the Chicago Mercantile Exchange was approximately 1.5% to 3.0% of the face amount of the position, and the Sterling (referred to as the British Pound by the exchange) is among the contracts traded at the exchange. Conservatively, we assumed a 6% margin requirement on interbank forward foreign exchange positions. Then, a $10 billion short position on Sterling would call for a $600 million margin to be deposited with counterparty banks. This was small compared to the asset under management of the Quantum Group at the time. A similar conclusion applies to the other Global/Macro hedge funds that potentially had short Sterling positions. The conclusion here is that the estimated aggregate short position in Sterling by these Global/Macro hedge funds was well below the limitation of what their collective capital can support in terms of position exposure.

Next we address the question of the size of the hedge funds' bet relative to the "market". In an April 1992 survey the Bank for International Settlement (BIS) showed that the daily turnover of the foreign exchange market was $880 trillion (BIS, 1996, p.3). Of this, Sterling's share was 7% (BIS, 1996, Table F-3, p.8). This gave a daily turnover estimate for Sterling of $62 billion. Therefore, in relation to daily volume, the hedge funds' position appeared small. One would conclude that the $11.7 billion short Sterling position can be implemented without significant impact to the daily flow of foreign exchange transactions; especially if the position was established over a period of time.

Total turnover, however, may not be a good gauge of the market impact of a large position. After all, roughly 80% of foreign exchange transactions are interdealer trades, involving the reshuffling of positions across dealers. Retail trades in Sterling could be as low as $12.4 billion per day in 1992. A $11.7 billion position in Sterling could have a substantial market impact.

Other measures also indicated that a $11.7 billion position in Sterling was substantial. UK official reserves averaged around $40 billion in 1992. A $11.7 billion Sterling position exceeded 25% of UK official reserves. Even in

the broader context of the entire ERM, a $11.7 billion position was sizeable. The IMF (1993a) reported that, as of August 1992, the official reserves of the seven countries involved in the ERM crisis (France, Germany, Italy, Ireland, Portugal, Spain, Sweden, and the United Kingdom) were $268 billion.

Based on these figures, it is reasonable to conclude that the estimated $11.7 billion short Sterling position generated a "material impact" to the external value of Sterling. Another piece of collaborating evidence is the reported profit from the short Sterling position the Quantum group disclosed. It was around $1 billion. This profit was generated in the course of a few short weeks in September 1992, as shown in Figure 1, which graphed Quantum's NAV along with the Sterling/Dollar exchange rate (expressed as amount of Sterling per US Dollar). The divergence in Quantum's NAV movements and the Sterling/Dollar exchange rate near the end of September signaled the end of that trade. Granted that the position might have taken a period of time to accumulate, it would be safe to say that the entire "trade" lasted well under one year. Comparing the $1 billion profit from this trade to the annual foreign exchange trading profit of the leading US Banks puts into perspective the "size" of this speculative position relative to the normal market activities. The 1991 foreign exchange trading profit (including both market making and proprietary trading) of any major US banks: Bank of America $246 million, Bankers Trust $272 million, Chase $215 million, Chemical $289 million, and Citicorp $709 million. (Levich, 1998, p. 70).

In conclusion, it is beyond doubt that large Global/Macro hedge funds had a significant short position in Sterling in 1992 that impacted the market. It is, however, difficult to determine whether this position "caused" the Sterling devaluation, because it coincided with net capital outflows from the UK. As explained in IMF (1993a), the prologue to the 1992 ERM crisis was the "convergence" play, estimated to be roughly $300 billion (IMF, 1993a, p. 10). As these trades were being unwound, a lot of pressure was put on European exchange rates. This can be seen by the loss of official reserves in European central banks. At the end of September, the official reserves of the six

countries defending their currencies fell by $17.8 billion. However, the central banks had spent more than this amount in defending their currencies. The UK issued private debt of ECU 10 billion, and Sweden ECU 11 billion, to bolster their reserve positions. This provided another $29.4 billion of intervention. In addition, the IMF (1993a) estimated that the German Bundesbank spent another DM 92 billion, or $53.2 billion, to support the ERM currencies. Altogether, European central bank interventions amounted to roughly $100 billion in September 1992. The $11.7 billion in hedge fund positions coincided with at least another $90 billion of sales in European currencies, which overwhelmed the central banks.

On the question of herding, there appeared to be correlated returns among 10 Global/Macro hedge funds. However, only eight Global/Macro funds had abnormal positive returns, indicating a coincidence of positions. To what extent this can be construed as herding given the similarity of these funds' strategies is difficult to ascertain. In direct contrast, three of the Trend-Following funds had abnormally large negative returns (see Table 4). This is not consistent with a thundering herd of hedge funds converging on the same short position mimicking each other's strategy.

In terms of positive feedback trading, the conclusion is also negative. Subsequent to the withdrawal of Sterling and the Italian Lira from the ERM, other European currencies experienced similar difficulties with the target zone policy of managing their foreign exchange. In Table 4, we reported the percentage change of the Swedish Kroner which was one of the non-ERM currencies managed by central banks to stayed within a target zone against the Deutsche Mark. During the month of November, 1992 it too "devalued" or abandoned the then prevailing target zone policy. In that month, there were no discernable abnormal returns experienced by the large hedge funds in our sample. This is consistent with the lack of feedback trading employed by these hedge funds, in the sense that a successful speculative attack on one currency did not lead to an increase in such activities on similar currencies.

In addition, immediately after the British and Italian currency crises,

in the month of October 1992, the same group of hedge funds that experienced abnormal gains in September also showed highly positive returns. Yet, no further currency crisis was reported in October other than a slight continuing weakness in Sterling. However, the Deutsche Mark did experience an unusual decline relative to the US Dollar. The large positive returns from the hedge funds were consistent with short positions in the German currency instead, presumably betting on the continuing weakness of the European currencies in light of the ERM crisis. This shift in focus away from country specific bets to a broad-based bet on European currency weakness is incompatible with hedge fund strategies displaying positive feedback characteristics. Instead, it is more consistent with a highly opportunistic, event specific style of trading that is common among Global/Macro style of hedge funds.

4.3. The 1993 Global Bond Rally & the 1994 Bond Market Turbulence

The seed to the global interest rate decline in 1993 was sowed by the ERM crises in 1992 which paved the way to a continuing process of interest rate declines in Europe. In the previous section, we argued that in October 1992, the abnormal hedge fund returns were consistent with weaknesses of the Deutsche Mark versus the US Dollar that followed the currency devaluations in Europe. In fact, during the same month, European bond markets also rallied spurred by the decline in short term interest rates that ensued. A similar pattern can be observed in December 1992. It is likely that the strong hedge fund returns resulted from a continuation of weakness in the Deutsche Mark and the rally in European bonds. Although this does not detract from our conclusions in the earlier section, it does add fuel to our analysis of the global bond market event in 1993.

Table 5 shows that most Global/Macro funds had strong gains consistent with long positions in European bonds during the 1993 global bond rally. Interestingly, some funds in other styles such as Trend-Following, Emerging Markets as well as "Unclassified" also showed strong gains. Table 5 shows that in all months where the bond markets returns were greater than one

standard deviation from the respective means (in italics), sizable gains were also reported by many funds in different style categories. Clearly there was a concurrence of "abnormal returns" between the bond markets and hedge funds.

In order to measure the impact of hedge fund activities in the European bond markets, we needed to select a risk unit for measuring bond market exposures. Here, we used the government bond futures contracts that trade in LIFFE for this purpose. This helped to aggregate what could potentially be a multitude of bets spread along the interest rate curve. An additional reason for using the bond futures contracts to proxy hedge fund exposures in the European Bond markets is the use of leverage by hedge funds. In most cases, when a hedge fund puts on a government bond position, leverage is achieved by entering into a "repo" agreement with a counterparty (typically an investment bank) whereby US$ margins are posted against the position. This effectively generates a synthetic forward position in the underlying bond position margined in much the same way as a futures contract on the underlying bonds.

We began by using Quantum's daily NAVs to estimate Quantum's exposures to the major asset classes (e.g. stocks, bonds, currencies, and commodities). The approach is similar to Sharpe (1992) and Brown, Goetzmann, and Park (1998). We began with a large number of assets markets in which Global/Macro and Trend-Following funds typically trade: US stocks, European stocks, Japanese stocks, Asian stocks, US bonds, European bonds, Japanese bonds, and three major currencies (Sterling, Deutsche Mark and Yen versus the US Dollar). Using a step-wise regression approach, we regressed the returns of the Quantum Fund against these markets and sequentially omitted markets which did not have a statistically significant regression coefficient. In addition, we varied the sampling interval for these regressions, allowing for discrete position changes.

Applying this method, we found that, from June through December 1993, Quantum’s returns were consistently positively correlated to European bond returns (represented by the German Bund contract, the UK Gilt contract, the Italian BTP contract at the LIFFE and the French Notional the Italian BTP at

the Matif). The average estimated aggregate equivalent exposure to these European Government Bond futures contracts was $9.1 billion (in USD equivalent). Other notable bets were short positions in Japanese Yen/long US Dollar and long positions in precious metals.

Applying the same technique to Quota's daily NAV, we estimated the average European bond positions of Quota to be $1.3 billion (in US$ equivalent). Quota also appeared to have big bets in currencies, Japanese stocks and bonds, and precious metals.

Unfortunately, we did not have weekly or daily returns for other Global/Macro funds. Applying the multiple regression technique to monthly returns would generally lead to less reliable results. To reduce as much estimation error as possible, we assumed that the Global/Macro funds which were strongly correlated with Quantum in the second half of 1993 had the same exposure as Quantum. For the other funds, we had to rely on exposure estimates derived from monthly returns. We also estimated the exposures of three dissolved large Global/Macro funds (listed in the Appendix) that operated in 1993. In total, we obtained an estimate of $53 billion in European bonds for Global/Macro funds in September 1993, a time when these funds had $27 billion of assets under management. This increased to $61 billion in December 1993, when their managed assets increased to $32 billion.

