IV

Managing Global Finance: Private and Public Policy Challenges Raised by Last Fall's Mature Market Turbulence

The severe turbulence that erupted in the immediate aftermath of Russia's effective default and devaluation has raised a number of questions about the adequacy of the current lines of defense against systemic risk and the factors underlying the dynamics and spillovers that characterize modern financial markets. The *World Economic Outlook and International Capital Markets: Interim Assessment* noted that the three lines of defense against systemic risk—market discipline, prudential supervision and regulation, and macro-prudential surveillance—had proved inadequate to avoid a buildup in vulnerabilities during the two preceding years. As a result, the global financial markets experienced a bout of severe turbulence in the late summer and early autumn of 1998 following the reappraisal of risk triggered by the Russian crisis. Moreover, both market participants and policymakers were surprised by the virulent dynamics and spillovers across markets during the turbulence—especially for emerging markets—as a rapid process of deleveraging and portfolio rebalancing was set in train by a sharp increase in risk aversion. Even in some of the deepest capital markets in the world, liquidity pressures emerged.

This chapter steps back from the proximate causes of the turbulence to address the questions of whether there are any particular features of financial systems that make them susceptible to such episodes, the degree to which modern risk management practices—and frequent marking to market—may contribute to the severe dynamics and spillovers that have characterized recent periods of deleveraging and portfolio rebalancing, and the associated challenges for public policy. In the process, the chapter discusses the main proposals that have been advanced by various groups to contain the excessive leverage that contributed importantly to financial market turbulence.

Even though it was influenced by the structure of modern capital markets, the recent turbulence shares several features with earlier episodes of financial distress. Most notably, the turbulence was preceded by a gradual buildup in vulnerabilities, as investors were increasingly willing and able to assume higher levels of risk and, as in earlier episodes, a relatively minor or unrelated event served as a trigger for a sharp reappraisal of risk and the bursting of the euphoria. The turbulence, in short, involved the traditional elements of boom-bust cycles that have been common in financial history.

In at least three respects, the environment of the recent turbulence has evolved from that in earlier episodes. First, reflecting the investments many governments have made in creating financial safety nets, such as deposit insurance and lender of last resort, many of the larger institutions are increasingly operating either explicitly or implicitly under a too-big-to-

fail policy. As a result, and notwithstanding the stepped-up supervision and regulation that accompanies the safety net, the system itself may be tending to encourage excessively risky behavior while blunting market discipline.

Second, modern risk management practices—such as marking to market, margin calls, dynamic hedging, and frequent portfolio rebalancing to meet internal and regulatory capital requirements—are leading to rapid adjustments in response to new information and/or reappraisals of risk. With the same large globally active institutions operating in many different markets and countries, these systems are also creating the potential for spillovers between seemingly unrelated markets. Moreover, risk management systems are placing an increasing premium on liquidity on account of the higher margin calls triggered during periods of financial stress.

Third, the growing use of OTC derivatives and structured notes is increasing the ability of institutions to leverage up capital positions. The high levels of leverage may be creating financial systems that are capable of making costlier mistakes during periods of euphoria (exacerbating the boom) and that can magnify the adverse consequences of a negative shock or a reappraisal of risk.

Following a brief review of some key features of episodes of financial stress as well as the growth of financial safety nets, the next section considers the environment in which the buildup in vulnerabilities occurred in the mature financial markets last year. In addition to a number of structural factors related to modern finance, relatively abundant global liquidity and competition among financial institutions appear to have contributed to an environment in which risk became underpriced and leverage rose to unsustainable levels. The next section discusses some key public policy issues raised by the turbulence, with particular emphasis on issues of market discipline, transparency, incentives, moral hazard, and the evolving nature of systemic risk. This is then followed by a review of the main proposals for addressing the risks posed by highly leveraged institutions and activities, and remaining challenges. Finally, the chapter concludes with an overall assessment of current proposals to effectively address the private and public policy challenges relating to weaknesses in private risk management and market discipline that contributed to the crisis. Appendix 1 discusses issues concerning the measurement of off-balance-sheet leverage. Appendix 2 addresses issues of market integrity that have arisen in connection with the activities of some HLIs in small and medium-sized markets.

Recurring Features of Turbulence and Crisis: Importance of Lines of Defense Against Systemic Problems

The mature market turbulence associated with the near-collapse of LTCM is the most recent example of a buildup of financial risks followed by a sharp adjustment in which exposures are unwound. The process of deleveraging was associated with virulent dynamics. Similar buildups of vulnerabilities can be identified in other episodes of financial turbulence

and crisis, including most recently in the emerging markets crisis in Mexico in 1994–95, the bond-market turbulence of 1994, the Asia crises in 1997–98, and the Russian crisis in 1998.

The episodes have frequently been characterized by relaxed attitudes toward risk taking, sometimes encouraged by economic and financial policies, and sometimes driven by overoptimism about the prospect for returns. The realization that imbalances are about to be unwound often leads to a race for the exits, rapid price adjustments, large volumes of transactions being unwound—sometimes even closures of institutions, severe price dynamics and liquidity crises, and on some occasions more long-lasting credit crises. These are characteristics of the manias and panics in the early part of this century, documented by Kindleberger and others, including the now seemingly irrational exuberance in the run-up to the bank runs and panics preceding the Great Depression.[1] In some cases,[2] the accumulation of excessive concentrations of risk can persist for some time before a series of triggering events encourages investors to reassess risks and rebalance portfolios. Risks and vulnerabilities can accumulate in systemically important financial institutions, in markets, or, as in more recent emerging market crises, in countries or regions. In the 1990s, excesses and vulnerabilities seem to have become more market-based and market-oriented than they were in the early part of the century, but the psychology of market behavior has probably not changed much. Imbalances between the "greed" for high returns and the "fear" of losses and default have persistently led to swings between overexuberance during asset market booms, and irrational panic during busts.

Although earlier episodes of turbulence and crises had similar features to those in the 1990s,[3] they often had different consequences. For example, in the United States (and in most countries) at the turn of the century, financial markets were much less regulated than today, and financial structures also were different. In the period leading up to the 1930s U.S. banking crises and the Great Depression, the banking system and financial markets more generally were less supervised and regulated than now. As a consequence, the banking and financial crises were largely resolved privately, with relatively low direct costs to taxpayers.[4] However, the adjustment in the real economy during 1929–33 was devastating—a 30 percent

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[1]See Kindleberger (1989).

[2]As in the banking crisis leading up to the 1930s Great Depression, the 1973 Bankhaus Herstatt international banking crisis, the 1980s developing-country debt crisis, the 1980s U.S. savings and loan crisis, Japan's 1990s asset-price bubble and financial system problems, and Thailand's 1997 foreign exchange and financial sector crisis.

[3]The buildup of financial excesses during the 1920s included a broad-based expansion of private debt (outstanding corporate bonds rose from 28 to 49 percent of GDP between 1920 and 1928) and household mortgages (from 12 to 27 percent of GDP).

[4]Bank failures during 1930–33 involved mainly capital losses of owners and depositors.

decline in real GDP in the United States and 17 percent decline in employment. This large real economic damage formed the basis for a significant amount of legislation aimed at creating a financial safety net and a regulatory and supervisory structure, and at ensuring both monetary and financial stability.[5] That is, it is as a result of the experience in the 1930s that financial markets, and more generally international financial markets, have several lines of defense against the potential for widespread damage or systemic problems. The changes in the United States were in most important respects, but also with some special differences, representative of the approaches taken in other industrial countries and in many developing countries.

