

Growing Exposure of Institutional Investors to Alternative Investments¹

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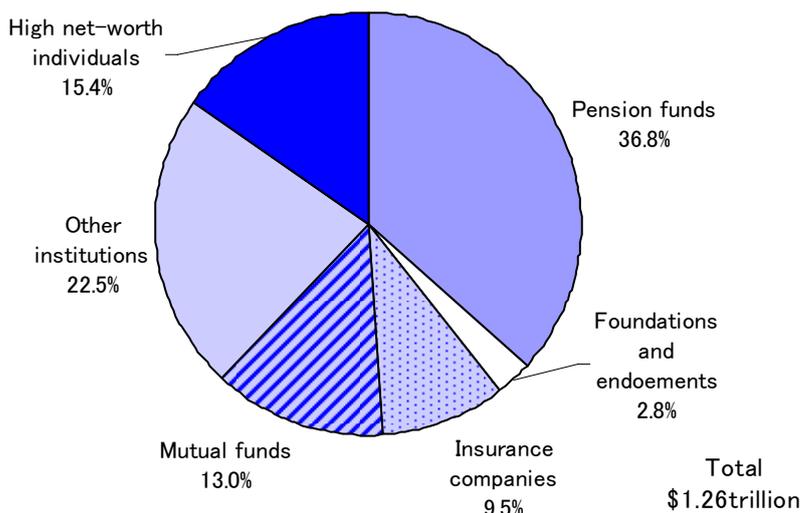
1. What are the alternative investments?

Alternative investments generally mean investments in non-traditional classes of assets that include private equity, hedge funds, real estate, and commodities. In this section, we will shed some light on the growing demand for alternative investments, despite the fact that reliable data are limited, and compare hedge funds with other alternative assets.

1.1 Increase in alternative investments

In major economic areas, there have been gradual increases in institutional investors' allocations to alternative investments. Alternative investments are considerably accounted for by various types of institutional investors (Chart 1.1). For example, the California Public Employees' Retirement System (CalPERS) started investing in alternative assets in the early 1990s based on the Alternative Investment Management Program. As of the end of March 2006, the CalPERS invested 5.1% of its total asset (\$211.1 billion) into real estate and other 5.0% into hedge funds and private equity (Chart 1.2).

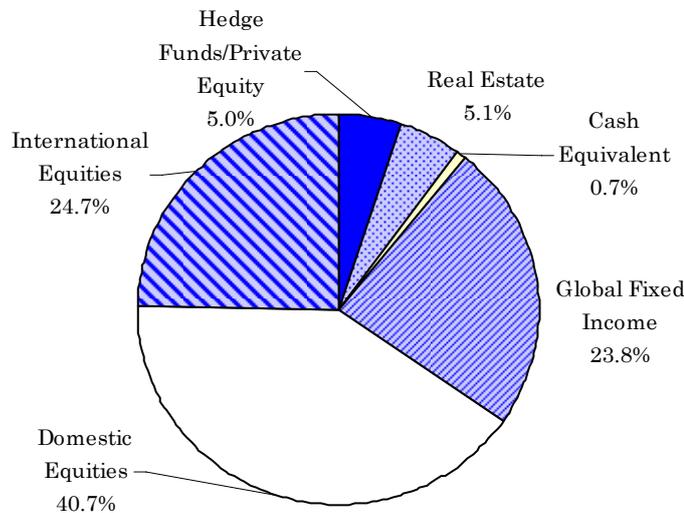
(Chart 1.1) Global Alternative Investments by Type of Investors (2005)



Source: Watson Wyatt

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(Chart 1.2) CalPERS Asset Allocation as of end of March 2006



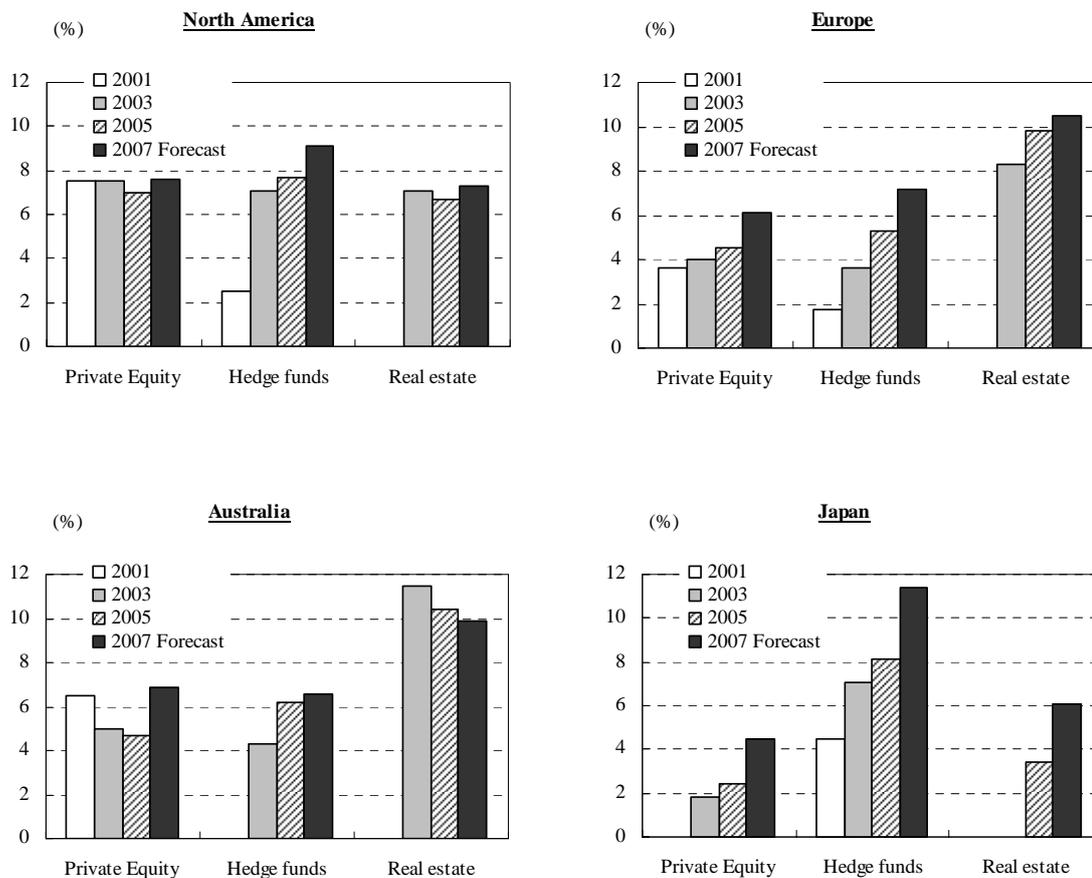
Source: CalPERS. website:
<http://www.calpers.ca.gov/>