Hedge funds in the other styles had modest positions in European bonds. For Trend-Following funds, we estimated their positions to be $3.3 billion in September, declining to under $2 billion by December.[7] For the Unclassified funds, we estimated their exposure to be $500 million. Altogether, hedge funds as a whole had around $54-64 billion of equivalent positions to the generic European bonds deliverable against the futures contracts in each market.

As before, we asked the question, "Did they bet the ranch?" For those hedge funds that had positions in European bonds, their total bet size was roughly two times their capital base. This is not an excessive leverage by normal hedge fund standards. Another method to measure the size of the bet is

the amount of futures margin needed for these positions. Typically the minimum margin requirement for bond futures contracts is just under 1%. Assuming three times the minimum margin to be conservative, the aggregate margin requirement for the estimated exposure was between $1.6 billion to $1.9 billion USD. This was a small fraction of the total assets managed by these funds.

Next we examined the size of the European Government Bond markets. The outstanding amount of domestic government debt at the end of 1992 were (in USD): France $184 billion, Germany $241 billion, U.K. $178 billion, and Italy $221 billion.[8] Converting these amounts into equivalent 10-year bonds, France had $81 billion, Germany had $94 billion, U.K. had $94 billion and Italy had $80 billion.[9] Superficially, hedge funds collectively only control 1%-2% of the outstanding government bonds.

However, bonds are generally held by long term domestic institutional investors. Therefore, not all of the outstanding bonds are liquid. Yet, highly leveraged traders like hedge funds (and proprietary trading desks at investment banks) hold these positions over a much shorter horizon. Given the apparent concurrence of long position exposures among different styles of hedge funds, one has to question the impact on the bond market if they all decide to exit at the same time. Here we used the bond futures contracts to provide a proxy for liquid bonds. The range of open interest of the European Bond markets fell narrowly between $50 to $60 billion USD from quarter to quarter during 1993.[10] The daily open interest peaked at $69.9 billion USD during August 1993. Based on these figures, the European Bond market exposure of the hedge funds equaled nearly 100% of the open interest of these markets. Therefore, although the fraction of outstanding bonds controlled by hedge funds was small, they could potentially have a significant impact on the liquidity of the European Bond market given their highly dynamic trading styles.

This highly dynamic trading style was evident in 1994, when the Federal Reserve raised interest rates in February, precipitating a sustained decline

in the global bond market. Table 6 shows that most Global/Macro funds suffered substantial losses during February and March. These losses were consistent with our estimates of the funds' exposures based on the last 4 monthly returns in 1993, as reported earlier. These losses were reduced by April and had all but disappeared by May. In contrast, the European Government bonds continued their losing streak through June of 1994. This indicated that the Global/Macro funds got out of the majority of their long European bond positions by May. An exception was the David Weill's Dorje Fund, one of the three dissolved funds listed in an Appendix. According to press accounts, this fund increased its long exposure to European bonds when European bonds continued their decline in 1994, resulting in double digit losses each month from April through August. This ended in the liquidation of the Dorje Fund, as distinct from the other two funds where operation ceased for different reasons at a later stage.

One can get a flavor on the potential role of hedge funds in this bond market decline by examining the open interest of the futures markets. The quarterly open interest for German Bunds, UK Gilts, Italian BTPs, and the French Notional Bond futures are as follows: $50.78 billion (93:Q4), $65.89 billion (94:Q1), $50.30 billion (94:Q2), $50.74 billion (94:Q3), and $53.55 billion (94:Q4), respectively. The aggregate open interest peaked during March 1994, at around $92.50 billion. The average open interest during the market rally of 1993 was $54.60 billion based on quarterly observations, which was not very different from the quarterly average of $55.12 billion. However, during the peak of the bond market decline towards the end of February and the beginning of March of 1994, the open interest increased by almost $40 billion from the Q4 1993 figure of $50.78 billion. This is consistent with an abrupt increase in investors' demand for hedging interest rate sensitive assets.

If we assumed that the increase in open interests were primary in new short positions, then our previous estimate of $54-$64 billion of long hedge fund positions in European bonds was a very sizable fraction of the market's liquidity. This is especially the case if the aggregate hedge fund exposures

to European bonds were by and large liquidated during the first quarter of 1994. Based on these estimates, hedge funds could easily have impacted the global bond markets through leverage and a dynamic style of trading. However, the trading appeared to be motivated by fundamental factors rather than pure speculative reasons. Nonetheless, the convergence of opinion between Global/Macro funds and Trend-Following funds led to a concentrated level of exposure in the global bond markets that was potentially problematic. When the "abrupt" shock of an unanticipated interest rate increase materialized, the rush to unwind these trades led to a major setback for the global bond markets.

On the question of herding, this is one of the few events where different hedge fund styles converged onto the same positions. From Table 5, it appeared that, along with Global/Macro funds, Trend-Following funds also participated in the bond market rally in 1993. However, their exposure to European bonds appeared to have started after the Global/Macro funds in July of 1993. This is consistent with a trend-following trading style where the decision rules are based primarily on market price movements. Typically, trend-following decision rules react to trending prices by waiting for observations to accumulate in one direction before a trade is triggered. This provides a counter argument to the contention that observable convergence of performance among hedge funds from different styles is a consequence of herding.

Our interpretation is supported by the performance of the Trend-Following funds during the bond market decline in 1994. Table 6 shows that by March, the Trend-Following funds' performance had swung into the positive column, in direct contrast to that of the Global/Macro funds. This performance divergence persisted for the balance of 1994. Based on these observations, we again concluded that there was no evidence of herding among hedge funds of different styles during this bond market event. However, one must note that when a prolonged trend develops in a liquid market, there will be an apparent convergence of exposures among hedge funds of different styles.

We prefer to think of this as a natural consequence of "style convergence", in the sense that different trading styles converged onto the same set of market exposures, rather than herding.

Finally, in terms of feedback trading, the performance of hedge funds clearly followed the positive run of bond market returns during 1993. However, there is no easy way to distinguish between positive feedback trading from a pattern of returns in what was, with hindsight, an upward trend in the bond markets. There are two pieces of evidence against the conjecture that hedge funds exhibited positive feedback trading behavior in 1993-4. One, the exposures of individual funds to European bonds did not appear to increase over time during 1993. Two, hedge funds did not switch to short positions in European bonds during the decline in 1994. To the contrary, the returns in Table 6 were consistent with the Global/Macro funds overstaying their welcome with their long positions in the bond market. The only group of funds that had returns consistent with positive feedback trading is the group of Trend-Following funds. However, the pattern of their returns were also consistent with trend-following trading behavior (where, again, in hindsight, the bond markets were in a down trend in 1994). Overall, we conclude that there is very little support to the conjecture of positive feedback trading behavior among hedge funds beyond what can be explained by their respective trading styles.

4.4. The 1994 Mexican Peso Crisis

Unlike the previous two episodes, hedge funds were noticeably absent from the financial press during the 1994 Mexican Peso crisis. Table 7 reports that few hedge funds had usually large gains or losses in December 1994, when the Mexican Peso devalued by more than 40%. Large hedge funds appeared to have no significant positions in the Mexican Peso during the December 1994 devaluation. The Emerging Market specialist fund was the only one that suffered substantial losses.

This is supported by an analysis of the available daily NAVs. Figure 2

graphs the daily NAV of Quantum and the Peso during that month. On December 22, the Peso suffered a 34.6% devaluation. Yet Quantum's NAV barely changed. Also, daily and weekly NAVs for six additional Global/Macro funds, two Trend-Following funds, and one Unclassified fund revealed no evidence of long or short positions in the Mexican Peso during December 1994. This is consistent with the statement made by George Soros that his fund was not responsible for the Peso devaluation[11] as the Mexican government actively prevented Mexican banks from engaging in speculative activity against the Peso.

In fact, the typical hedge fund was not affected by the Mexican Peso devaluation. In the HFR performance index, there were 583 hedge funds in 1994 managing $53.6 billion. Their average return was -0.1% in December 1994 and -0.2% in January 1995. Only funds specializing in emerging markets were affected. There were 58 hedge funds managing $7.5 billion invested primarily in emerging markets, with average returns of -3.2% and -5.5%, respectively. Of these, 18 hedge funds managing $1.8 billion specialized in Latin America, and their average returns were -3.6% and -6.3%. In comparison, the Morgan Stanley (MS) Emerging Market index was -8.0% and -10.6% respectively, while the MS Latin American index was -15.0% and -11.0%.

One explanation for the specialty hedge funds outperforming these indices was that they had earlier hedged their Latin American positions. Even if these hedges were all short positions in the Peso, the amount would have been relatively small, given the size of these specialty funds. In addition, these short positions were hedges rather than speculative bets against the Peso, as evidence by the losses during the Peso devaluation. Another explanation is that the specialty hedge funds were primarily betting on Brady bonds (which are denominated in US Dollars and therefore have no currency risk), as their returns were more in line with those of Brady bonds than with Latin American equities.

In comparison, Lipper Inc reported that there were 19 US equity mutual funds specializing in Latin America, with assets of $4.3 billion as of November 1994. These funds returned on average -17.4% in December 1994 and

-14.0% in January 1995. This was in line with the MS Latin American index, but much worse than the specialty hedge funds, which is consistent with the tendency of US emerging market mutual funds to leave their currency exposures unhedged.

Several US bond mutual funds also suffered large losses. Some high yield income funds appeared to have exposures to emerging market debt, and a few short-term world income funds were playing the "carry trade" in Mexico by holding Peso-denominated short-term debt while betting against a Peso devaluation.[12] Figure 3 graphs the NAVs of one of the largest short-term world income mutual funds against the Mexican Peso in that month, showing large losses during the Peso devaluation.

In conclusion, our analysis did not turn up any hedge funds or mutual funds that had speculative bets against the Mexican Peso. This is consistent with the conclusion in IMF (1995) that the Mexican Peso crisis was due to a general capital outflow from the Mexican debt market. According to the International Financial Statistics, $373 million flowed out of Mexico from the equity markets in the last quarter of 1994, but that flowed reversed in the next quarter. Initially, $5.1 billion flowed out of Mexico from the debt market in the last quarter of 1994, followed by another $11.5 billion in the next nine months. Based on the statistics provided by the BIS, bank loans to Mexico declined about $1.5 billion in the last quarter of 1994, but there was no further reduction in the first half of 1995. Basically, the IMF concluded that Mexican residents, not foreign investors, played the leading role in the 1994 crisis. [See Frankel and Schmukle (1996) and IMF (1995).]