As a result, the advanced countries now have financial systems that have significantly different balances of costs related to the buildup and unwinding of financial excesses. There are extensive official safety nets and monitoring frameworks—banking supervision and market surveillance—and self-regulatory private organizations. By creating safety nets and monitoring frameworks for preventing and managing systemic problems, modern financial systems—in Europe, the United States, and Japan—have sought a different balance of costs than existed in the 1930s between prevention and resolution of crises, in which the potential for higher ex ante costs of prevention and ex post costs of resolution (both borne by taxpayers) yield benefits by reducing the economic damage and systemic consequences.

Meanwhile, national financial systems and the international financial system have been transformed dramatically by financial liberalization, innovation, modernization, and globalization. Most recently, these developments include the growth of derivatives markets (especially the OTC market) and the development of off-balance-sheet finance, the increasingly widespread use of complex quantitative models for portfolio and risk measurement, and the associated practices of marking to market and rapid portfolio rebalancing. International finance is now driven by globally active financial institutions that rely on modern techniques and instruments of finance using sophisticated information, communication, and computer technologies. Recent crises, and in particular last fall's virulent dynamics, leave open the question of whether the official safety nets and monitoring systems have adapted sufficiently to this new financial environment and whether they are still ensuring that incentive structures encourage an appropriate amount of market discipline.

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[5]For example, in the case of the United States, while the Federal Reserve was charged with financial stability as early as 1913, its powers were expanded and consolidated with the Banking Acts of 1933 and 1935. The mandate for monetary policy beyond financial stability was not granted until the Employment Act of 1946 provided implicit guidance. Banking legislation during the 1930s also tightened the public safety net with the provision of deposit insurance, but commercial banking, investment banking, and brokering were separated to reduce financial concentration, which was suspected as a contributor to earlier financial excesses.

It might be argued that, on the basis of the available evidence, it is difficult to justify the absolutely firm conclusion that last autumn's turbulence demonstrates serious weaknesses in the functioning of the global financial system that generate the potential for substantial systemic risk. It is the function of financial institutions to take on and manage risks. Sometimes ex ante risks materialize in adverse ex post outcomes, and those undertaking such risks incur losses or even become insolvent, with costly consequences for owners, creditors, and counterparties. This is an inevitable feature of the normal and healthy functioning of a market-based, competitive financial system. Realization of losses and occasional insolvencies are essential to instill the necessary discipline on risk management policies and practices for all who participate in the financial system. In addition, periods of turbulence are a normal and recurring feature of financial markets, especially when markets experience significant adverse developments. Realization that such turbulence can occur—because it actually does occur—is also important for instilling proper discipline. In this regard, the difficulties that were encountered and the losses that were sustained in the turbulence that followed the Russian default and the near failure of LTCM have taught (or reinforced) some important lessons about prudent risk management in modern global financial markets. Moreover, while the actions of the U.S. Federal Reserve and other central banks to calm financial markets suggest that the turbulence of last autumn did generate the potential for meaningful systemic risk, the comparatively modest extent of these actions and their subsequent success suggests that the level of such risk was well within manageable proportions. That major central banks may, on infrequent occasions, need to fulfill their responsibilities in this way does not necessarily imply grave defects in the general functioning of the global financial system.

However, on a reasoned assessment, this would clearly be too sanguine a view of the financial market turbulence of last autumn and of the lessons it should teach concerning the functioning of the global financial system. As emphasized in the *World Economic Outlook and International Capital Markets Interim Assessment*, the extent of the turbulence last autumn—which affected a broad array of financial markets, including those that are normally the deepest and most liquid—does appear grossly disproportionate to the initiating causes. Something was not right in the buildup of vulnerabilities that preceded the turbulence, and something was not right in the exaggerated market response after the turbulence started. Moreover, one can wonder what might have happened in a similar situation of apparent (at least ex post) vulnerability, if there had been a substantially larger initiating disturbance, such as a sudden upsurge in global inflation or the onset of recession affecting most of the global economy. How would global financial markets have responded? Would the turbulence have been so easily contained and reversed? One can also ask, given the same initiating shocks as last year, what would have happened if monetary policy in the major countries had been less able to calm financial market turbulence because, for example, higher priority needed to be given to containing inflationary pressures? While such questions lack clear answers, they do strongly suggest that the path of prudence is to analyze carefully, with a view to designing and implementing relevant reforms, a variety of deficiencies in the functioning of financial markets and institutions that may contribute either to the unwarranted buildup of risks and vulnerabilities or to their disorderly and turbulent unwinding.

Environment in Which Financial Excesses Accumulated and Created the Potential for Systemic Problems

The buildup of leverage and the market dynamics experienced last fall occurred in an environment shaped by the structural features of the modern global financial system. These features undoubtedly affected the nature of market dynamics in international financial markets, but do not alone explain the buildup of excesses and the corresponding threat of systemic problems. A combination of conjunctural factors and market psychology also contributed to financial excesses manifest in the buildup of unsustainable risk exposures and concentrations, and leverage. These features, which are described below, cannot be precisely measured, but discussions with market participants strongly suggest that they all played a role in the turbulence.

Market Dynamics Are Changing

Greater Reliance on Securities Markets, Especially OTC Derivative Markets

As the returns from traditional banking have declined, globally active firms have increasingly relied on off-balance-sheet activities and, in particular, OTC derivatives, as a source of revenues. For the 50 largest banks, the ratio of other (i.e., noninterest) operating income to net interest revenue rose from almost 50 percent in 1991 to about 85 percent in 1997. This change in the business of global banking reflects at least two important factors. First, the opportunities for unbundling and repackaging risks provided by relatively recent advances in information and computer technologies have made it possible to create new derivative products that can be custom tailored to a customer's needs.[6] The development of derivative products and the growth of this market have increased the opportunities for embedding financial features (options) in traditional securities that allow investors to hedge or to take specific positions on precisely defined risks (though the apparent precision may sometimes be illusory, because apparently separate components of financial risk may in fact be closely related at times).

Second, both private and regulatory incentives have encouraged the use of off-balance-sheet OTC derivatives, in part reflecting the more active internal and dynamic reallocations of capital across the various businesses within the organizations. Much of the activity has shifted off balance sheet because this is where profits can be made. Banks' clients now engage in more liquidity and asset management, and in hedging and position

[6]This has been one of the main driving forces behind the rapid growth in the OTC derivative markets, whose notional value of outstanding contracts amounted to more than $80 trillion at end-1998, up from $47.5 trillion in 1995.

taking. Commercial banks have tapped into market-oriented business through other off-balance-sheet instruments as well, such as commercial credit lines and revolving underwriting facilities. The regulatory environment also provides incentives to shift activities off the balance sheet, as off-balance-sheet risks often carry a smaller regulatory capital burden than on-balance-sheet risks. For example, by using OTC derivatives in their trading activities, commercial banks can increase leverage considerably without significant additional bank capital charges. Also, risk taking has shifted to market risk, which can be engineered through the use of off-balance-sheet derivatives. OTC derivatives are valued at market value on the balance sheet, but implicitly may contain additional layers of leverage that are not captured by capital requirements. Moreover, OTC derivative assets currently receive a maximum 50 percent risk weight (compared with 100 percent weight for private loans) according to the Basel Accord.[7] Finally, loan commitments with a maturity of up to one year, even if they are routinely rolled over, carry no capital charge.

Modern Portfolio Risk Management and Control Systems

A key aspect of modern finance is the reliance on risk management, measurement, and control systems. Financial institutions now use risk management models and stress tests to measure the risk to capital (and ultimately the risk of insolvency) of their investment positions. Value-at-risk (VaR) models are one way to achieve this objective, as they quantify the amount of the firm's capital that is exposed over a given period, conditional on various assumptions. Some financial institutions also use stress tests in which scenarios are simulated. Regardless of the methodology, if the potential loss is too large, the firm might rebalance its portfolio to reduce the value at risk (the loss on the firm's portfolio that should be exceeded with no more than a small probability).[8] Some financial institutions also allocate capital on the basis of VaR and similar models.