One factor behind the increase in alternative investments has probably been the search for yield that has taken place during the last couple of years. An environment characterized with global interest rates at historical lows and with abundant liquidity. In this environment, many investors have found it hard to achieve their target rate of return. Hence, investors increased their allocation to alternative investments in order to enhance their expected return and to further diversify their portfolios.

Although conditions in global financial markets may change in the future, the recent trend of growing allocations to alternative assets is expected to continue. These non-traditional assets provide different risk-return profiles from traditional assets such as equities and bonds. Investors can improve their risk-return trade off by introducing alternative investments in the portfolios, which will be discussed in more detail in the next section.

Among institutional investors globally, the opportunity set of asset-classes to invest in differ. In particular, for their allocation to private equity and real estate, for example, in some countries real estate is considered as a traditional asset while in other countries it might be viewed as an alternative asset. When it concerns institutional investors' allocation and attitude towards hedge funds, there seems to be a common trend of increased interest and possibly larger allocation in hedge funds in the future (Chart 1.3).

(Chart 1.3) Current and Forecast Mean Strategic Allocation of Alternative Investments



Note: The coverage of the survey is public and corporate pension funds / endowments / foundations generally with assets \$1 billion or more in Japan (64), North America (176), Europe (65), Australia (22).

Source: The 2005-2006 Russell Survey on Alternative Investing.

In the following, we will mention each class of alternative assets.

Private Equity

Private equity investments normally mean investments in unlisted companies in the form of equity and is channelled mainly via private equity investment companies. Private equity investment companies have grown into significant players in recent years. Private equity investment companies that invest in unlisted companies are a phenomenon that originated in the United States. A private equity market has existed there since the 1950s, and private equity has constituted an investment alternative for institutional investors for the past 30 years. The US market is also the biggest and most developed. In terms of its

share of the country's GDP, the private equity market in the United States is twice as large as the most developed market in Europe, that in the United Kingdom.

Equity capital investment in unlisted companies is channelled mainly via private equity investment companies that, through private equity funds, own unlisted companies (known as portfolio companies). Private equity firms' investments can essentially be divided into investments in early phases of a company's life cycle – *venture capital* – and investments in later phases of the life cycle – *buyout funds*.

Venture capital investments began in the United States in the 1960s and expanded from around 1980. In somewhat simplified terms, early investment can in turn be subdivided into three different stages. Seed financing is financing provided to entrepreneurs to enable development of concepts or products that may lead to the start-up of a business. Start-up financing is financing to set up companies and develop products. Finally, expansion financing is financing provided for the growth and expansion of an existing company. Generally speaking, investment at any of these early stages is a high-risk undertaking, since it involves the financing of newly started companies with weak cash flows and few tangible assets.

Meanwhile, investments by buyout funds became active in developed European countries and the United States in the 1980s. Buyout funds, however, usually involve somewhat lower risk, since they entail investment in mature companies with more stable cash flows and a larger stock of tangible assets. Buyouts chiefly comprise the acquisition of unlisted companies or the takeover of listed corporations. The private equity investment company partly finances the acquisition through loans, partly from banks. This is known as a leveraged buyout (LBO).

Private equity investments provide investors with opportunities for high returns and high risks through investments in the companies whose growth potentials are expected to be large. Common to all private equity investment companies, regardless of their investment philosophy, is that they invest for a limited period of time. Private equity funds have different investment horizons depending on the portfolio company's investment phase. Seed financing usually involves the longest investment horizon, 10 to 12 years, while buyouts often have a horizon of 5 to 8 years. Irrespective of the portfolio company's investment phase, the private equity investment company in most cases is an active, controlling owner that collaborates closely with the portfolio company's management team with a view to improving the company's operating profit and cash flow, thus increasing its value. At the end of the period, the company is divested (the private equity fund 'exits' the investment). There are a number of exit options open to a private equity investment company: to sell to an industrial investor, that is to say, another

industrial firm that wants to acquire the portfolio company for synergy reasons; to sell the company by initial public offering (IPO); or to sell it to another private equity investment company.