4.5. The 1997 Asian Currency Crisis

In July 1997, the Thai Baht devalued by 7%, followed by the Malaysian Ringgit, the Indonesian Rupee, and the Korean Won. By the end of 1997, these Asian currencies lost between 44% to 56% of their values. This series of events, known as the Asian Currency Crisis of 1997, led to a series of exchanges between the Malaysian Prime Minister Mahathir Mohamad and hedge fund

manager George Soros, on whether hedge funds were responsible for the crisis.

We started by examining the monthly returns of the large hedge funds. Table 8 indicates that most Global/Macro hedge funds had sizable gains in July 1997, when the Thai Baht devalued 23%. Stanley Druckermiller, who headed the daily operations of the Quantum Fund, confirmed the existence of short positions in the Thai Baht and Malaysian Ringgit in a Wall Street Journal (September 5, 1997) interview. The position sizes were not disclosed. The popular press assumed that the short position was large and profitable.[13] For the month of July, Quantum gained 11.4% while the Thai Baht fell 23%. Given Quantum's assets of $5 billion in June 1997, a $3 billion short position in the Thai Baht would have been needed to generate an 11% return.

However, it would be naïve to think that a sizeable fund like Quantum had no other position in their portfolio. One must adjust for the effects of the other portfolio positions on performance in order to arrive at reasonable estimates of exposure. In particular, the US equity market had large gains during the second half of 1997, as shown in Table 8. It turned out that the monthly returns of large hedge funds were more correlated with the US equity market, as measured by the S&P 500 index, than with Asian currencies.

To demonstrate this point quantitatively, we ran regressions of the returns of 28 funds against the rates of change of the Thai Baht and the S&P, jointly, for the last 6 months of 1997. The S&P was statistically significant and positive in 17 of the regressions, the Thai Baht was statistically significance and negative (indicative of short positions) in only 4. Furthermore, in the 17 regressions where the S&P was significant, the average R^2 was 65%. This shows that the S&P was a much stronger determinant of hedge fund returns in the second half of 1997 than the Thai Baht.

Similar results held for the other Asian currencies. In the regressions with both the S&P and the Malaysian Ringgit, the S&P was statistically significant in 15 cases, while the Ringgit was significant and negative (indicative of short positions) in only 3 cases. There was one additional case where the Ringgit was significant and positive, indicating a long

position. In the regressions with both the S&P and the Indonesian Rupiah, the results were 18 to 3. In the regressions with both the S&P and the Korean Won, the results were 18 to 0, and there were additional 3 cases when the funds were long the Korean Won. There is no strong evidence that many hedge funds were heavily short Asian currencies in 1997.

Hedge fund managers are known to be nimble and change their positions frequently. Monthly returns, therefore, can only provide a crude guide to position estimates. We collected daily and weekly returns for 12 large hedge funds (10 Global/Macro funds and 2 Trend-Following funds) from publicly available sources, such as the Financial Times, the International Herald Tribune, the Republic National Bank (Suisse) Investment Fund Newsletters, Bloomberg and Reuters.

These high frequency returns provided many more observations to check our findings based on monthly returns. We began with Figure 4 which graphs the daily NAV of the Quantum fund from May 29 to Dec 31, 1997, along with the Thai Baht and the S&P 500 index. It shows that Quantum's performance was much more closely correlated with the S&P 500 index. This point is even more forcefully made in Figure 5, showing that Quantum was long the US stock market throughout 1997. Once we accounted for Quantum's underlying exposure to the US stock market, roughly equal to 100% of its capital, the 8% rise in the S&P explained the lion's share of Quantum's 11.4% gain in July.

4.6. Position Estimates Using Daily and Weekly Returns

The higher frequency returns allowed us to estimate the significant exposures of hedge funds in a more precise manner using step-wise multivariate regression, as described previously. Here we added four Asian currencies (Thai Baht, Malaysian Ringgit, Indonesian Rupiah, and Korean Won) as explanatory variables. Applying this procedure to each of the 12 funds for which we had daily or weekly returns, we obtained estimates of their aggregate positions in the Asian currencies. These are graphed in Figure 6. It shows that large hedge funds had a net short position just shy of $5 billion in the

Thai Baht at the end of June 1997. It dropped below $3 billion on July 8, and was below $2 billion by July 30. For the remainder of 1997, the group as a whole held both long and short positions in the Thai Baht several times, but never exceeding $2 billion in either direction. The decline in the short position in July also indicates that the Global/Macro group, as a whole, did not use positive feedback trading strategies.

For the four Asian currencies as a whole, large hedge funds never had more than $6 billion of short positions. The largest positions (in absolute size) were at the beginning of the crisis, and they declined (in absolute value) as the crisis progressed. There was no evidence of positive feedback trading.

Beyond the large hedge funds, we also did not uncover significant speculative bets in smaller specialty funds investing in Asian assets. According to HFR, there were 31 hedge funds specializing in Asian emerging markets, managing $1.8 billion of assets in 1997. In July 1997, these funds had an average return of 2.6%, which was better than the Barings Emerging Market Asian Index return of -0.6%. Even if we attributed the excess performance of 3.2% to a short position in Thai Baht, it would only have amounted to $250 million. These funds suffered losses in the next five months, which indicated that they did not have speculative bets against the Asian currencies. The same was also true of US mutual funds. According to Lipper Inc, there were 92 US equity mutual funds specializing in the Pacific Region excluding Japan, managing $9.7 billion of assets. Their performance for the same period was in line with the returns of MS Pacific Ex Japan index.

The available evidence indicates that hedge funds never had more than a $6 billion short position in Asia currencies. "Was a $6 billion position in Asian currencies large?" It was small relative to the capital of large hedge funds. "Did this position have a large effect on the Asian currency markets?" This is the more difficult question to answer. Unlike the case of Sterling, the BIS foreign exchange survey did not separately estimate daily turnover in Asian currencies prior to its April 1998 survey. In that survey, the BIS

found daily turnover for the Thai Baht to be $3.0 billion. The $6 billion position was also small relative to official reserves, which stood in excess of $122 billion in June 1997 in the five affected Asian countries (Indonesia, Korea, Malaysia, Philippines, and Thailand).

The problem for the Asian central banks was that the hedge fund speculative bet coincided with significant sales of Asian currencies in the fall of 1997 by other market participants. This can be inferred from capital outflows in the second half of 1997, particularly in bank lending. Figure 7, based on IMF (1998), shows that net private capital inflows jumped from an average of $30.4 billion during 1990-1994 to $62.9 billion in 1995 and $72.9 billion in 1996. More than half of the unusual $74 billion of capital inflow came in the form of bank lending, which quickly departed in 1997. Even though inflows through direct investment and portfolio investments remained positive, they were not sufficient to offset the outflows of bank lending. Capital outflows were likely to be even greater, because 'errors & omissions' jumped to an outflow of $19.5 billion in 1997, $10 billion higher than the previous two years.

The outflow in bank lending began in the third quarter of 1997, as shown in Table 9 which provides the assets and liabilities of the reporting banks in the BIS quarterly survey vis-a-vis selected Asian countries. The decline in bank lending was $11.7b in the third quarter of 1997 for Thailand alone. Thus, a combination of a speculative bet and large capital outflows overwhelmed the Thai central bank.

The sales of Asian currencies can also be inferred from the reserve losses of the five affected Asian countries, reported in IMF (1998) to be $36 billion in 1997. Actual intervention probably was much larger than this figure, since the loss of reserves did not reflect forward transactions of Asian central banks. As reported in Eichengreen et al (1998), the Thai central bank alone had $26 billion of forward transactions on their books. Market participants attributed $7 billion of that amount to hedge funds. This estimate was broadly in line with, but greater than, our estimate using

performance data.

The evidence indicated that while a $6-7 billion position was large in Asian currencies, its effect was compounded by a much larger concurrent outflow of bank lending. While the hedge fund position could have been the last straw that broke the camel's back, it was no more responsible than any of the other straws.

The evidence also indicated that hedge funds did not employ positive feedback strategies in Asian currencies. Table 8 shows that the largest decline for the Asian currencies typically occurred in December. If hedge funds were piling on short positions as the Asian currencies fell, they should have larger positive returns in December than in July. This did not happen. Figure 7 also shows that hedge funds did not use positive feedback trading in Asian currencies. Had they done so, the position sizes would have grown as Asian currencies continued their decline in 1997. This did not happen.

Even though the positions of large hedge funds were modest, there were concerns that other traders and investors followed the lead of hedge funds in shorting Asian currencies, which forced the subsequent devaluations. While there was no direct evidence to confirm or refute this possibility, there was indirect evidence that hedge funds were late-comers to the trade.

To see this, it is important to recall the events that led up to the crisis. The Asian Currency Crisis of 1997 was much reminiscent of the ERM Crisis of 1992. Substantial amounts of "carry trades" were involved in the buildup of both crises. These carry trades allowed Thai corporations and banks to borrow in foreign currencies, which had a lower interest rate than the domestic currency. As long as the domestic currency did not depreciate, the foreign currency loans represented a cheap source of funding.

In the end, the carry trade led to an unsustainable equilibrium. By fixing the exchange rate, the Thai central bank was indirectly paying a risk premium to foreign investors to support domestic funding needs. However, when these foreign "lenders" are themselves highly leveraged institutions such as proprietary desks from investment banks (and occasionally leveraged domestic

corporations), the resultant equilibrium is at best tenuous. The leveraged "carry trade" amounted to financing long-term foreign currency needs of the domestic economy from leveraged short-term speculators. The long-term merit and economic rationale of running what is essentially an asset/liability mismatched position is best deferred to another occasion. What is clear is that there will be periodic funding crisis whenever adverse fundamental economic factors emerge around rollover dates of these funds. When the foreign "lenders" smell trouble, they will flee the local market. In such an event, the existence of a "lender of last resort", irrespective of the economic motivation, should be considered as a solution not a problem.