Modern risk management models have two significant limitations. First, they rely heavily on historical data and relationships, which may understate the likelihood of future extreme events and often involve the assumption that stable processes generate market prices. Recent events have underscored that rare, "fat-tailed" events can occur more frequently than might be expected, that correlations can increase and change sign during periods of extreme turbulence, and that volatility can increase sharply.

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[7]The cap on the risk weights for (nonbank) OTC derivatives in the 1988 Basel Accord was based on the (by now questionable) presumption that the counterparties in the OTC derivatives market are of first-rate quality. The proposed revisions to the Basel Accord would eliminate the cap on risk weights for OTC derivatives.

[8]For example, a firm's value at risk might indicate that its losses over the coming week should exceed $10 million with no more than 5 percent probability.

Second, the modeling of nonmarket risks, such as credit and liquidity risks, is challenging even for the most sophisticated financial institutions.[9] Credit risk modeling is still in its infancy, in part because defaults are rare, and the risk of default evolves in a complicated fashion. However, the bulk of risk on balance sheets consists of credit risk, and credit losses have been, and still are, key sources of risk. Even less advanced is the modeling of liquidity risk—the risk that transactions (involving assets, liabilities, and off-balance-sheet items) cannot be executed without significant price changes. Risk models generally assume that market liquidity will be maintained so that positions can be closed out when necessary without adverse price declines. Liquidity risk may have been the most significant type of risk in the recent turbulence, since a lack of liquidity may have been responsible for some of the price discontinuities that occurred.[10]

Computer-driven portfolio management techniques, such as portfolio insurance[11] and dynamic hedging,[12] are an important component of the risk management and control systems used by the major financial institutions. When these methods are widely used they can trigger many simultaneous sell orders and accentuate price declines, as they did during the 1987 stock market crash in the United States. The resulting increase in volatility can cause further selling pressures as firms internally reallocate capital to meet margin calls and as quantitative VaR models require portfolio managers to scale back risky positions to balance risk and allocate capital. Risk components that in normal circumstances are isolated—market, liquidity, and counterparty risks—can become blurred in such circumstances and risk management systems can break down.

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[9]Other types of risk—which for the most part remain to be quantitatively addressed—include legal and operational risks; see Jorion (1997).

[10]Another type of liquidity risk is the ability to roll over funding. See Jorion (1997).

[11]Techniques that change a portfolio's market exposure systematically in reaction to prior market movements, with the objective of avoiding large losses and securing as much participation as possible in favorable market movements.

[12]Dynamic hedging is a position-risk management technique in which option-like return patterns are replicated by adjusting portfolio positions to offset the impact of a price change in the underlying market on the value of an options position (the "delta"). Dynamic hedging relies on liquid, continuous markets with low transaction costs.

Liquidity and Speed

Another, and closely related, aspect of the modern financial system is that modern portfolio and risk management systems rely heavily on market liquidity.[13] Market liquidity can be seen as having three important characteristics: tightness (range for asset price bid-ask spreads), depth (volume of trades possible without affecting prices), and resiliency (speed with which price shocks are dissipated).[14] Financial systems have become increasingly "liquidity hungry" as modern hedging and portfolio management need liquid markets to facilitate portfolio rebalancing and unwinding of leveraged positions. Derivative markets in particular require that underlying securities markets produce continuous prices; otherwise, shocks can trigger a snowballing sequence of margin calls and sell orders that can cause prices to move very sharply.

Market-making activities rest with broker/dealers who often take positions themselves and also require ready access to liquid repurchase markets or money markets to finance their positions. Broker/dealers rely on credit lines from banks for funding when circumstances do not permit them to roll over their funding positions in the repo or money markets. For the linkages among market liquidity, broker/dealers, banks, and money markets to operate smoothly, counterparties must be able to assess credit risks and must be assured of efficient and timely clearance and settlement of transactions. Unusual events that raise doubts about credit risk can cause these linkages to break down and lead to an evaporation of market liquidity. When markets become illiquid owing to the withdrawal of market makers, portfolio rebalancing can be disruptive, and asset prices can adjust abruptly.

Such adjustments occurred last fall during the mature market turbulence. As mature markets moved toward their nadir in late September and early October, there were few suppliers of liquidity. Those already holding safe liquid assets, such as newly issued (that is, on-the-run) U.S. treasury bonds, were not selling them and arbitrageurs that normally "insure" liquidity (such as LTCM, other hedge funds, and investment banks) were already highly leveraged and faced liquidity spreads that were likely to widen further. This generated losses and even greater pressures to obtain liquidity. The drying up of liquidity appeared to have been magnified and accelerated because many institutional market makers (investment banks, some commercial banks, and hedge funds) experienced proprietary trading losses and were unable to provide liquidity. These institutions withdrew from market making as they rushed to liquidate positions and absorbed market liquidity, and there appeared to be no natural sellers of liquid assets once the severe market dynamics took hold. Also, as many financial institutions had to meet margin calls, lending to market makers evaporated, which

[13]Traditional financial intermediation also relies heavily on liquidity, but of a fundamentally different variety—the ability to fund illiquid loans with liquid deposits versus the ability to sell marketable securities at or near the current price.

[14]See Committee on the Global Financial System (1999).

added to pressure on market makers. Discussions with market participants have suggested they are now paying more attention to liquidity risk, and some risk models are being adjusted to mark assets to "liquidation values," using nonlinear pricing formulas, in times of stress rather than to "market values" as is done in normal market conditions.[15]

Even during normal market conditions, however, a particular event could trigger—via modern risk management and control systems—many simultaneous sell or buy orders in the same assets. Decentralized markets obscure the number of participants on the other side of the market (within the normal range of price variation). Without sufficient liquidity to support market transactions, prices can jump sharply as markets become one-sided, especially when market positions have been multiplied by leverage.

All Have Influenced Market Dynamics

Summing up this part of the discussion, the structural changes just described together have changed market dynamics in two important ways. First, modern finance allows risks to be priced and traded more actively, more continuously, in larger quantities, and ideally more safely. Changes in fundamental economic value that were once hidden on bank balance sheets are now recognized more quickly and more frequently in a mark-to-market environment through market prices. In addition, as market prices provide continuous (albeit noisy) signals about value, market participants reappraise risk, rebalance portfolios, and deploy or withdraw capital. This reassessment and rebalancing can, in turn, feed back to market prices. Thus, along with potential improvements in efficiency have come more frequent changes in asset prices and financial flows, and possibly more rapid and complicated market dynamics. Second, because the market makers that provide critical market liquidity are often also traders and investors, large price shocks can be associated with the withdrawal of market makers, a decline in market liquidity, and sharp and disruptive price declines (not only in the market that originally experienced the shock, but in any market where market makers might have been active).

Many of these features of modern finance are efficiency enhancing when used in moderation, but in the event, a critical mass of them were pushed simultaneously, aided by a buildup of high leverage, similar position-taking, and excessive reliance on—and presumption of—continuous market making and ample liquidity. In this environment, the August 1998 Russian default then came as an event that triggered the wholesale reassessment of risk that ultimately led to the mature market turbulence. Given the environment, some other combination of events could have done the same.

[15]For a summary of market practices, see Counterparty Risk Management Policy Group (1999).

The Roles of Market Psychology, Conjunctural Factors, and Leverage in Virulent Market Dynamics

Market Psychology

In addition to the above-mentioned features of modern finance, market psychology also played a role. Financial markets have long been seen as subject to cycles of market sentiment, in which excessive optimism suddenly shifts to extreme pessimism. This phenomenon is sometimes attributed to market irrationality, but it can have fundamental underlying causes.[16] Early in the cycle, a critical mass of market participants begins to view some investment opportunity in a more attractive light than in the past. This belief might be triggered by a new paradigm; a strong track record of returns; or the observation that those market participants that are viewed as having "inside information" or special expertise are pursuing that opportunity and profiting from it. These can cause trend-following behavior by market participants that extrapolate past returns, and "copycat" behavior by those that attempt to "free ride" on the superior information of "insiders" and "experts."[17] Eventually, some event puts the initial optimism in question and, in response, risk is reassessed and portfolios are rebalanced. Sentiment deteriorates rapidly, capital is withdrawn, and prices fall further, potentially creating a cycle of price declines and eroding sentiment that feed upon one another.