Real Estate

Real estate investment has rarely accounted for a significant share in institutional investors' portfolios, although it has been recognized by investors as a hedge against inflation. This is mainly because of the heterogeneity and low liquidity of real estate. From a historical perspective, the decline in property prices in the United States during 1989 and 1990 made investors aware of risks involved in real estate investments.

The development of investment vehicles for real estate including real estate investment trusts (REITs) and securitization have contributed to the recent increase in real estate exposure by institutional investors. These investment vehicles help disperse risks involved in real estate investment and ease the liquidity constraint.

Commodities

Institutional investors have recently developed an interest in commodities investment. They come to realize that commodities can offer the diversification benefits from low correlations with traditional assets and a hedge against inflation.

In addition to orthodox instruments for the commodities investment including commodities futures and stocks of utilities companies, commodity-index linked notes and commodity exchange traded funds have been introduced as new products for having exposures to commodities. These developments have helped increase the commodities investment in the last few years.

Hedge funds

The precursor to what are today called hedge funds was started up in the United States in 1949 by Alfred Winslow Jones. Jones bought shares he considered to be undervalued and sold short shares he considered to be overvalued.² Jones thought that the price of undervalued shares should rise relatively more on a rising market and that the price of overvalued shares would fall relatively more on a falling market, and the fund would thereby earn money on both a falling and a rising market. As the net position in shares as a whole was small, the portfolio was insured, "hedged" against overall (systemic)

² Edwards, Franklin R (1999) *Hedge Funds and the Collapse of Long-Term Capital Management*, The Journal of Economic Perspectives, Vol 13 No 2.

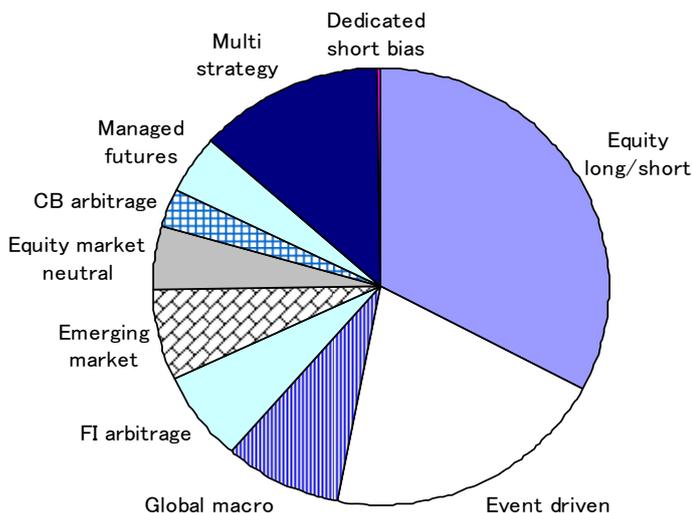
market risk.

Hedge funds are generally defined as “any investment vehicle that is privately organized, administered by professional investment managers, and not widely available to the public³.” But, the term may encompass investment vehicles that invest in various types of financial assets more broadly. The basic idea behind hedge funds was thus to take positions on the basis of the relative prices of the securities, and at the same time eliminating or reducing market risk. Today, however, hedge funds are a very heterogeneous group of funds, which in some cases have some common characteristics. Moreover, the concept hedge fund is misleading, as many of these funds do not hedge, but take large net positions.

Asset inflows into hedge funds were subdued after the collapse of the Long-Term Capital Management in 1998, but increased significantly in the last several years on the back of investors’ demand for return enhancement and portfolio diversification.

Hedge funds are usually classified by the investment strategies they employ. For example, funds that take long positions on undervalued stocks and short positions on overvalued stocks are called “equity long/short” fund. According to a recent survey, equity long/short and event driven are the most popular among the various strategies (Chart 1.4).

(Chart 1.4) Strategy Types of Hedge Funds (06/1Q)



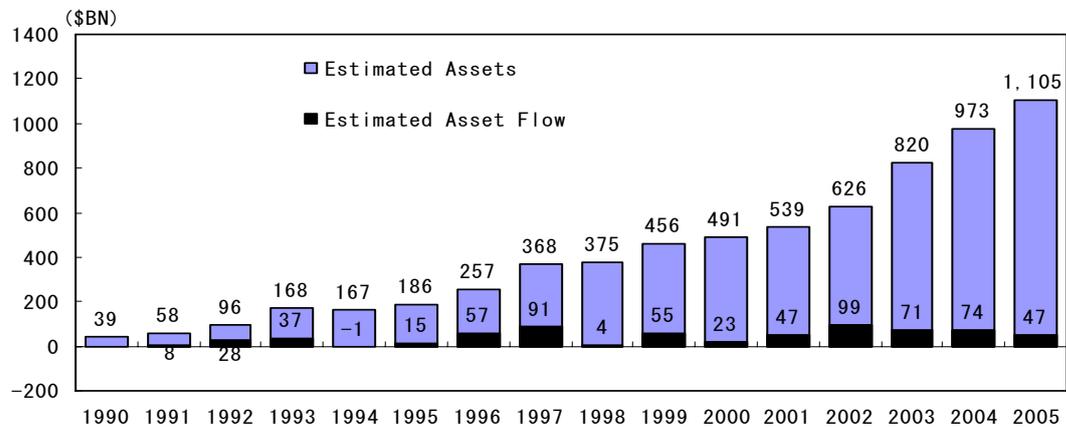
Source: Tremont Capital Management.