In July 1997, for whatever reason, some foreign lenders decided to unwind their carry trades in Thailand. They sold Baht/bought Dollars in the spot market, putting tremendous pressure on the Baht. The Thai central bank had two options. Either it could supply the Dollars in the spot market to facilitate the unwinding (thus depleting its official reserves), or it could postpone this by arranging forward Dollar sales (thus conserving reserves) with commercial banks.

To understand the effects of the forward transactions, note that the commercial banks that engaged in this transaction with the Thai central bank were buying Dollars/selling Baht forward. To hedge this transaction, the commercial banks would typically sell Dollars/buy Baht in the spot market, rolling the position until the forward contract expires. That would supply the much needed Dollars to unwind the carry trades without depleting official reserves. Thus, the forward transactions of the Thai central bank was basically a short-term financing operation to borrow Dollars.

The commercial banks that engaged in the forward transaction with the Thai central bank now faced two problems. One, they had to manage the currency risk of that position. Two, their long Dollar/short Baht forward trade has a negative carry, since they were long a lower yield currency and short a higher yield currency. It was, therefore, natural for these commercial banks to look for counterparties to absorb the offsetting

transaction. Presumably, this was how large hedge funds came to accumulate a $5 billion forward position against the Baht in a short period of time. Hedge funds were late-comers in the forward trade. They were not likely to herd other investors into this trade. Ironically, they became the lenders of last resort to allow the Thai central bank to roll the immediate currency crisis forward.

In examining this episode, we come to the same conclusions as the IMF study by Eichengreen et al (1998). One, hedge fund positions were relatively modest at the beginning of the crisis. Two, hedge funds did not utilize positive feedback trading to destabilize the Asian markets. If anything, they displayed some contrarian trading in being long the Indonesian Rupiah while it was still falling. Three, hedge funds cannot be blamed for herding other investors to doing the same trade. The underlying economic fundamentals were ripe for an "accident" to happen.

5. Concluding Remarks and Policy Implications

Our analysis of large hedge funds provided some quantitative answers to the issues of market integrity posed in Eichengreen et al (1998).

First, we found several episodes in which hedge fund activities were prominent and probably exerted market impact. These episodes included the ERM Crisis in 1992, the European bond market rally in 1993 and decline in 1994. There were also other episodes in which hedge funds were unlikely to have exerted influence on markets. They included the stock market crash in 1987, the Mexican Peso Crisis of 1994, and the Asian Currency Crisis of 1997. There was no evidence that hedge funds were able to manipulate markets away from their "natural paths" driven by economic fundamentals.

Second, there was no evidence that hedge funds used positive feedback trading in any of these episodes.

Third, hedge funds did not act as a single group. There are a number of different styles. Most of the time, these styles pursued unrelated trades. Once in a while, as in the case of the 1993 global bond rally, we found

evidence of style convergence, when both Global/Macro funds and Trend-Following funds had large positions and traded in the same direction.

Fourth, there was no evidence that hedge funds deliberately herded other investors to doing the same trade.

The evidence indicates that, by themselves, hedge funds were not likely to have caused the market turmoil examined in this paper. Rather, the evidence indicates that some highly leveraged trades, practiced by hedge funds as well as other market participants, can lead to market disruptions when they are unwound subsequently. The unwinding of the leveraged "carry trades" led to the 1994 Mexican Peso Crisis, in which hedge funds had no discernible role. The unwinding of the leveraged "carry trades" also resulted in the 1992 ERM Crisis and the 1997 Asian Currency Crisis, in which hedge funds had a significant role alongside other, much larger, market participants. The unwinding of leveraged interest rate bets led to market disruption in 1994. In this case, hedge funds were very much involved. These episodes indicate that it is the strategy, not the players, that can cause market disruptions.

Why then would regulators be interested in hedge funds? Hedge fund activities may serve as a leading indicator of market turmoil. Many large hedge funds employ opportunistic trading strategies on a leveraged basis. It is natural to find their footprints in most major market events, particularly when "one way bets" developed. Monitoring the strategies of hedge funds can provide early indication of potentially dangerous risks assumed by the "market" as a whole.

Footnotes:

1. Frequently, an onshore fund is set up for US domiciled investors and an offshore fund is for foreign investors.

2. Fung and Hsieh (1997a) found evidence consistent with this point. Hedge funds use many of the same asset markets as mutual funds --- equities, bonds, currencies, commodities. Yet, while mutual fund monthly returns are strongly correlated to buy-and-hold return indices of these standard asset markets, hedge fund monthly returns are not. This is consistent with the notion that hedge funds frequently change positions within a month.

3. Our usage of the term "herding" refers to the consistent and repeated strategy of imitation. Sometimes, "herding" also means position imitation in isolated episodes. We use the term "style convergence" for these situations.

4. See Barron's (Nov. 2, 1987 p. 35-36).

5. Wall Street Journal, Dec 16, 1987, "The Crash of '87 -- Black Monday".

6. See Forbes, Nov. 9, 1992, p. 40-42.

7. We have daily NAVs for one of the three Trend-Following funds in Table 6. Applying the same technique used in Quantum, we estimated its average position in European bonds to be $300 million. We then scaled this up by the assets of the other two Trend-Following funds, to arrive at the $500 million exposure.

8. These are based on Merrill Lynch's world government bond indices. Italy's figure is based on year end 1993.

9. This is based on the average durations of 4.43, 3.88, 5.29, and 3.62 years for the government bonds in France, Germany, UK, and Italy, respectively.

10. The end-of-quarter open interests are:

	Q4/92	Q1/93	Q2/93	Q3/93	Q4/93
Open Interest	51.65	53.74	57.81	56.05	50.78

There are in billions of US dollars, and include German Bunds, UK Gilts, Italy BTPs, and the French Notional Bond futures contracts.

11. See the Globe and Mail, Jan 30, 1995.

12. Within Morngingstar's "short term world income fund" category, eight U.S. open ended mutual funds had losses in excess of 5% during December 1994: Alliance Multi-Market Strategy Fund A, B, and C returned -10.0%, -9.9%, and -10.1% respectively; Alliance Short Term Multi-Market Fund A, B, and C returned -9.3%, -9.4%, and -9.4%, respectively; Alliance North American Government Income Fund A, B, and C returned -20.0%, -20.2%, -20.1%, respectively; Alliance World Income Fund returned -7.0%; and TCW/DW North America Government Income Fund -9.9%. Within Morningstar's "world bond" category, another 15 funds suffered losses in excess of 5% in December. Within the "high yield corporate bond" category, two funds lost more than 5% in December.

13. "Mr. Druckenmiller won't comment on the size of the $9.1 billion fund's positions or how profitable, if at all, they were. But the fact that Quantum's year-to-date returns climbed from 3.2% at the end of the first quarter to 22% as of Sept. 3 suggests they were, indeed, highly profitable." (Wall Street Journal, September 5, 1997, p. C1).

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Table 1
Hedge Funds & CTA Funds with Assets over $1 billion

Fund	Additional Similar Funds	Assets on 12/31/97 Amount ($ mil)	Source	Monthly Data
1.	-	2,071	Tass	9006-9801
2.	2	1,500	Tass	8608-9801
3.	-	1,000	Republic	9301-9801
4.	-	1,098	MAR	8802-9801
5.	2	1,050	Tass	9206-9801
6.	1	1,130	MAR	9201-9801
7.	2	1,000	Republic	9101-9712
8.	2	1,042	Tass	9207-9801
9.	1	1,093	Tass	9002-9801
10.	2	1,382	Tass	8207-9801
11.	-	5,600	MAR	8601-9801
11.	-	1,326	MAR	8408-9801
12	-	1,600	Republic	8603-9802
13.	-	4,700	Republic	9402-9801
14.	-	1,020	MAR	9301-9801
15.	-	4,000	MAR	9001-9802
16.	-	4,000	MAR	9201-9708
17.	-	5,369	MAR	8701-9801
18.	-	1,824	MAR	9201-9801
19.	-	2,772	MAR	9703-9802
20.	-	1,210	MAR	9104-9801
21.	-	1,596	MAR	9201-9801
22.	-	1,815	MAR	9309-9801
23.	2	1,571	Tass	9401-9801
24.	-	1,100	Republic	8801-9708
25.	-	1,100	Republic	8611-9802
26.	-	1,000	Republic	9611-9711
27.	-	1,490	MAR	8705-9801
Total		63,938		

Table 2
Principal Component Analysis

Period	# of Funds	% of total variation explained by principal components #1	#2	#3	#4	#5
92-94	20	31%	15%	10%	10%	6%
93-95	23	32%	13%	9%	7%	6%
94-96	24	31%	14%	9%	6%	6%
95-97	23	32%	14%	9%	7%	7%
92-97	17	31%	10%	8%	8%	7%
Excluding Quota, Quasar, Quantum Emerging, and Quantum Industrial:						
92-97	14	25%	11%	9%	9%	7%

Table 3
1987 Stock Market Crash

	Sep	Oct	Nov	Dec
Market:				
SPX	-2.2%	*-21.6%*	*-8.3%*	*7.7%*
US 10Y	*-5.6%*	*7.2%*	0.1%	1.4%
DEM	1.8%	*-6.2%*	*-5.3%*	*-4.2%*
JPY	3.0%	*-5.5%*	*-4.4%*	*-8.5%*
Global/Macro:				
1.	1.1%	*-30.5%*	*-5.9%*	*13.4%*
2.	1.0%	*-30.1%*	*7.0%*	*7.6%*
3.	4.1%	*-33.4%*	-0.1%	*11.1%*
4.	1.8%	1.6%	0.1%	*5.7%*
5.	0.5%	*-15.9%*	*-10.5%*	1.2%
6.	0.1%	3.7%	*9.0%*	*17.2%*
Trend-Following:				
1.	5.5%	-5.6%	*17.8%*	2.0%
2.	-8.9%	*28.0%*	*32.5%*	*21.2%*
Unclassified:				
1.	*4.0%*	*10.7%*	0.9%	2.1%
2.	0.3%	0.4%	0.6%	0.5%
3.	-6.1%	*56.8%*	9.2%	-5.8%
US Equity Mutual Funds (Source: ICI):				
	-1.0%	*-20.8%*	-6.0%	4.9%

Notes:
Returns exceeding one standard deviation from their means are in italics.
SPX: S&P 500 index.
US 10Y: The US 10 Year Treasury futures contract.
DEM: The US Dollar/Deutsche Mark exchange rate.
JPY: The US Dollar/Japanese Yen exchange rate.