These psychological dynamics are generic to financial markets, and may have been at work in recent years. Suggestions that the economic structure has changed in the 1990s may have led market participants to overweight the recent unusually favorable experience. The short price history of emerging markets provided a potentially distorted picture of the risks in those markets during the early 1990s. Generous liquidity in international financial markets—and a presumption that it will continue to be provided on generous terms—may have boosted asset prices in the 1990s.

Conjunctural Factors

Conjunctural factors also played an important role in the buildup of imbalances before the fall of 1998. In the period 1996 to mid-1998, three interrelated factors appear to have influenced conditions in global financial markets. First, low inflation rates, and in some cases near price stability, in the major countries resulted in very low nominal interest rates and a boom in the major fixed-income markets. Second, liquidity was generally ample, if not

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[16]See Chapter 2 of Flood and Garber (1994).

[17]Empirical studies of herd behavior and momentum trading among institutional investors in mature markets include Grinblatt, Titman, and Wermers (1995) and Lakonishok, Shleifer, and Vishny (1992), which find some statistically significant evidence for momentum trading and herding among U.S. equity funds.

excessive, in international financial markets (but not necessarily in particular domestic markets). Third, competition to manage funds and maintain high returns intensified among major financial institutions, which along with ample liquidity compressed margins in many markets, adding to the incentives to reach for yield. In turn, these conjunctural factors encouraged changes in market features and practices, which later gave rise to the buildup in vulnerabilities through mid-1998.

Interplay of Financial Market Practices and Conjunctural Factors

Although it is not possible to be precise about the separate influences of market practices and conjunctural factors in the buildup in mature market vulnerabilities, market participants have suggested that the following were particularly important:

- *lax attitudes toward risk taking*, including in emerging markets—manifested, inter alia, in ineffective risk management (including the presumption of continuous market liquidity) and overreliance on collateral (which substituted for counterparty risk assessment and concentrated certain risks in some institutions);

- *inadequate transparency about counterparty risk*, because of widespread reliance on off-balance-sheet, OTC, cross-border, and cross-market transactions;

- *mark-to-market accounting*, which contributed to liquidity pressures; and

- *unsustainable leverage*, which became increasingly necessary to remain competitive and meet expectations of continued high returns.

Leverage, Financial Fragility, and Systemic Risk

Perhaps the single most important factor in the buildup of financial conditions that enabled a single credit event—the Russian default—to trigger such large reactions in the deepest and most liquid markets in the world was leverage. Without the exposures magnified by leverage, the effect of moderate shocks on systemically important institutions might not have induced the degree of withdrawal from market making and the extent of selling to meet margin calls witnessed in September and early October 1998. Without such selling pressures, initial declines in prices and widening in spreads might not have been amplified and propagated. Without the amplification and propagation of market shocks, large, systemically important institutions might not have seen the pressures against their profitability and capital that emerged at the height of the market turbulence.

High levels of leverage can give rise to vulnerabilities at every level of the financial system. At the individual firm level, although leverage enhances returns on equity when asset prices move in a favorable direction, leverage also magnifies losses when prices move against the firm’s positions. This magnification of losses increases the risk to the firm’s solvency and the risk that the firm will face margin calls and forced liquidation of securities holdings when adverse price movements occur.

The same applies for groups of financial institutions, particularly when many of them have similar highly leveraged exposures. In those circumstances, high levels of leverage can produce simultaneous swings in the profit-and-loss accounts of many firms, and by the same token, simultaneous adjustments in portfolios. A large market "shock" can also raise concerns that several financial institutions may simultaneously risk substantial losses. Either mechanism may give rise to sharp price declines and spillovers in response to price shocks, for example, owing to disproportionate selling pressures and reassessment of counterparty risk. Thus, modern financial systems can produce potentially disruptive price movements in the presence of high leverage.

At the financial market level**,** high leverage may contribute to price variability, as it could create price movements that reduce efficiency. These may occur first during the buildup of leverage, by leading to misallocations of resources and unsustainable appreciations of asset values, and second during the deleveraging process, in which sharp price reversals that are disruptive and temporarily destabilizing are likely. Unsustainable leverage can cause price swings on the downside that are beyond what is required by efficiency as market participants simultaneously attempt to liquidate leveraged positions in order to minimize losses.

In some circumstances, the risk of market disruptions stemming from high leverage can reach systemic proportions if leverage has built up in several markets simultaneously or through markets that are linked by the similar leveraged, cross-market investment strategies pursued by key participants, or if leverage causes the risk of insolvency in a critical mass of systemically important institutions. The potential for systemic consequences can also increase through highly leveraged price arbitrage between different market segments or markets. The buildup of unsustainable leverage can, in extreme circumstances, transform the financial system into one that is temporarily inefficient and unstable.

Finally, despite the risks raised by leverage, too little is known about how to measure leverage, about its role in modern, complex financial institutions, about the optimal degree of leverage within financial markets, and about whether, and if so how, to regulate it. Because of the paucity of data on financial transactions flows, the most direct and observable evidence (ex post) of the buildup of counterparty risk concentrations and of high levels of leverage are various price data. These include the relatively compressed spreads on higher-risk debt instruments, the prevalence of low or zero initial margin requirements and haircuts on repo transactions, and the relatively easy terms of lending to those engaged in arbitrage in the markets for liquidity and short-term credit. The prevalence of these phenomena during the buildup of leverage, and the severity of the market dynamics during the turbulent deleveraging process last fall, suggest that leverage might have been excessive. However, there is no widely accepted analytical framework for determining and assessing the threshold beyond which leverage in a firm—or in a market or financial system—becomes potentially disruptive. If a comprehensive measure of leverage could be formulated and made transparent, then shareholders, creditors, and counterparties could reflect it in their assessments of counterparty risk and in the cost of capital they charge (see Appendix 1). This would add a degree of market discipline to constrain unsustainable leverage.

Regarding optimality, even if it can be argued that each institution pursues a risk management and leverage policy that appears individually sensible, the buildup of leverage at the systemic level may, due to unforeseen interactions in a crisis situation, reach unsustainable levels. This would suggest that the use of leverage can at times create a significant negative externality with potential systemic consequences.

Private and Public Policy Issues and Challenges

Because of concerns about the activities of hedge funds and especially about the events surrounding the near-collapse of LTCM, consideration has been given to whether to regulate hedge funds to reduce the possibility of their potentially excessive use of leverage. Like all other financial intermediaries, hedge funds use leverage, and in some cases misuse it. However, because the use of leverage is not by any means confined to hedge funds, the issue of reforms in this area should not focus only on regulating and reforming hedge funds. As observed in previous *International Capital Markets* reports,[18] hedge funds have not been the only, or even the largest, financial institutions involved in highly leveraged financial activities in international financial markets. Many other financial institutions, including the proprietary trading desks of commercial and investment banks and other institutional investors, are major participants in the same kind of highly leveraged activity. The financial vulnerabilities that accumulated in and across several markets before August 1998 resulted from the activities of a large number of globally active financial institutions and many smaller specialized institutions (brokers, dealers, settlement systems) in both cash and derivative markets, and was not the outcome of the activities of a single group of financial institutions.[19]

From a public policy perspective, a key concern is that an unsustainable degree of leverage accumulated in the international financial system, with some early warning signs, but without sufficient remedial action to forestall a buildup of vulnerabilities. The relevant participants who could have taken corrective actions include private financial institutions, authorities responsible for supervising internationally active banks and for national market surveillance, and international groupings composed of central banks and national supervisory authorities that monitor international financial markets. The main challenge going forward is for private financial institutions and public policy to maintain the efficiency-enhancing aspects of modern finance while reducing the tendency for financial excesses to build up in the system and generate risks of virulent market dynamics.