³ This definition does not hold for all countries.

Among possible assets for alternative investments, hedge funds are appealing for a wide range of investors. Hedge funds' investment performance depends on the managers' ability and investment strategies. Investors can choose (the combination of) managers and strategies that have risk-return profiles they want. Moreover, under the recent low inflation and interest rate environment, hedge funds are expected to produce relatively stable and moderate returns.

Reflecting institutional investors' growing interest, the estimated size of hedge funds' assets has expanded by 6 times for the last ten years and reached USD1.1 trillion (Chart 1.5).

(Chart 1.5) Estimated Assets and Assets Flow

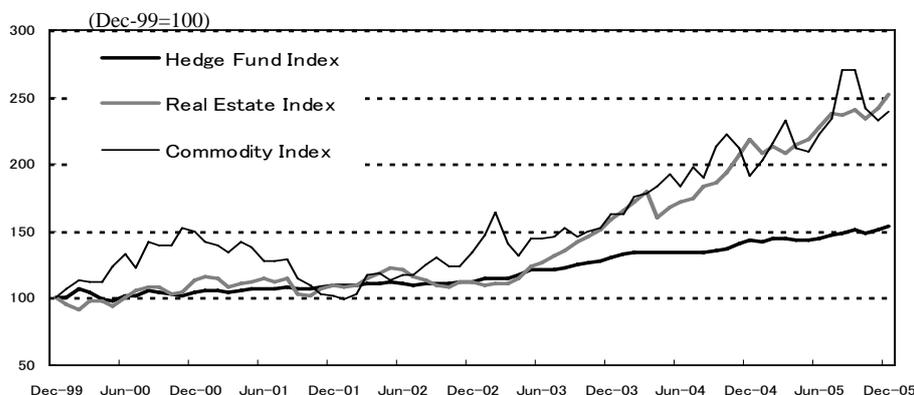


Source: Hedge fund Research.

1.2 Comparison of the risk-return profile among alternative investments

Comparing the performance among a variety of alternative investments (hedge funds, real estate and commodity) represented by certain indices, real estate and commodities have performed well after 2003 against a backdrop of the global economic growth (Chart 1.6). The prices of real estate and commodities tend to show relatively higher correlations with the economic cycle, while the index of hedge funds shows a relatively stable pattern.

(Chart 1.6) Performance of Alternative Investments



Source: Credit Suisse/ Tremont, FTSE EPRA/NAREIT, Goldman Sachs.

Standard deviations of these indices confirm the above statement (Table 1.7). Among them, the hedge funds index recorded the smallest standard deviation between 2000 and 2005. The real estate and commodity indices recorded much better annualized returns while their standard deviations were much larger than that of hedge funds index.

(Table 1.7) Risk-return Characteristics of Alternative Investments (2000-2005)

	Hedge Fund Index	Real Estate Index	Commodity Index
Annualized Return	7.56%	17.72%	18.51%
Standard Deviation	5.09%	13.52%	22.51%

Source: Credit Suisse/ Tremont, FTSE EPRA/NAREIT, Goldman Sachs.

The correlation between returns on alternative investments and traditional assets has been relatively low, which suggests that alternative investments provide risk reduction (diversification) benefits to investors (Table 1.8).

(Table 1.8) Correlation between Traditional Assets and Alternative Assets (2000-2005)

	World Stock Index	World Bond Index
Hedge Fund Index	0.46	0.13
Real Estate Index	0.62	0.08
Commodity Index	0.02	0.01

Source: Credit Suisse/ Tremont, FTSE EPRA/NAREIT, Goldman Sachs, Bloomberg.

However, the information available on hedge funds is incomplete and the databases that compile the hedge fund statistics may contain several systematic sources of error.⁴ Three of the largest sources of error are discussed below. *Survivorship bias*: A source of error arises as databases generally only include the funds that are currently active. The average lifetime of a hedge fund is remarkably short - after one or two years of poor returns a fund often ceases to operate. It is estimated that around 5 per cent of the existing hedge funds are closed down every year. This means that the databases make the return on hedge funds look higher than it actually is. The fact that hedge funds with a low return are often closed down is partly due to high watermarks in the bonus systems for the fund managers. A watermark rule means that a manager who has had a poor return one year must earn it back again in order to obtain a performance-based bonus in the future. In other words, if a fund has done badly several years in a row, it becomes very difficult for managers to pass their watermarks, which increases the incentive to close down the fund. *Self-selection bias*: Hedge funds provide information to databases on a voluntary basis, primarily with the aim of marketing the fund to investors. The most probable cause of a fund ceasing to report is that it has had a very low return, which would affect the statistics in the database in the same way as a survivorship bias. To some extent this can be counterbalanced by funds that have done very well, and which cease reporting because they do not require any further marketing or capital. *Backfilling bias*: This source of error arises when a new hedge fund is added to the database and the fund is then asked to report its history. If the fund in question had a weak return further back in time, its management may choose to report only a brief history, which could also lead to an overestimate of the hedge funds' return.