Table 4
1992 ERM Crisis

	Sep	Oct	Nov	Dec
Market:				
GBP	*-10.1%*	*-12.3%*	-3.2%	-0.0%
ITL	*-15.8%*	*-5.6%*	*-6.1%*	*-5.6%*
ESP	*-8.3%*	*-10.6%*	*-4.9%*	-0.2%
SEK	-3.1%	*-9.4%*	*-17.7%*	*-3.3%*
DEM	-0.6%	*-8.3%*	*-3.2%*	-1.3%
FTSE	*10.4%*	1.1%	4.5%	2.4%
FTITL	-6.6%	*23.2%*	-0.8%	3.9%
FTESP	-5.1%	2.6%	*9.9%*	-0.1%
FTSEK	-6.7%	3.6%	*25.9%*	2.3%
Global/Macro:				
1.	5.2%	2.5%	-0.3%	0.3%
2.	*4.8%*	*9.9%*	*4.7%*	*3.2%*
3.	2.5%	3.4%	3.4%	4.8%
4.	*12.1%*	4.8%	-1.4%	-0.8%
5.	1.9%	3.9%	2.5%	4.9%
6.	*25.5%*	*9.9%*	2.2%	5.3%
7.	*14.1%*	*9.4%*	2.5%	6.2%
8.	*22.3%*	*9.1%*	4.7%	4.4%
9.	*15.5%*	*13.1%*	-3.2%	0.9%
10.	2.7%	-0.3%	2.9%	4.0%
11.	1.1%	-0.6%	-0.3%	4.1%
12.	4.0%	4.8%	-0.2%	4.6%
Trend-Following:				
1.	*-6.8%*	5.2%	2.3%	-1.9%
2.	-8.2%	-5.4%	-4.3%	-8.1%
3.	-5.2%	-4.5%	-0.8%	-2.6%
Emerging Market:				
1.	1.5%	-0.5%	-2.7%	3.2%
Unclassified:				
1.	-0.3%	-0.7%	0.8%	2.4%
2.	1.3%	0.6%	0.9%	2.6%
3.	-2.0%	2.4%	0.6%	5.9%
4.	0.3%	0.4%	1.1%	1.7%
5.	1.0%	1.0%	2.2%	1.2%
6.	*14.6%*	*11.0%*	-3.8%	-0.1%

Notes:
Returns exceeding one standard deviation from their means are in italics.
GBP: The US Dollar/British Pound exchange rate.
ITL: The US Dollar/Italian Lire exchange rate.
ESP: The US Dollar/Spanish Peseta exchange rate.
SEK: The US Dollar/Swedish Krona exchange rate.
FTSE: The FTSE-100 index.
FTITL: The Financial Times Italian stock market index.
FTESP: The Financial Times Spanish stock market index.
FTSEK: The Financial Times Swedish stock market index.

Table 5
1993 Bond Market Rally

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Market:								
US10Y	-0.3%	*2.6%*	-0.0%	*2.2%*	0.5%	-0.2%	-1.5%	0.3%
JGB	0.2%	1.2%	*2.2%*	1.2%	1.5%	1.1%	*1.9%*	1.6%
Gilts	-0.2%	*4.4%*	2.1%	*4.6%*	-0.7%	0.8%	2.3%	*3.3%*
Bunds	-0.5%	1.5%	0.4%	*2.0%*	0.6%	*1.3%*	-0.3%	1.2%
Fren Bd	-0.1%	*2.7%*	1.1%	*2.2%*	0.1%	0.2%	0.1%	*2.4%*
DEM	-0.2%	*7.2%*	2.5%	*-3.7%*	-2.7%	2.5%	2.4%	1.3%
JPY	*-3.7%*	-0.6%	-1.5%	-0.4%	1.3%	2.2%	0.6%	2.6%
IFC	0.7%	2.1%	0.9%	4.6%	3.5%	*7.9%*	*6.9%*	*19.5%*
Global/Macro:								
1.	*1.9%*	*3.1%*	*3.3%*	*2.5%*	-0.3%	*2.1%*	0.3%	*5.1%*
2.	*6.8%*	*9.1%*	*10.9%*	3.0%	-1.5%	*6.5%*	3.2%	*8.6%*
3.	1.9%	2.5%	2.7%	*6.0%*	2.3%	*4.8%*	-1.4%	*5.4%*
4.	1.6%	*6.8%*	*6.1%*	*6.2%*	-0.5%	*7.5%*	-1.9%	*11.2%*
5.	*8.6%*	*5.9%*	0.2%	*8.8%*	0.5%	*6.1%*	-1.0%	*8.6%*
6.	3.0%	*10.3%*	*5.9%*	1.8%	-0.5%	3.7%	-2.5%	*11.3%*
7.	4.3%	*13.8%*	6.1%	6.1%	-0.5%	*8.2%*	0.5%	*12.5%*
8.	3.1%	*10.6%*	5.1%	2.8%	0.5%	1.0%	-2.4%	*8.2%*
9.	3.1%	*18.5%*	*11.4%*	*-9.4%*	-2.5%	3.7%	-6.4%	*10.4%*
10.	*4.3%*	*4.1%*	1.7%	*4.7%*	*2.5%*	0.6%	*-3.1%*	*3.8%*
11.	0.5%	3.9%	3.2%	*13.8%*	0.1%	6.4%	*8.4%*	*9.6%*
12.	-0.2%	*6.0%*	*6.8%*	*7.0%*	-2.2%	3.5%	-1.6%	*5.2%*
13.	0.1%	*8.1%*	2.3%	2.5%	1.7%	4.2%	1.0%	4.1%
Trend-Following:								
1.	0.4%	1.0%	*9.5%*	5.9%	-2.6%	-0.1%	1.0%	5.8%
2.	3.8%	0.6%	7.4%	8.4%	-5.0%	1.6%	1.0%	6.1%
3.	3.4%	0.1%	*9.7%*	-0.8%	0.2%	-1.1%	-0.3%	2.9%
Emerging Market:								
1	2.6%	*5.6%*	2.2%	*5.7%*	4.5%	*5.7%*	*7.8%*	*12.7%*
Unclassified:								
1.	*3.3%*	*4.0%*	*2.0%*	*2.1%*	*2.5%*	*2.3%*	1.1%	*2.2%*
2.	0.9%	1.3%	1.4%	-1.0%	0.0%	-1.0%	0.6%	*3.4%*
3.	*1.3%*	*2.8%*	*1.5%*	*1.6%*	0.9%	0.9%	*1.6%*	*2.5%*
4.	1.8%	0.5%	0.6%	2.0%	1.1%	-0.4%	*4.7%*	0.2%
5.	*1.5%*	*3.4%*	*1.3%*	*1.3%*	*2.0%*	0.8%	0.8%	*1.9%*
6.	*3.9%*	*5.8%*	0.3%	-2.4%	*5.0%*	*4.6%*	1.0%	*7.7%*
7.	1.8%	0.5%	1.6%	2.0%	0.3%	1.3%	2.2%	*3.1%*
8.	*-3.5%*	0.7%	1.3%	0.1%	0.8%	2.1%	0.7%	*3.8%*

Notes:
Returns exceeding one standard deviation from their means are in italics.
JGB: Japanese government bond futures.
Gilts: UK government bond futures.
Bunds: German government bond futures.
Fren Bd: French government bond futures.
IFC: International Financial Corporation’s Emerging Market Index.

Table 6
1994 Bond Market Turbulence

	Feb	Mar	Apr	May	Jun
Market:					
US 10Y	*-2.8%*	*-3.5%*	-0.9%	-0.3%	-0.8%
Gilts	*-4.8%*	*-4.0%*	*-1.8%*	*-5.1%*	0.2%
Bunds	*-3.6%*	0.1%	-1.7%	*-2.4%*	-0.4%
Fren Bd	*-2.8%*	*-2.1%*	*-2.0%*	*-3.0%*	*-1.3%*
S&P	*-2.8%*	*-4.3%*	1.4%	1.5%	-2.4%
IFC	-3.4%	*-8.3%*	0.6%	2.6%	-1.8%
Global/Macro:					
1.	-3.8%	-1.0%	1.3%	-0.8%	1.5%
2.	*-6.6%*	*-3.1%*	*-2.9%*	*3.3%*	*-3.3%*
3.	-1.8%	*-4.3%*	0.8%	0.7%	*-3.8%*
4.	*-7.5%*	*-3.9%*	*-2.0%*	2.4%	-0.5%
5.	*-12.5%*	*-10.0%*	-2.0%	1.9%	*-3.3%*
6.	-3.5%	*-4.6%*	-0.2%	6.0%	3.6%
7.	*-5.6%*	*-8.6%*	*-5.4%*	0.8%	-3.6%
8.	*-4.5%*	-3.1%	-0.4%	4.3%	2.1%
9.	-5.3%	-4.9%	*11.4%*	3.4%	*-9.2%*
10.	1.1%	*-1.1%*	2.2%	2.1%	3.0%
11.	-2.1%	-1.5%	0.5%	0.0%	0.9%
12.	-1.9%	2.4%	-2.1%	5.2%	4.4%
13.	*-18.4%*	*-10.8%*	-2.8%	-2.0%	-2.8%
14.	-7.2%	0.2%	*-14.5%*	*-16.7%*	*-11.9%*
15.	*-4.5%*	-1.2%	-1.7%	1.1%	1.4%
Trend-Following:					
1.	-4.9%	0.1%	-0.6%	9.1%	7.0%
2.	-5.3%	*14.9%*	7.0%	5.2%	3.3%
3.	-0.5%	7.2%	0.9%	1.3%	4.5%
Emerging Market:					
1.	-2.1%	*-6.7%*	*-4.9%*	3.8%	-3.6%
Unclassified:					
1.	0.6%	2.3%	0.2%	0.3%	*-0.1%*
2.	0.3%	2.3%	-0.3%	-0.5%	1.9%
3.	1.0%	*0.2%*	0.4%	0.6%	2.0%
4.	2.4%	-0.1%	*-2.6%*	-1.3%	-2.3%
5.	0.9%	0.9%	0.9%	0.5%	1.0%
6.	*-1.3%*	-0.6%	0.8%	*5.3%*	*-2.9%*
7.	*-3.9%*	*-8.7%*	1.6%	*6.3%*	*-4.8%*
8.	4.3%	-1.2%	4.4%	4.3%	*12.0%*
9.	1.3%	1.8%	2.4%	2.0%	*7.3%*
10.	-3.1%	-0.1%	-1.3%	-2.0%	6.0%

Notes:
Returns exceeding one standard deviation from their means are in italics.
S&P: The Standard & Poors 500 index.