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[18]See, for example, International Monetary Fund (1998a).

[19]For a general discussion of the role of hedge funds in the Asian crises see Eichengreen and others (1998).

Importance of Improving Market Discipline

In a market-based economy, internal private discipline (set by internal incentives and enforced by top management in financial firms) and, ultimately, market discipline (provided by external incentives from creditors, equity holders, and counterparties) are the primary market mechanisms for constraining private risk taking and leverage. Internal and market discipline are intended to detect growing financial imbalances within firms and remove them through internal management controls and through market mechanisms (appropriate incentive structures, arbitrage opportunities, profit and loss statements, and market-related governance, including bankruptcies and the threat of takeovers) before they become large and threatening to a particular financial institution, market, or set of markets.[20]

While improving private market discipline has been identified as the most important challenge coming out of the turbulence, insufficient market discipline may itself have been a manifestation of other more fundamental deficiencies. Effective internal and market discipline rely on various other features of the economic and financial system and infrastructure. Of paramount importance are the availability of relevant information and the effectiveness of private and regulatory incentive structures. More broadly, challenges include improving financial disclosure and transparency; understanding and better aligning private, market, and regulatory incentive structures; and better understanding the changing nature of systemic risk. Ultimately, however, the presence of the public safety net for financial institutions—especially the largest systemically important institutions─creates countervailing incentives that work against adequate private internal and market discipline; accordingly, containing moral hazard from such public policies is also a key challenge.

Greater Financial Disclosure and Transparency About Risk Exposures

Disclosure by financial institutions and transparency about their risk profiles is a fundamental requirement for private market discipline and regulatory and supervisory oversight. Without sufficient and timely information about on- and off-balance-sheet activities, the market disciplining mechanisms that are relied upon to address financial

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[20]There is also the presumption that when a single financial institution develops an unsustainable risk profile (for example, because senior management faces inappropriate incentives), this will become known and reflected either in the share price of the firm or in its ability to attract deposits or raise funds within the market place. There is the further presumption in most of the mature markets that the infrastructures are built so as to prevent problems at one institution from necessarily leading to problems at other institutions through the large-value transfer payments systems and through other parts of the private and public financial infrastructures (such as exchanges and securities settlement systems). All of these presumptions rest on the fundamental assumption that there is sufficient information available on a timely basis for investors and counterparts to assess reasonably accurately the risk profiles of their counterparts and their relationships with them.

imbalances before they become vulnerabilities will not produce adequate self-corrective adjustments. Because of the complex nature of modern finance, the information requirements for assessing risk profiles of financial institutions are challenging both for those within the institutions (for risk management purposes and for allocating capital among businesses) and externally for stakeholders (including depositors, investors, creditors, counterparties, and supervisors). In an environment in which risks can be unbundled, repackaged, and embedded in securities, it is not a simple matter for the senior management of a financial institution to obtain accurate measures of the aggregate risk exposures of the institution. Risk managers from the most sophisticated international commercial and investment banks report daily estimates of the firms' capital at risk to senior management, by relying on risk management models and stress tests. The combination of estimation and testing provides management with some, but not necessarily a sufficient, understanding of the firm's existing exposure and how well the firm's portfolio might perform outside historically based scenarios of market stress and turbulence. The financial industry is now developing techniques for more accurately estimating potential future exposure and for assessing the potential impact of systemic disturbances (that is, of liquidity risk) on the amount of capital at risk.

Investors, depositors, creditors, and counterparties to financial institutions also are challenged by the lack of transparency. Often, the only information available about the riskiest off-balance-sheet activity is embedded in footnotes of the firm's presentation of its simplified balance sheet in its annual report. Private stakeholders have the option of not lending to, or not dealing with, counterparts if they do not have sufficient information to manage their risks. However, in the highly competitive environment that existed in the mid-1990s, counterparts appear to have been willing and able to engage cost effectively in counterparty relationships with limited information. A prophylactic for counterparty complacency would be increased disclosure and enhanced transparency of off-balance-sheet activity and other vital parts of a counterpart's operational controls, including risk management.

In addition to the challenges faced by senior managers and counterparties in assessing risk exposures, there are also systemic concerns associated with the lack of transparency. These concerns extend beyond the exposures of individual systemically important financial institutions, and include the degree of concentrations of exposures within specific markets and the linkages across markets. Without such information, it is difficult for those in charge of official market surveillance and systemic risk management to know where all of the risks and vulnerabilities reside within the international financial system and where and how they might be concentrated. Overall, the objective is to enhance the degree of transparency and disclosure so that it strikes the appropriate balance between (1) the type of information that allows counterparts to assess counterparty risk accurately and that allows systemic risk managers to assess market imbalances and vulnerabilities soon enough to take preemptive actions against potentially systemic turbulence, and (2) encouraging and not inhibiting efficiency-enhancing financial activity.

Realigning and Improving Incentive Structures to Promote Better Market Discipline

Greater disclosure and better transparency, in particular about risk exposures, are necessary but not sufficient for improving credit and counterparty risk assessments. Appropriate incentive structures—both within a financial institution and for outside stakeholders—are also required to encourage firms to obtain sufficient information and act upon it properly. Without such incentives, disclosure would not create sufficient market discipline to discourage the buildup of concentrations of exposures and unsustainable leverage within individual financial institutions. This kind of market discipline appears to have been deficient in the period leading up to the turbulence in the fall of 1998.

The overall incentive structure faced by financial institutions is a complex composite of the internal firm-specific structures, a competitive market environment, corporate governance arrangements, and the supervisory and regulatory framework. Internal discipline is guided by business practices, including appropriate capital endowments, sufficient profitability, and acceptable asset quality, and is safeguarded by internal control mechanisms, including risk management and assessment procedures. Effective internal discipline requires the support of an internal incentive structure that aligns incentives of individual business units and individual decision makers with the overall objectives of the institution. The alignment of incentives at various levels of a complex decentralized organization is difficult because decision makers at various levels have the incentive to take rewards and shift associated risks onto others (or into the future).

That the turbulence appears to have been largely unanticipated suggests that risk management and stress testing systems may have been predicated on insufficient information and incomplete views about market dynamics and possible market repercussions from economic and financial shocks, as might be expected during a process of learning and adaptation to structural changes. The systems may not have fully taken into account the pace of financial innovation and the impact on market dynamics and cross-market linkages of the increasingly widespread use of derivative financial instruments. For example, until recently, many global financial institutions maintained separate market and credit risk departments with the consequence that positions that were profitable because of price movements became unprofitable because of their impact on the solvency of the counterpart.

Ultimately, internal discipline is supported (and bolstered) by external market discipline by bank owners, creditors, and counterparties (as well as to some extent by supervisors). However, even if external stakeholders have access to sufficient information about the firms' risk profiles, they may not have strong incentives to closely monitor risk taking and other business activities. External monitoring is likely to be inadequate because of the highly complex nature of modern financial institutions, the opacity of their investment positions to outsiders, the nature of competitive pressures, and free-rider problems that are inherent in widely dispersed counterparty and financing relationships. This possibility of less than adequate private external monitoring by private stakeholders suggests there is a role for

public policy to provide additional guidance, rules, and incentives for proper risk management.