2. Why have hedge funds become so popular among institutional investors?

To a considerable extent, the phenomenal growth of the hedge funds industry can be attributed to an expansion of its investor base, which was traditionally almost exclusively confined to high net-worth individuals. However, the international financial landscape has, in recent years, changed in a way that has made pension funds, insurance companies and other institutional investors embrace hedge funds.

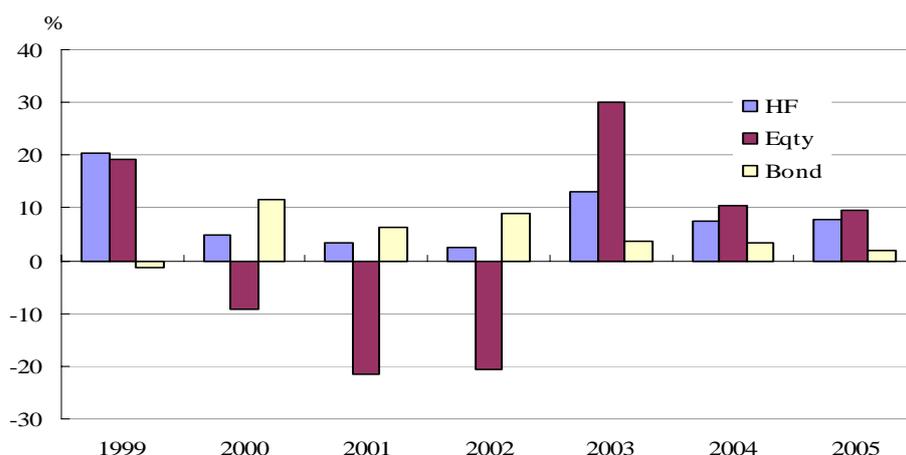
⁴ See, for example, ECB (2005) *Hedge Funds and Their Implications for Financial Stability*, Occasional Paper No. 34, August 2005.

2.1 Searching for yield

Shortly after the turn of the century, subdued inflation and accommodative monetary policy around the world sent interest rates to record lows globally. The benign interest rate environment and the resulting ample liquidity gave rise to a ‘search for yield’ phenomenon in which investors moved into riskier assets to achieve higher returns. The ‘search’ has manifested into rapid emergence and growth of new financial instruments (such as structured credit derivatives, private equities and REITs) and alternative investment strategies and vehicles, apart from increased investment in bonds and equities in emerging markets.

This all happened at a time when the tech bubble burst, which possibly exacerbated the ‘search.’ Poor performance of equity markets has forced many institutional investors such as pension funds to look for alternatives to their traditional long-only strategies to protect themselves from abrupt adverse market movements. Hedge funds, which employ a variety of investment strategies that enable them to do so, thus became a natural choice. Indeed, during 1999-2005, they were able to deliver overall higher and more consistent returns than the traditional equity and bond funds (Chart 2.1). A recent study by the ECB shows that overall fund flows — including those of individual investors — into hedge funds are sensitive to the level of short-term interest rates and investors’ risk appetite, supporting the notion that the ‘search for yield’ phenomenon plays a positive role in their growing popularity.⁵

(Chart 2.1) Investment return 1999-2005



Source: Bloomberg, Credit Suisse/ Tremont.

⁵ “The Global Search for Yield and Funding Liquidity Risks for Hedge Funds,” Financial Stability Review, European Central Bank, June 2006.

2.2 Offering portfolio diversification benefits

The performance of hedge funds is not only higher and more consistent than that of traditional financial instruments, but also weakly or even negatively correlated with it (Table 2.1). Hedge funds employing different investment strategies also exhibit low correlation with each other. Consequently, they offer an important opportunity for institutional investors to diversify the risks of their existing portfolios.

(Table 2.1) Correlations between hedge funds and traditional instruments

		S&P 500	Citigroup- USBIG Bond
Hedge Funds	Convertible Arbitrage	0.11	0.06
	Dedicated Short Bias	-0.78	0.09
	Equity Market Neutral	0.46	0.17
	Event Driven	0.55	-0.1
	Fixed Income Arbitrage	-0.03	0.06
	Global Macro	0.18	0.2
	Long/Short Equity	0.57	0.05
	Managed Futures	-0.21	0.43
	All	0.48	0.1
Fund of Hedge Funds		0.72	-0.05

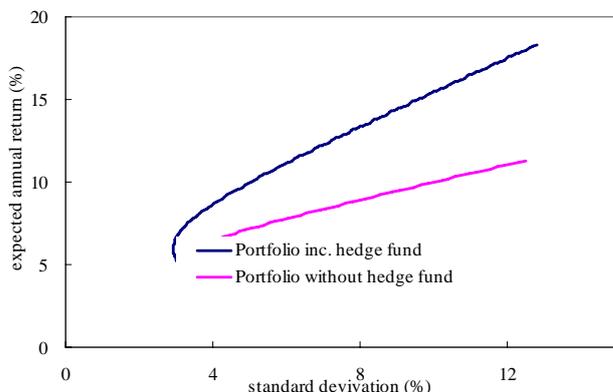
Sources: Bloomberg, Credit Suisse/ Tremont.