Table 7
1994-5 Mexican Crisis

	1994 Dec	1995 Jan
Market:		
MXP	*-41.5%*	*-23.5%*
BARMEX	-2.2%	*-15.7%*
Mex Brady	*-14.2%*	-2.8%
All Brady	*-4.6%*	*-5.0%*
Global/Macro:		
1.	-0.0%	-0.1%
2.	1.1%	1.6%
3.	1.8%	0.1%
4.	-1.0%	-0.9%
5.	-1.9%	0.9%
6.	2.2%	*-6.5%*
7.	-2.8%	*-8.1%*
8.	0.5%	-1.4%
9.	-2.9%	*-11.1%*
10.	-2.8%	-1.1%
11.	1.9%	1.3%
12.	1.9%	-2.6%
13.	-2.0%	-1.5%
Trend-Following:		
1.	2.9%	-3.2%
2.	-4.2%	0.5%
3.	-3.5%	-3.8%
Emerging Market:		
1.	*-8.1%*	*-10.3%*
Unclassified:		
1.	-0.3%	0.0%
2.	*-5.8%*	*-3.5%*
3.	0.8%	0.8%
4.	1.2%	1.8%
5.	0.5%	0.9%
6.	-0.5%	2.6%
7.	-1.3%	-1.5%
8.	0.2%	3.6%
9.	0.5%	1.8%
10.	-1.0%	2.6%
HFRI Hedge Fund Indices:		
Emer Mkt	*-3.2%*	*-5.5%*
Lat Amer	*-3.6%*	*-6.3%*
US Latin American Mutual Funds (Source: Lipper Inc)		
	-17.4%	*-14.0%*

Notes:
Returns exceeding one standard deviation from their means are in italics.

Table 8
1997 Asian Currency Crisis

	Jul	Aug	Sep	Oct	Nov	Dec
Market:						
THB	-23.0%	-7.3%	-6.2%	-13.0%	1.9%	-19.6%
MYR	-4.5%	-10.6%	-11.4%	-5.0%	-3.0%	-10.2%
IDR	-7.5%	-12.8%	-10.8%	-10.2%	-1.2%	-50.7%
KRW	-0.2%	-1.4%	-1.4%	-5.5%	-21.4%	-44.5%
S&P	8.0%	-5.6%	5.4%	-3.3%	4.6%	1.7%
IFC	1.6%	-10.8%	0.5%	-15.2%	-5.7%	0.4%
MSWorld Ex US	1.9%	-7.3%	5.6%	-7.5%	-1.1%	1.0%
BARASI$	-0.6%	-18.1%	-8.6%	-20.5%	-11.7%	-7.2%
BARTHAL	31.0%	-29.0%	13.5%	-22.6%	-14.7%	-10.2%
BARMALL	-4.9%	-19.8%	0.7%	-17.0%	-21.6%	18.4%
BARINDL	-2.8%	-32.7%	17.0%	-5.5%	-21.3%	-1.2%
BARKORL	-3.3%	-2.9%	-9.1%	-27.9%	-5.8%	4.9%
Global/Macro:						
1.	2.4%	-0.1%	1.7%	-0.3%	0.3%	1.7%
2.	11.4%	2.8%	9.4%	10.4%	5.1%	7.2%
3.	6.9%	0.1%	4.9%	0.8%	0.5%	1.5%
4.	10.1%	-1.9%	1.5%	3.8%	1.8%	5.9%
5.	6.5%	-2.0%	3.7%	-5.8%	-0.4%	5.0%
6.	11.4%	-7.4%	4.6%	-10.6%	2.5%	3.9%
7.	10.3%	-6.7%	2.0%	-11.8%	0.9%	-4.4%
8.	7.3%	-3.4%	3.0%	-7.4%	4.2%	2.0%
9.	9.2%	-5.9%	0.4%	-15.1%	5.8%	7.4%
10.	13.6%	-8.2%	-3.9%	-15.7%	5.1%	12.0%
11.	21.7%	12.1%	0.3%	1.5%	1.5%	10.5%
12.	9.6%	-0.8%	8.5%	-1.2%	1.2%	7.1%
Trend-Following:						
1.	6.2%	-8.0%	5.0%	-2.3%	1.7%	4.8%
2.	6.8%	-10.2%	6.5%	-.6%	9.8%	1.5%
3.	15.8%	-3.7%	2.2%	2.0%	2.5%	2.9%
Emerging Market:						
1.	3.3%	-7.6%	3.3%	-13.6%	-2.3%	2.4%
Unclassified:						
1.	1.5%	1.1%	1.3%	1.0%	1.2%	1.0%
2.	8.7%	-2.8%	1.8%	-1.0%	1.5%	7.5%
3.	0.5%	-0.1%	1.9%	1.1%	1.2%	0.0%
4.	-1.7%	2.8%	0.3%	-0.8%	-8.9%	-2.4%
5.	1.2%	0.9%	0.3%	0.3%	0.3%	-0.2%
6.	1.0%	0.7%	3.5%	0.3%	-0.8%	2.4%
7.	2.2%	-1.3%	4.1%	0.9%	2.3%	3.6%
8.	0.4%	4.1%	1.5%	0.7%	3.4%	1.4%
9.	2.8%	1.9%	na	na	na	na
10.	4.3%	2.4%	-0.8%	-3.2%	3.7%	2.4%
11.	16.5%	7.4%	15.6%	6.0%	1.3%	na
HFRI Hedge Fund Indices:						
Emg Mkt	4.6%	-2.1%	0.6%	-8.0%	-3.9%	1.3%
Asian	2.6%	-2.8%	-4.4%	-7.0%	-2.7%	-1.9%
US Mutual Funds						
Emg Mkt	2.9%	-11.0%	3.6%	-16.7%	-4.6%	0.9%

Pacific Ex Japan						
2.3%	*-15.3%*	-1.3%	*-25.2%*	-3.5%	-2.6%	

Note: Returns exceeding one standard deviation from their means are in italics.

Table 9
BIS Reporting Banks' Assets and Liabilities
($ billion)

	96-I	96-II	96-III	96-IV	97-I	97-II	97-III	97-IV	98-I	98-II
Thailand:										
Asset	94.5	98.0	98.9	99.3	98.3	99.5	87.8	79.7	70.8	65.0
Liab	11.7	12.0	9.0	9.0	10.0	8.7	8.7	9.8	10.9	12.3
Malaysia:										
Asset	19.1	23.6	26.2	25.9	31.0	32.9	33.0	29.1	26.2	24.6
Liab	15.1	17.5	17.0	17.5	18.4	17.1	13.8	13.1	14.3	15.2
Indonesia:										
Asset	50.8	52.1	54.8	57.9	59.2	61.9	65.0	62.8	57.6	53.7
Liab	11.7	11.1	11.0	13.6	12.5	11.1	9.6	11.6	10.2	12.1
South Korea:										
Asset	91.2	98.5	101.8	109.1	112.9	118.0	115.7	103.9	87.3	83.0
Liab	29.4	31.1	28.4	29.1	32.6	35.7	34.3	41.3	45.9	43.9
Total:										
Asset	279.1	293.8	303.6	315.0	326.0	337.5	326.4	297.9	263.8	248.6
Liab	107.8	109.7	102.8	106.7	110.2	108.4	103.5	112.2	119.8	119.6

Appendix
Dissolved Large Hedge Funds

Fund	Style	Year of Dissolution	Assets Under Management Prior to Dissolution
1.	Global/Macro	1994	$ 1,200m
2.	Global/Macro	1995	$ 2,700m
3.	Global/Macro	1997	$ 3,000m

Figure 1: Quantum NAV Vs the Pound/DM & the Lira/DM (8/31/92 = 100)