Although possible, it seems unlikely that the apparent inadequacies of internal discipline within financial institutions and external stakeholder governance and control in the recent turbulence were entirely the combined result of coincidental misjudgments and errors. Because transformations in modern finance have altered the way national and international financial markets price and allocate resources, it is reasonable to expect that private incentive structures would also need to adjust to these different ways of doing business. Thus, part of the explanation of insufficient discipline is probably that private incentive structures have yet to adapt to account adequately for financial modernization, securitization (market-based finance), and globalization, and may be neither consistent with, nor supportive of, effective market discipline.

This suggests, in turn, that there may need to be adjustments in the role that public policy plays in ensuring that private incentive structures provide an appropriate degree of market discipline in financial markets. In addition to improving private risk management and prudential oversight over the risk-taking activities of financial institutions, policymakers, supervisors, and financial regulators can enhance the ability of market discipline to prevent systemic problems by providing greater incentives for stakeholders to exercise a greater degree of control and governance over the activities of financial institutions with whom they have business relationships. Moreover, because private and regulatory incentives interact and jointly affect private financial decisions, and because of the potential impact of financial modernization and globalization on them, it would be beneficial to review existing regulations and their potential impact on private incentives to ensure that distortions are not being created. Part of this effort would include providing a proper balance of insurance against systemic risk and disincentives (penalties) for exploiting the financial safety net.

Reducing Moral Hazard

The existence of financial safety nets (for depositors, financial institutions, and markets) creates the presumption that when market discipline is not sufficient to prevent systemic problems, there will be official involvement through the supervisory process and official market surveillance, and occasionally through more direct means of support. Financial stability (for example, in official large-value payments systems) is a public good that can be adversely affected by a collection of private actions. Without some degree of official involvement to insure against systemic risks, private market participants might collectively lack the willingness or ability to undertake optimal levels of financial risk, and they might therefore engage in suboptimal levels of financial intermediation. This seems to have occurred at the height of the market turbulence in the fall, when the widespread fear of private losses disrupted the normal operation of financial markets, to an extent that raised systemic problems. This is one reason why the U.S. Federal Reserve System, and other central banks, intervened to reduce the cost of liquidity and risk taking.

Prudential oversight and other elements of official involvement constitute preventive and corrective mechanisms, which—like market discipline—provide a degree of insurance and stability to national financial systems and, more broadly, to the international financial system. This presumes that the degree of official involvement remains within reasonable boundaries and does not unduly influence market participants into thinking they can engage in imprudent risk taking without suffering the consequences of bad outcomes. The presumption should be that official involvement occurs only so far—up to the point where it encourages normal and prudent risk taking.

This poses a difficult balancing act for policymakers who are responsible for encouraging normal risk taking and at the same time insuring the financial system against systemic problems. The challenge is for banking supervision, market surveillance, and financial policymaking more generally to balance efforts to manage systemic risks with efforts to ensure that market participants—in particular, the systemically important institutions—will bear the costs of imprudent risk taking and, accordingly, will have the right incentives to avoid imprudence. Accountability also needs to be in place, and perhaps bolstered in some cases, to foster and promote discipline in the exercise of official supervision and surveillance.

Improving Understanding of the Changing Nature of Systemic Risk

The evolving character of the global financial system raises challenges for systemic risk management. The national and international lines of defense put in place over the past twenty years to deal with systemic events rest on a certain conception of the nature of systemic risk, one that may have become too narrow given the expanded opportunities for risk taking and reliance on markets for financing. Most of the existing defenses are built on the presumption that a systemic financial event is (confined to) one in which the problems at one institution might cascade through a payments system, interbank relationships, or depositor runs and infect other institutions to the point of posing risks for the financial system itself.

As financial systems have moved from separate national bank-based intermediation systems to a globally integrated market-based system, national payments systems have also been reformed. Market-based systems in which securities are traded in markets have lower potential for traditional systemic risk than bank-intermediated systems: securities firms hold liquid assets that can be traded and have a higher proportion of longer-term funding; and economic shocks are in principle absorbed by price changes, and their effects are spread and dispersed more widely (in fact, almost globally). There is now a much greater reliance on securitized finance in most national financial systems and certainly within the international financial system. This may have created a more market-oriented form of systemic risk, involving an array of markets and their underlying infrastructures, which by and large are privately owned and operated. As a result, systemic risk may now be more highly concentrated in capital and derivative markets, and involve private settlement systems and quasi-private clearing houses.

In addition, there is an element of dynamic competition—a race—between the regulated and the regulator. Because of the combination of technological advances and private incentive structures, private financial practices may be changing more quickly and dynamically than it is possible for supervisory and regulatory frameworks to adapt to monitor them. Likewise, because of differences in resources and incentives, the ability of the private sector to capture the gains from technological advances may have exceeded the ability of officials to learn how these technologies can be applied to the measurement, calibration, and management of systemic risk. As noted by one former senior regulator, the relationship of supervisors and financial institutions is like that of a "bloodhound chasing after a greyhound": regulators have trouble keeping pace with the ability of internationally active financial institutions, and the gap between them may be widening.

Current financial regulatory frameworks generally provide a financial safety net supported by (1) prudential regulations requiring banks to maintain sufficient capital, and (2) reporting and accounting standards, and best business practices. The former are designed to ensure that financial institutions—particularly systemically important ones—have sufficient capital to absorb internally any losses sustained so that taxpayer costs are minimized. The latter are designed to ensure that losses are quickly and adequately reflected in profit/loss statements so that private stakeholders can discipline financial institutions to implement changes that prevent future losses. This general approach has worked reasonably well in limiting collateral systemic damage from private financial excesses and problems. Nevertheless, this approach is not without tensions: it creates potential conflicts between the objectives of regulators, who—by providing insurance—underwrite private risk taking beyond some limit that might not otherwise be taken, and those of regulated institutions, who have incentives to find ways to take greater risks within internal and regulatory capital constraints. A danger in imposing further constraining regulations is that the regulatory environment might then tend to inhibit efficiency-enhancing risk taking; alternatively, the danger in not adequately enforcing existing regulations is that financial institutions will take risks not usually considered worth taking.

There is no final solution to these challenges, and it is neither possible nor desirable for financial supervisors and regulators to know as much about a financial institution and its risk taking activities as its own management. Nevertheless, financial policymakers necessarily must continuously reassess instruments for encouraging prudent behavior and risk management, recognizing that some instruments are likely to be imperfect and blunt. The challenge is to develop instruments that are effective in encouraging prudent behavior and management but that do not inhibit efficiency-enhancing activities. As markets evolve and become more complex, regulatory frameworks need to be continuously well adapted to the changing nature of private financial risk and systemic risk.

In summary, the transformation of the modern financial system is changing the nature of systemic risk. As noted recently by President Tietmeyer of the Deutsche Bundesbank, "...systemic risk is not a given quantity. To a large extent, it is an endogenous variable which depends on the structures of the financial markets, on the supervisory framework at the national and international levels, and on the decisions taken by the political and monetary

authorities."[21] A fundamental concern is that private incentives are not strong enough to prevent excesses and that the existing lines of defense presently inadequately address some aspects of the transformed, more market-oriented systemic risk. A desirable approach is to consider reforming existing private and public mechanisms (including crisis prevention and management mechanisms) for dealing adequately with all of these evolving elements of the international financial system. In addition to reforming private risk management systems, G-10 financial policymakers may also need to consider reforming systemic risk management systems to more effectively deal with the evolving nature of systemic risk and events. This will entail a more global approach, as has taken place so far in the policy discussion on, and reform of, the international financial architecture.

Proposals for Reform

Even before the turbulence in the fall of 1998 had fully dissipated, private market participants, national authorities, and international groupings had begun to consider reforms to address the weaknesses revealed by the episode. The proposals made so far do not take the view that new regulations (except for improved disclosure), and in particular direct regulations for HLIs, are needed at this stage to address the private and public policy challenges posed by the near-collapse of LTCM and the associated market turbulence.[22] Proposals have focused on strengthening market discipline and bank risk management by increasing the transparency of financial institutions through improved disclosure.