The benefit to a traditional investment portfolio comprising only equities and bonds derivable from introducing the possibility of investing in hedge fund can be illustrated in a simple single period mean-variance optimization model. In the estimation, the investment opportunity set of institutional investors is approximated by major world equity and bond indices, while hedge fund is represented by the CSFB/Tremont Hedge Fund Index.⁶ All parameters are estimated with monthly data in the period 1999-2005. Chart 2.2 shows that introducing hedge fund into the portfolio can significantly improve the portfolio frontier – raising the expected return for any given level of risk tolerance.⁷

⁶ The investment opportunity set is approximated by the S&P 500, Frankfurt DAX, TOPIX and Citigroup World Bond Indices.

⁷ One should note that in practice institutional investors will be subjected to various constraints like benchmark weightings and short-sell limits, they will also be investing in individual instruments instead of indices, so the actual improvement will not be as significant.

(Chart 2.2) Portfolio frontier



Source: Bloomberg, Credit Suisse/ Tremont, staff estimates.

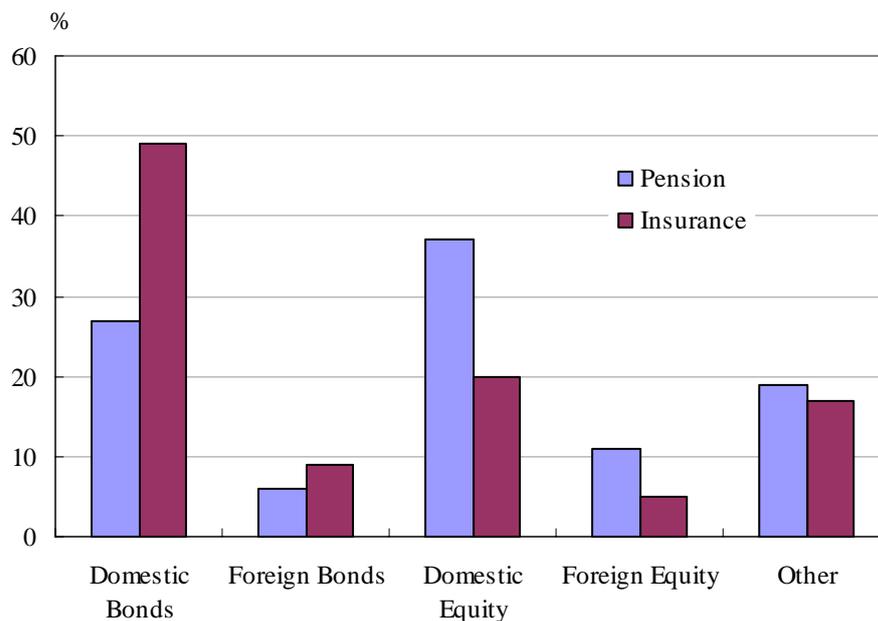
2.3 Improving asset-liability management

Hedge funds could aid the process of the asset-liability management of many institutional asset managers who, in the past, tended to manage their portfolio against a certain market benchmark and placed little emphasis on liability structure. Many pension and insurance funds became seriously underfunded when bond yields slid and stock markets fell sharply during 2001-2002. Pension funds, which have their future pension liabilities to meet, used to have a sizeable portion of their portfolio allocated to equities. The insurance industry was also faced with similar problems. In response, these institutional investors had to look for ways to enhance their long-term investment returns to better match their liabilities. The result of this has been introduction or expansion into their portfolio of alternative investments such as hedge funds, private equities and real estate investment funds.⁸ Such portfolio shifts have intensified as the balance sheet problems facing institutional investors deepen with increase in life-expectancy and acceleration of regulatory reforms.⁹

⁸ To the equity-overweighed institutional portfolio managers, investing in hedge funds also appears to be an attractive solution given the enormous potential diversification benefits.

⁹ In countries such as the U.K., new accounting rules have been introduced such that pension funds need to eliminate their deficits within certain time limits.

(Chart 2.3) Institutional investors' asset allocation in 2003



Source: Global Financial Stability Report September 2005, IMF.

2.4 Growing public acceptance

The increasing popularity of hedge funds also owes much to their growing public acceptance in recent years. In the past, the public image of hedge funds was mostly negative. Hedge funds were seen as an opaque group of institutions engaging in highly speculative activities. The theatrical close-down (or near-close-down) of some high profile hedge funds further reinforced such an image.

However, as more investors venture into hedge funds, the positive side of hedge funds also becomes more well-known. Hedge funds can be expected to have several positive effects on the functioning of the financial markets – their flexible investment strategies mean that they improve pricing and liquidity on many markets. One example of this is hedge funds that analyse companies and then invest in the shares they perceive as undervalued and take short positions in shares they perceive as overvalued. In this case, the hedge funds' actions lead to fairer market prices, which can lead to more efficient allocation of resources and better risk management. Another example is hedge funds that have specialised in identifying securities derivatives that are not consistently priced, that is to say, classical arbitrage activities. Hedge funds and other agents using arbitrage ensure that prices converge, which can enable trade that would not have been possible under the incorrect prices. Hence, their existence can potentially remove market

distortions and increase market efficiency.