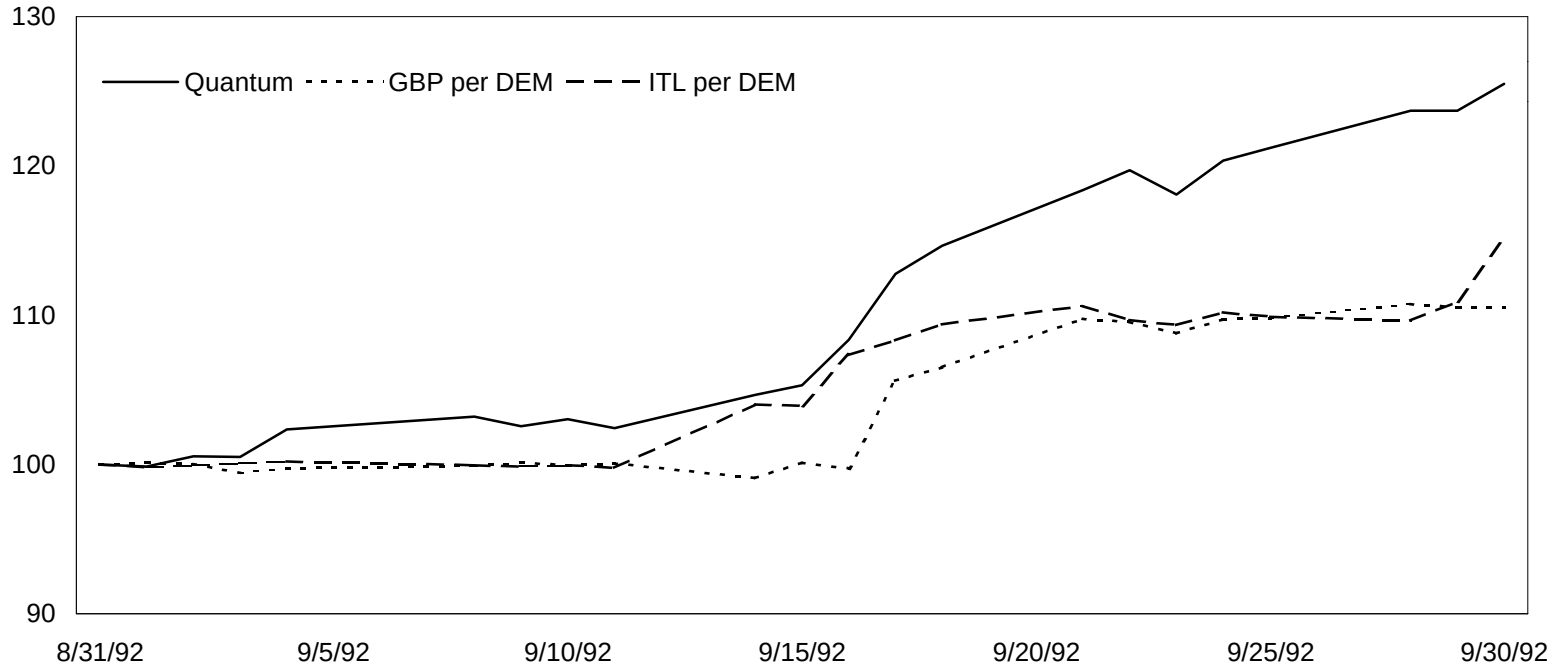

Figure 2: Quantum NAV and Mexican Peso (9/30/94 = 100)

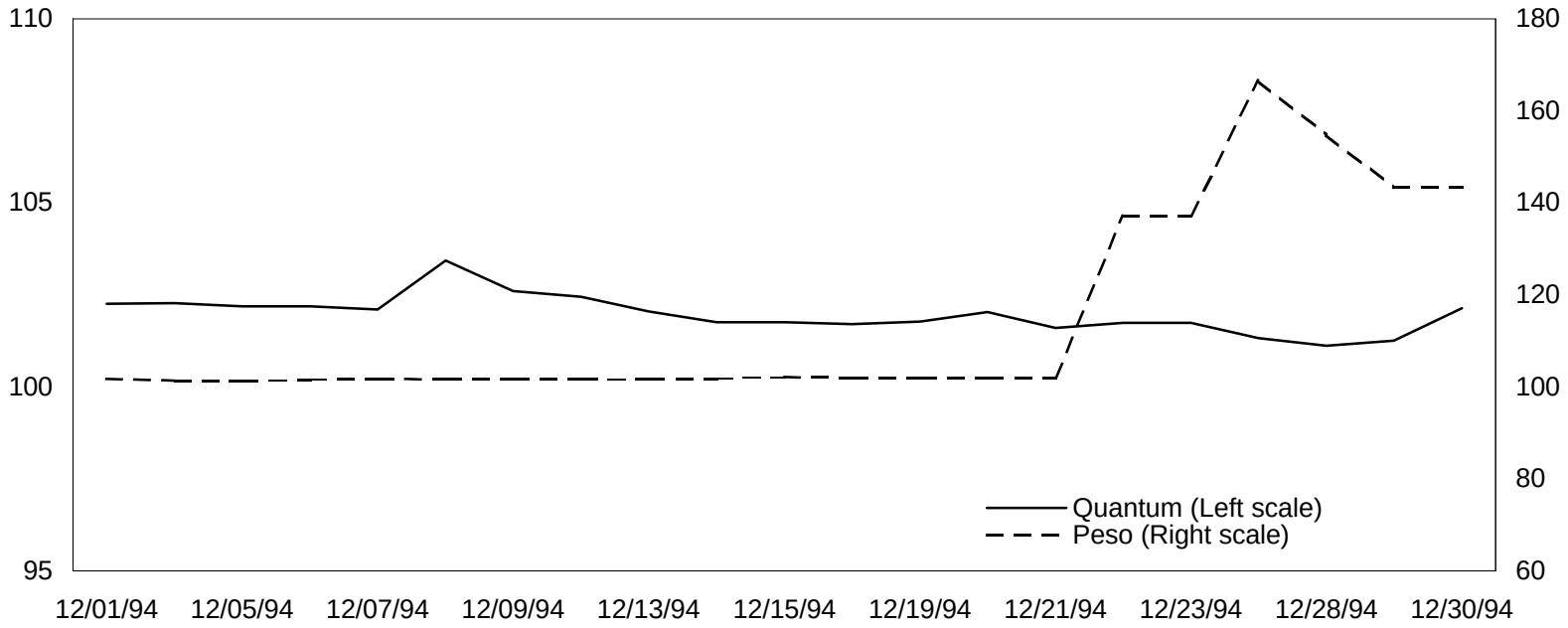

Figure 3: Mutual Fund NAV and Mexican Peso: December 94

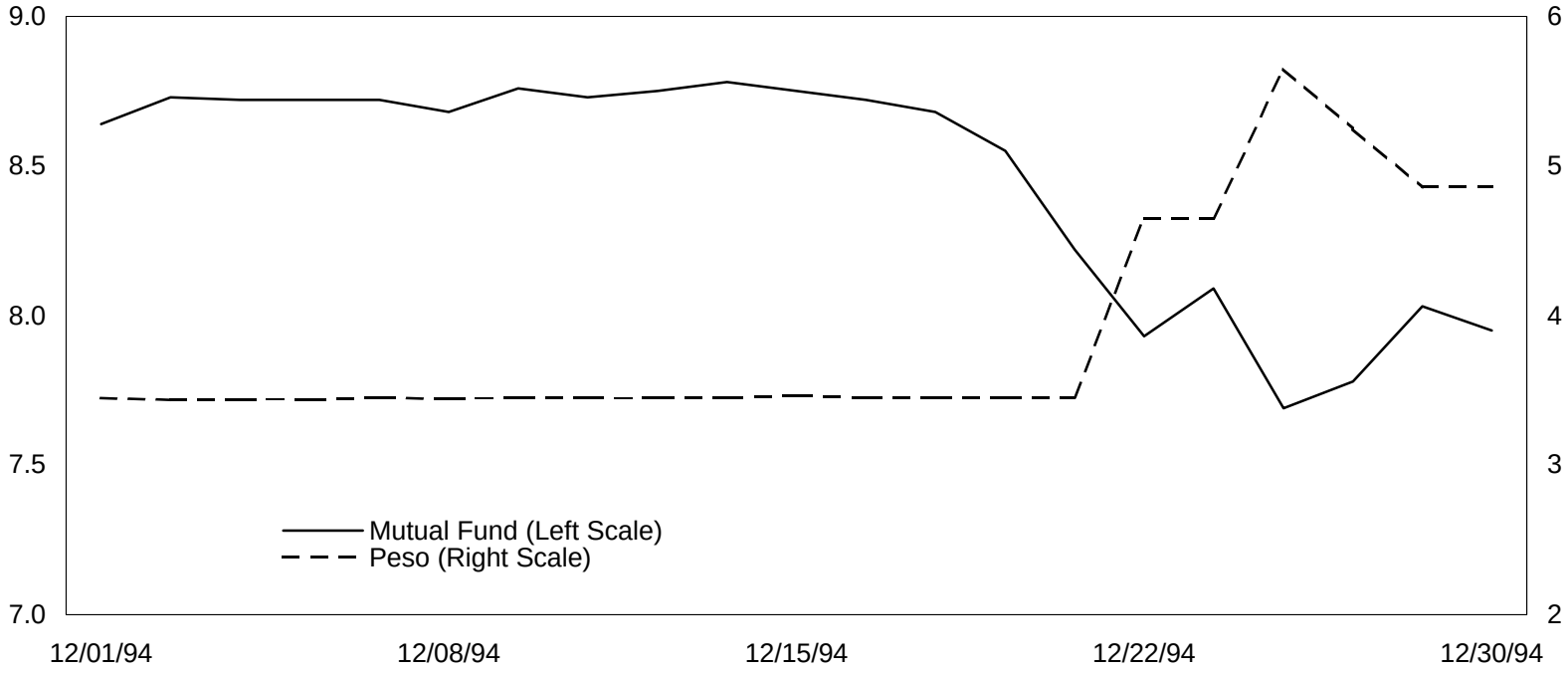

Figure 4: Quantum vs S&P & Thai Baht (97/5/30 = 100)