Private sector proposals have focused on improvements in private risk management, especially the integration of market and credit risk functions.[23] They stress the need for adapting risk management procedures to the evolving financial environment and for better understanding the role of collateral. Undoubtedly, given the losses sustained at some institutions and lessons learned more generally from the recent turbulence, there have been already, and will continue to be, significant adjustments in risk management policies and practices. This is a favorable result that should help to improve systemic stability. However, some private sector proposals are critical of any attempt to codify risk management practices.[24] Although some private studies advocate enhanced transparency in financial markets, others have expressed doubts about the net benefits of requiring extensive public disclosure of exposures to HLIs and direct disclosure by hedge funds.[25] This approach adds

[21]See Tietmeyer (1999).

[22]The main initiatives, both public and private, are summarized in Annex IV.

[23]See Counterparty Risk Management Policy Group (1999); Institute of International Finance (1999); and International Swaps and Derivatives Association (1999).

[24]For example, see Corrigan and Thieke (1999).

[25]See Harris (1999).

somewhat to more general doubts about whether private initiatives to improve risk management—important and valuable as they will surely be—will be enough to meet the evolving challenges of the increasingly complex global financial system.

Some *national authorities* have suggested changes in private risk management procedures or supervisory practices that go beyond private sector proposals. For example, the U.S. President's Working Group on Financial Markets surveyed the issues surrounding hedge funds and recommended a number of measures designed to constrain unsustainable leverage by improving transparency and private risk management.[26] The Working Group proposed, inter alia, that hedge funds should be required to report their quarterly financial statements to the public, and that all public companies should publicly disclose their aggregate exposures to HLIs. The Working Group also identified a need for regulators to provide guidance on risk management practices. It noted ambiguities in the close-out netting regime and severe shortcomings in the interplay of national bankruptcy laws, in particular vis-à-vis offshore centers. Supervisory directives have been issued in the United States by the Federal Reserve Board and by the Office of the Comptroller of the Currency (OCC). These directives provide guidance on key elements of counterparty credit risk, such as the measurement of credit exposures, and on internal controls to ensure that practices comply with policies. They stress that due diligence—not competitive pressures—should drive the credit decision process.

A Bundesbank report noted that sole reliance on market discipline is unlikely to suffice to contain excessive leverage.[27] The Bundesbank argued that the systemic risks associated with hedge funds depend primarily on the degree of their integration with the banking system. The report proposed an international credit register as an effective monitoring system for creditors and concluded that it would be desirable if hedge funds were required, under direct supervision, to comply with reporting rules and possibly with investment and capital requirements. The Bundesbank recognized the practical difficulties in enforcing national regulatory measures given globalized markets and complex investment strategies.

A Reserve Bank of Australia report indicated there is a case for a public policy response to the emergence of hedge funds.[28] Although the report argues that regulation of some types of hedge funds was warranted, it also acknowledges considerable practical difficulties, including the possible migration of hedge funds to nonregulated offshore centers and the emergence of new institutions similar to hedge funds that would not be covered by regulation. The report concluded that, given these practical difficulties, the most effective

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[26]See United States, President's Working Group on Financial Markets (1999).

[27]See Deutsche Bundesbank (1999).

[28]See Reserve Bank of Australia (1999).

approach would include improving disclosure standards, enhancing the risk monitoring by the creditors of hedge funds, and removing distortions in the Basel capital framework that favor bank exposures to hedge funds.[29] The report also noted that, notwithstanding ongoing efforts toward international coordination, there was scope for unilateral action by national regulators, particularly in the United States, with beneficial effects for the global financial system.

There have also been several *international initiatives*. In addition to risk management practices, these have concentrated on how greater appropriate disclosure could be beneficial for improving counterparty risk assessments by private agents and for enhancing banking supervision and official market surveillance efforts for assessing market and system-wide accumulations and concentrations of risk and leverage.

A draft EU paper on the reform of the international financial system advocated that HLIs should comply with the same rules on transparency and disclosure that apply to other financial institutions.[30] HLIs' overall leverage should be monitored and bank lending to HLIs tightly supervised. The EU paper also proposed a credit register on the overall indebtedness of funds and suggested that financial institutions situated in offshore centers could face higher capital requirements or transparency obligations.

The Basel Committee on Banking Supervision issued a paper on, and sound-practice guidelines for, banks' interaction with HLIs.[31] The paper noted that transactions with HLIs pose special challenges for risk management, given the opaqueness of their activities and the dynamic nature of their trading strategies. It urged supervisors to put in place incentives and standards to encourage prudent management of bank exposures to HLIs. The sound practices call upon banks, inter alia, to adopt credit standards in line with the specific risks associated with HLIs; to monitor exposures frequently; and to develop meaningful measures of potential future exposure and establish appropriate credit limits.

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[29]The Reserve Bank report notes that, according to the current Basel Accord on Capital Adequacy, inter alia, banks' derivative exposures to nonbanks receive only a 50 percent risk weight (implying a 4 percent capital requirement compared with the standard 8 percent for claims on the private sector), that short-dated foreign exchange contracts are zero-weighted, and that on-balance-sheet exposures to hedge funds are treated like other claims on the private sector. The proposed revisions to the Basel Accord address some, but not all, of these issues. For example, the Basel Committee proposes lifting the cap on OTC derivatives risk weights and introducing a new 150 percent risk weight category for poor-quality corporate claims.

[30]See EU Economic and Financial Committee (1999).

[31]See Basel Committee on Banking Supervision (1999b, 1999c).

Ongoing work on these issues is taking place in various international forums. In February 1999, the Financial Stability Forum was established by the Group of Seven (G-7) industrial countries to improve cross-border and cross-sector cooperation of official agencies in identifying incipient vulnerabilities and ensuring that consistent international rules apply across all types of financial institutions. The Financial Stability Forum has three working groups currently examining HLIs, offshore financial centers, and capital flows. The three working groups are expected to prepare reports for the next meeting of the Financial Stability Forum in mid-September 1999.

Work is also under way in various working groups established by the Committee on the Global Financial System (formerly the Euro-currency Standing Committee). One working group is developing templates for disclosure of market exposures and trading positions by the large internationally active banks that will allow national and international authorities to assess market-wide risk exposures and concentrations without knowing details of risk exposures within individual institutions. Another working group is investigating the usefulness of aggregate position data for improving financial system transparency.

Overall, current private and official proposals have emphasized the role of private risk management (the first line of defense) for containing leverage and have viewed regulatory and supervisory activities (the second line of defense) primarily as tools for strengthening market discipline. Much less attention has been devoted to reforms that would improve the ability of supervisory and regulatory frameworks to ensure incentives for a sufficient degree of oversight to effectively monitor and influence the levels of leverage and risk-taking. Appropriate incentives—for bank management, credit and market risk management, and supervisors—supported by effective enforcement through supervisory oversight and guidance are also necessary. In addition, it would be prudent to make clear—through appropriate incentives and disincentives, perhaps requiring new regulations and even laws—that senior management (decision makers) and the financial institutions they manage will bear the cost of mistakes.

Remaining Challenges

The proposed measures for enhanced private risk management are by and large appropriate, but there are several areas that have not yet been addressed fully. Both private and public sectors face important challenges in improving incentive structures, increasing the breadth of information to be disclosed and learning how to best utilize it for prudent financial decision making, and redefining a well-articulated and enforceable role for public policy, in particular supervision and market surveillance (the second and third lines of defense against systemic problems). There are also several important areas where improvements can be made in the public sector’s role in financial policymaking and implementation: better coordinating micro- and macro-prudential oversight; narrowing the gap between the regulators and the regulated; and better understanding the linkages between monetary and financial stability.