More importantly, the hedge funds industry itself has also evolved to meet investors' needs. For example, hedge funds have substantially expanded in their risk-return profile, ranging from funds entailing very high risks to those very low risks, with volatilities lower than major benchmark indices. Funds of hedge funds (FOHFs) have also emerged to tap the benefits of diversification of different investment strategies. These funds obviously mean an additional layer of management fees. However, many institutional investors prefer FOHFs to individual hedge funds, because they could leave the job of monitoring the performance of individual hedge funds to the FOFH manager, which can often be very costly.

3. Challenges and implications

The growth of institutional investors is a key financial innovation of recent years. Generally, the institutionalization of the financial sector probably improves corporate governance and should enhance and promote the stability of the financial system. There are, however, challenges/risks to the stability of the financial system from the increased linkages between institutional investors and the possibility of contagion under extreme market conditions.

3.1 Growing linkages between institutional investors and sources of vulnerabilities

The increased linkages between different types of institutional investors imply that shocks to one market or asset class might be transferred to other markets and participants not active in that market or asset class. Hence, the increased linkages might call for improved risk management and liquidity risk management techniques of institutional investors.

Linkages with the banking sector

There may be sources of vulnerabilities through their increased interdependences and linkages with the banking sector. Insurance companies and pension funds are sub-components of the financial system and their linkages with the banking sector and the securities markets have grown significantly over the past decade. In the Euro area,

together their assets now represent slightly less than 60% of GDP, with the insurance sector accounting for more than two thirds of it. They are thereby the second most important group of financial institutions after banks which represent close to 270% of GDP.

Contagion effects from financial distress arising in one insurance company or one pension fund, however, appear to be limited a priori. These institutions are not directly connected to the interbank market or the payment system. With the exception of the bancassurance, these institutional investors are less likely to generate a liquidity crisis in the interbank market.

In the medium term we might also expect insurance companies and pension funds to play a growing role in the corporate bond markets. Due to their long-term liability, they may have a larger role in the development of bond markets. They would possibly be a more stable source of funding when compared to the highly cyclical patterns seen in bank lending. It is important to recognize that these financial institutions, owing to their balance sheet structure and their long-term horizon, may play a positive and important role in safeguarding the stability of the overall financial system.

Insurance companies, pension funds and other institutional investors can affect the banking sector. A significant portfolio reallocation or unwinding of major derivative positions by such entities might have a potential destabilizing impact on asset prices and liquidity in some asset markets. This source of vulnerability may arise as institutional investors hold a growing proportion of overall financial assets.

There has been some evidence that the slump in equity prices led some insurance companies to liquidate part of their equity portfolios in order to reduce regulatory capital need, the bursting of the IT bubble in 2000 for example. Such forced sales would have contributed to adverse market dynamics by driving down equity prices even further, thereby also affecting banks' equity portfolios.

Market liquidity risk

The emergence of hedge funds as important institutions for market liquidity and volatility in asset markets arises largely from the fact that their activities can result in damaging fire-sales of financial assets. However, fire-sales of financial assets are not only restricted to hedge funds or absolute return portfolios but are probably more an externality of relative portfolios, i.e. index portfolios and mutual funds, that track a

benchmark index. When prices move adversely, liquidity problems can arise as institutions attempt to meet margin calls, with solvency becoming an issue if the positions are highly leveraged. These problems can force rapid fire-sale of troubled institutions, triggering a wave of selling in other markets through a cascading process of liquidation of positions. The difficulties are compounded when financial institutions have large credit positions to the selling institutions or have exposures to the market in which the sales are taking place. Furthermore, trades by large institutional investors might also create volatility in relatively illiquid markets, which may create price movements that are hard to explain by fundamental news.¹⁰

Institutional investors have globally increased their allocations to alternative investments during recent years. Hence, linkages between different types of institutional investors have increased, the increased linkages implies that investors to a larger extent are exposed to the same shocks.

Implications of Tail Risk

Institutional investors have embraced hedge funds because the correlations between traditional financial assets and hedge funds are low and the significant diversification benefits they could potentially tap are tempting. Many of them are not fully aware of the amount of tail risk they assume when investing in hedge funds.

When the market (traditional assets such as equities and bonds) collapses, hedge funds can also collapse, a distinct possibility to which the LTCM episode has testified. The reason, as supported by many studies, is that hedge fund returns tend not to follow a normal distribution but ones that are characterized by fat tails.¹¹ In this case, correlations would fail to adequately capture contagion, if any, between hedge funds and the market (traditional assets) and thus underestimate the true market risk of hedge funds.¹²

Tail risk has important implications for both investors and policymakers. A high probability of contagion between hedge funds and the market means that the diversification benefits of hedge funds obviously do not extend to periods of extreme market conditions. It also implies that systemic risk increases in times of extreme

¹⁰ See for example X. Gabaix, P. Gopikrishnan, V. Pleurou and H. E. Stanley, "Institutional Investors and Stock market volatility" NBER Working paper 11722 (forthcoming *Quarterly Journal of Economics*).

¹¹ The thickness of the tails of a statistical distribution is very important here because it represents the chances that extreme losses (or gains) would happen. Simply put, fatter tails mean that these chances are higher.

¹² Contagion, here, can be defined as the tendency of hedge funds and the market moving together more closely during extreme market conditions than could be predicted by correlations.

market conditions as the likelihood that hedge funds may fail goes up.