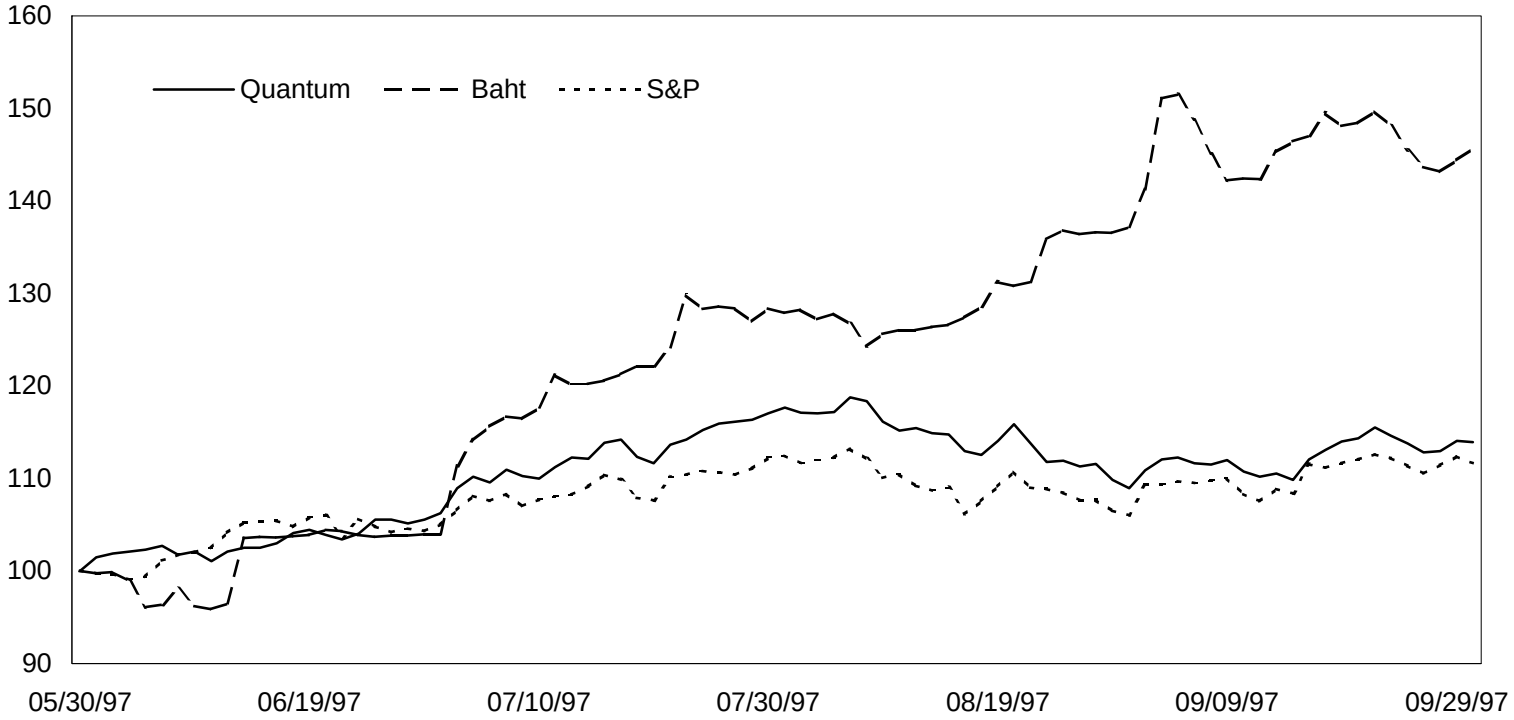

Figure 5: Quantum vs S&P (96/12/31 = 100)

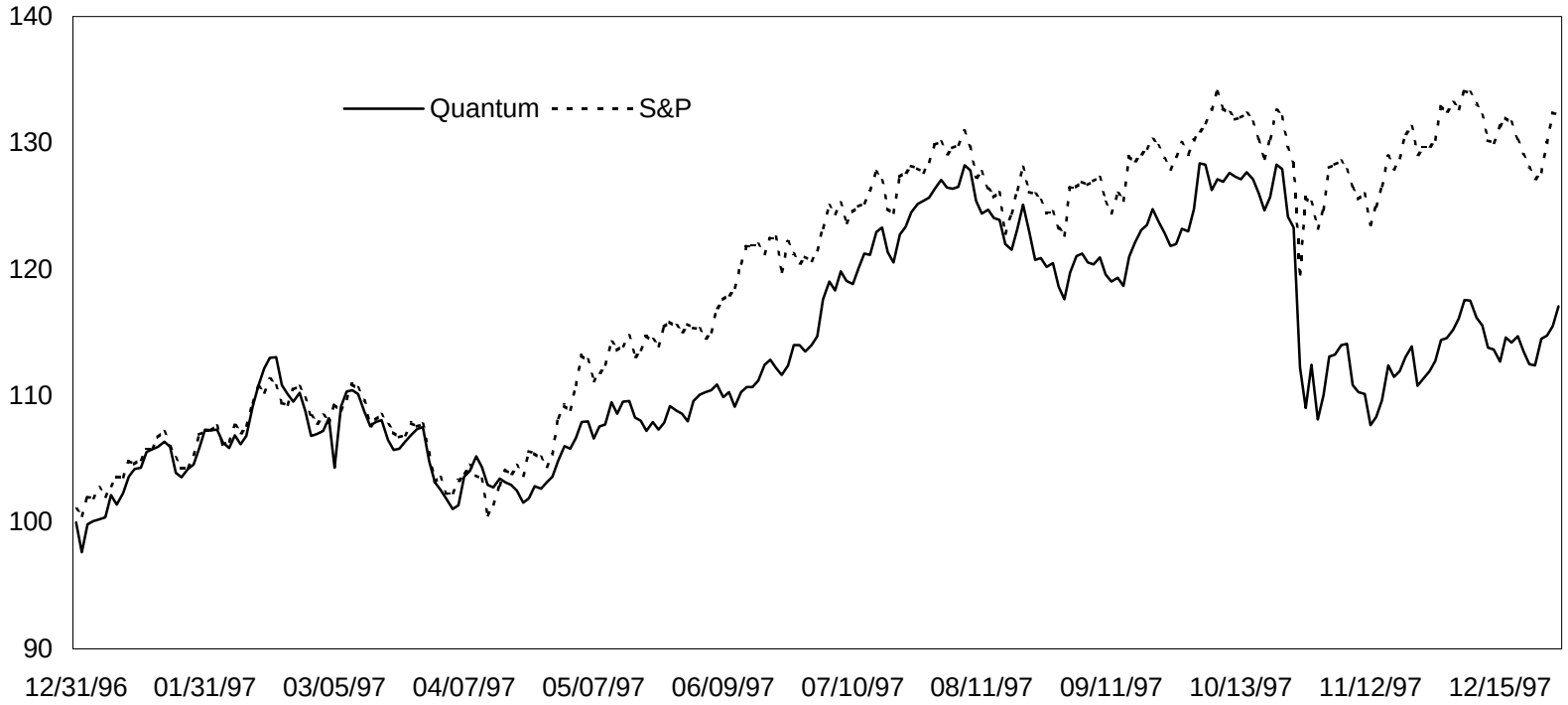

Figure 6: Asian Currency Positions of 12 Large Hedge Funds

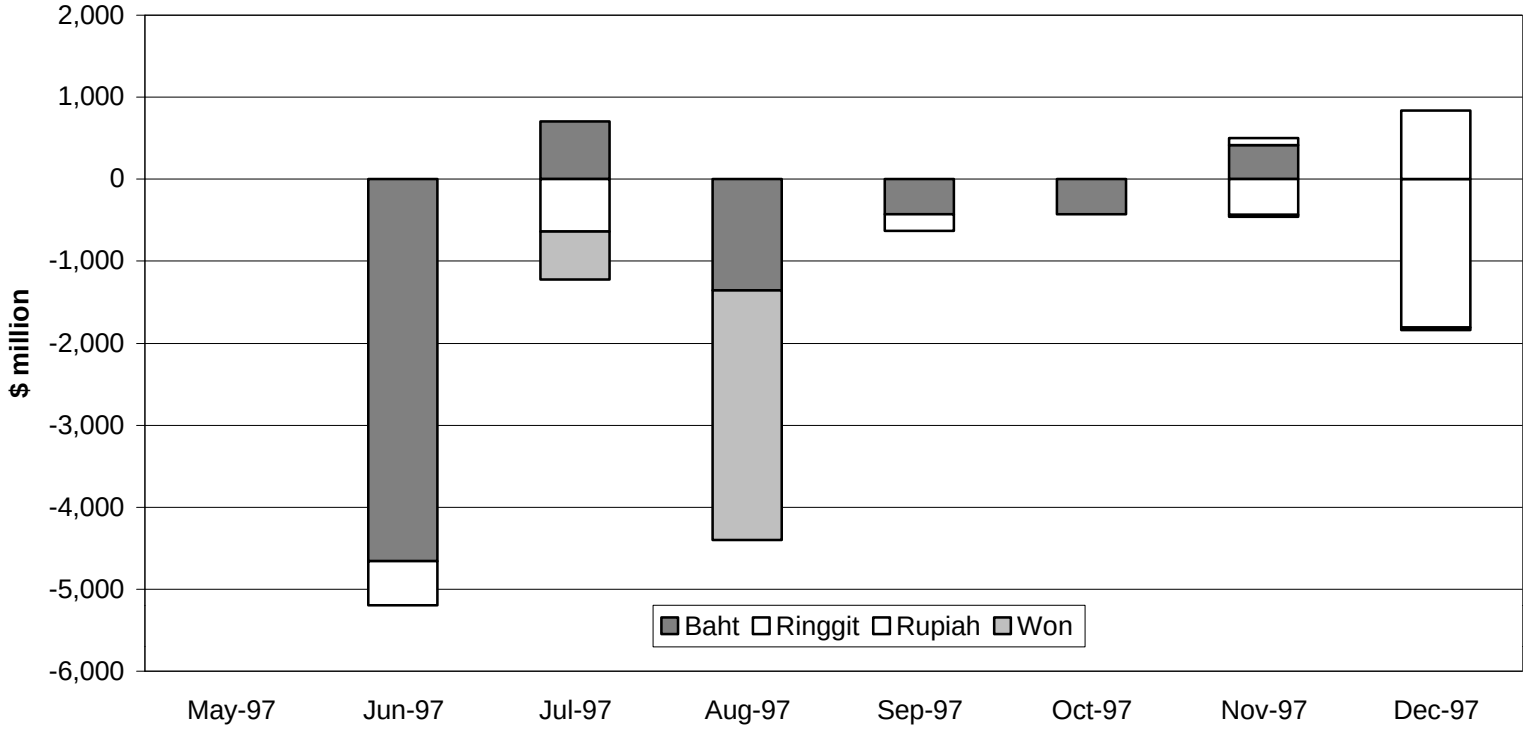

Figure 7: Net Private Capital Flows in 5 Affected Asian Economies