Table 3.1 summarizes the findings of some recent empirical studies on hedge fund contagion. Of some comfort to those who fear the potential systemic risk arising from the explosive growth of hedge funds in recent years, most of the studies found little contagion between hedge funds and bonds/equities in bull markets and between hedge funds and bonds in bear/bull markets. However, evidence about the possibility of contagion between hedge funds and equities in bear markets is rather mixed.

Table 3.1: Empirical evidence of hedge fund contagion

	Contagion	Bull/ bear markets
Agarwal and Naik (2004)	Yes	In bear markets
Bacmann and Gawron (2004)	No*	Only with stocks in bear markets, but not with bonds
Boyson, et al (2006)	No	In neither bear nor bull markets
Brown and Spitzer (2006)	Yes	Stronger in bear markets
Edwards and Caglayan (2001)	Yes	Stronger in bear markets
German and Kharoubi (2003)	Yes	In bear markets
Liang (2004)	Yes	Only in bear markets, but in not bull markets
Mitchell and Pulvino (2001)	Yes	Only in bear markets, but in not bull markets
Schneeweis, et al (2002)	No	Extreme market conditions offer even more diversification benefits

* Yes if the August 1998 observation is included in the sample.

Furthermore, some empirical studies (e.g., Boyson, et al, 2006, and Brown and Spitzer, 2006) found that there exists a high probability of contagion among different hedge fund strategies and thus diversification across strategies does not offer good protection during extreme market conditions. In other words, tail risk cannot be diversified away by investing in hedge funds of different strategies or funds of hedge funds. To policymakers, this means that the systemic risk is higher than implied by simple correlations between strategies – whenever one type of hedge funds suffers large losses during extreme market conditions, the rest of the industry is also likely to experience the same.

3.2 Challenges for central banks

The above-mentioned sources of vulnerabilities create the potential for problems in the insurance, pension fund sector or other institutional investors to significantly disrupt the smooth functioning of the financial system. Market liquidity is probably the most

prospective challenge for central banks as a result of the increased linkages between institutional investors and increased reliance on market prices.¹³

A second challenge for central banks might be the increased portfolio allocation for alternative assets in institutional investors' portfolios. From having been a form of investment limited to a small number of wealthy individuals, hedge funds now attract a large group of institutional investors and consumers. Pension funds in particular are attracted by the stable return shown by hedge funds and the diversification advantages they offer. Their arbitrage activities and their flexible investment strategies mean that hedge funds fulfil several valuable functions in the financial markets – they increase breadth and depth, improve pricing and create liquidity. However, the substantial growth in hedge funds in recent years has triggered an international debate on the risks involved in their operations. Hedge funds' illiquid positions and occasionally high leverage mean that problems in individual funds can spread and lead to a major liquidity crisis. In addition, some types of hedge funds have become known for short-term speculation and herd behaviour, which may have destabilizing effects on the financial markets. There are different views regarding regulation of hedge funds, but a common agreement is that focus should be on the hedge funds' counterparties – particularly the systemically-important institutions – being able to manage their risks.

¹³ See for example speech by Sir Andrew Large, Bank of England, "Financial Stability: Managing Liquidity Risk in a Global System", 28 November 2005.

References

Agarwal, V and N. Naik “Risk and Portfolio Decision Involving Hedge Funds” *The Review of Financial Studies*, 2004, 63-98.

Bacmann, J.F. and G. Gawron “Fat Tail Risk in Portfolios of Hedge Funds and Traditional Investments” 2004 Working Paper, RMF Investment Management.

Boyson, N.M, C.W. Stahel and R.M. Stulz “Is There Hedge Fund Contagion?” 2006 NBER Working Paper 12090.

Brown, S.J. and J.F. Spitzer “Caught by the Tail: Tail Risk Neutrality and Hedge Fund Returns” 2006 manuscript, NYU Stern School of Business.

ECB, Financial Stability Review, “The Global Search for Yield and Funding Liquidity Risks for Hedge Funds”, June 2006.

Edwards, F. and M. Caglayan “Hedge Fund and Commodity Fund Investments in Bull and Bear Markets” *Journal of Portfolio Management*, 2001, 27(4): 97-108.

Financial Systems and Bank Examination Department and Financial Markets Department, Bank of Japan, “Recent Developments in Hedge Fund,” June 2006, Bank of Japan Research Bulletin

Gabaix, X and P. Gopikrishnan, V. Pleurou and H. E. Stanley, “Institutional Investors and Stock market volatility” NBER Working paper 11722 (forthcoming *Quarterly Journal of Economics*)

German, H. and C. Kharoubi “Hedge Funds Revisited: Distributional Characteristics, Dependence Structure, and Diversification” *Journal of Risk*, 2003, 5(4): 55-74.

IMF, Global Financial Stability Report, September 2005.

Large, A, Speech, “Financial Stability: Managing Liquidity Risk in a Global System”, 28 November 2005, Bank of England.

Liang, B (2004) “Alternative Investments: CTAs, Hedge Funds, and Funds-of-Funds,” *Journal of Investment Management*, 2004, 3(4), 76-93.

Mitchell, M and T. Pulvino “Characteristics of Risk and Return in Risk Arbitrage” *The Journal of Finance*, 2001, 56(6), 2135-2175.

Schneeweis, T, V. Karavas and G. Georgiev “Alternative Investments in the Institutional Portfolio“ 2002 Working Paper, University of Massachusetts at Amherst.