Ineffective Incentive Structures

Current proposals do not, at this stage, sufficiently address the role of incentive structures in preventing a buildup of financial vulnerabilities. Internal incentive structures could be improved through an integrated firm-wide and comprehensive approach to risk management and control that aligns the incentives of all players—from back-office to traders to risk officers—with the incentives and risk preferences of senior management and shareholders. Incentives for screening and monitoring by stakeholders could also be encouraged by providing market participants with additional market-based incentives more in line with public policy objectives: for example, by requiring banks to issue subordinated debt.[32] In addressing these inconsistencies in private incentives, official oversight of their implementation can help to ensure that private incentives are more effective.

Official proposals do not explicitly acknowledge the scope for improving regulatory incentive structures. The current proposal to revise the Basel Accord to make it more risk-focused suggests there is likely to be greater flexibility in tailoring the regulatory burden (including capital requirements) to the effectiveness of a firm's risk management and control systems, but this remains to be seen (see Box 4.1). Other similar adjustments in prudential regulations and supervisory oversight may also be considered, many of which have been, and are still being, discussed in the various consensus-oriented committees, subcommittees, and working groups of central banks and supervisory authorities that meet regularly under the auspices of the BIS. In addition to enforcing private sector safeguards, the effectiveness of public sector involvement may be enhanced by evaluating, and improving if necessary, the ability of incentive structures to limit excesses in the transformed global financial system. Part of this effort should include an evaluation of how regulatory and private incentives interact, and whether regulatory incentives are distorting private incentives, especially in light of the modernization and globalization of finance.

Gaps in Disclosure and Transparency

There were also significant gaps in information (vis-à-vis counterparties, supervisors, and the public) in the run-up to last fall's financial turbulence. Official proposals for increasing disclosure requirements and transparency do not clearly delineate what type of information should be disclosed, how often, and to whom (investors, depositors, shareholders, counterparties, or supervisors). This reflects in part the fact that there has not yet been sufficient time to digest completely how modern financial systems have altered the informational requirements for assessing, monitoring, and managing financial risk. Beyond the need to know more about risk exposures, off-balance-sheet activity, and OTC derivative markets, the form the information is likely to take remains unclear. A better understanding of the role of leverage, for example, could provide guidance on the type of information

[32]See Calomiris (1998) and Meyer (1999).

Box 4.1. Proposed Revisions to the Basel Accord on Capital Adequacy

The Basel Committee on Banking Supervision recently issued a consultative paper proposing revisions to the 1988 Basel Accord.[1] The proposals are designed to align capital requirements more closely with a bank's risk profile and to address financial innovations, such as asset securitization and credit derivatives, while at least maintaining the current level of capital in the system.

The 1988 Accord has been criticized for being based on crude measures of economic risk, for permitting regulatory arbitrage between the true economic risk of an asset and the applicable risk weights, and for not providing proper incentives for risk-mitigating techniques. While maintaining in principle the 8 percent risk-weighted capital requirement, the new proposals redesign the risk weights assigned to asset categories and provide some scope for judgments by bank management and supervisors in setting adequate capital. The revisions primarily address credit risk. Explicit capital charges for other types of risk, such as interest rate risk in the banking book and operational risk, are still to be developed. The coverage of the capital rules would be extended to include, on a fully consolidated basis, holding companies that are parents of banking groups. While the new rules would directly apply to internationally active banks, the Basel Committee noted that the guiding principles are generally suitable for any bank in any jurisdiction.

The new framework rests on three pillars: minimum capital requirements, supervisory review of a bank's capital adequacy, and market discipline. The revised *minimum capital requirements*, as the centerpiece of the new framework, build on the existing "standard approach," but would increase the number of risk buckets and allow the selective use of external credit assessments and banks' internal ratings.

- While the current Accord differentiates risk weights for *claims on sovereigns* by membership in the Organization for Economic Cooperation and Development (OECD)[2] (0 weight for members, 100 percent weight for nonmembers), the revised risk weights would be benchmarked to assessments of sovereign long-term foreign currency obligations by eligible external credit assessment institutions (rating agencies and G-10 export insurance agencies) (see table). However, to be eligible for a risk weighting below 100 percent, the country would have to subscribe to the IMF's Special Data Dissemination Standard (SDDS). Supervisors could impose lower weights for banks' exposures to their own sovereign denominated in domestic currency.

- All short-term *claims on banks* (and long-term claims on OECD-incorporated banks) are currently assigned a 20 percent weight, while long-term claims on banks incorporated outside the OECD are weighted at 100 percent. The Basel Committee invites comments on two alternative options. Under the first option, claims on banks would receive risk weights one category less favorable than that of their home country sovereign—with a cap at 150 percent (see table).[3] Under the second option, risk weights would depend directly on the counterparty bank's rating. The weighting on short-term claims would

[1]Basel Committee on Banking Supervision (1999a).

[2]The OECD group comprises, for the purpose of the current Accord, all member countries of the OECD and countries that have concluded special lending arrangements with the IMF associated with the IMF's General Arrangements to Borrow and that have not rescheduled their external sovereign debt within the previous five years.

[3]Risk weights below 100 percent, under either option, would only be admissible in countries that have implemented or endorsed the Core Principles for Effective Banking Supervision (see Basel Committee on Banking Supervision, 1997).

Proposed New Risk Weights
(In percent)

	Assessment[1]					
Counterparty	AAA to AA-	A+ to A	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Sovereigns	0	20	50	100	150	100
Banks						
Option 1[2]	20	50	100	100	150	100
Option 2[3]	20	50[4]	50[4]	100[4]	150	50[4]
Corporates	20	100	100	100	150	100

Source: Basel Committee on Banking Supervision (1999a).

[1]As illustration, assessments are based on Standard & Poor's ratings system.
[2]Risk weighting based on the risk weighting of the country in which the bank is incorporated.
[3]Risk weighting based on the rating of the individual bank.
[4]Claims on banks of a short original maturity, for example, less than six months, would receive a weighting that is one category more favorable than the usual risk weight.

generally be one notch more favorable than the bank's overall risk weight, with a floor either at 20 percent or at the weight applied to its sovereign. It is proposed that claims on securities firms that face risk-based capital adequacy regulations similar to banks would be weighted in the same way as claims on banks.

- The current Accord assigns a uniform 100 percent weight to all *claims on corporates* regardless of credit qualities. Under the new scheme, the 100 percent standard weight bucket would be supplemented by a 20 percent weight bracket for very-high-quality corporates and a 150 percent weight bracket for very-poor-quality corporate claims (see table).

- *Mortgages* on commercial real estate would not be considered, in principle, to justify a weight of less than 100 percent. Mortgages on residential property would retain the current 50 percent weight.

- The Committee is proposing to use external ratings to set capital charges for *asset securitizations* to reduce incentives to employ securitization to circumvent capital requirements. The risk weights would range from 20 percent on securitization tranches rated AA- or better to 150 percent on tranches rated BB+ or BB-; lower-rated tranches would be deducted from capital.

- The existing conversion factors on *off-balance-sheet items* would remain largely unchanged. The new proposals would abolish the 50 percent cap on risk weights of OTC derivative exposures and would impose a 20 percent risk weight on short-term business commitments (in place of the current zero risk weight).

- The Committee also suggests revising the capital treatment of *risk-mitigating techniques* (such as credit derivatives, collateral, guarantees, and on-balance-sheet netting). It proposes to expand the definition of eligible guarantors (currently only OECD public sector entities and multilateral development banks) and eligible collateral (marketable securities) to all guarantors and financial assets that attract a risk weight lower than the underlying exposure.

Subject to supervisory approval, internal credit ratings—and, at a later stage, portfolio credit risk models—could form the basis for setting capital charges at some sophisticated banks, with details to be proposed in a forthcoming paper.

The purpose of the second pillar of the proposed new framework—*supervisory review*—is twofold: to ensure that a bank's capital position is consistent with its overall risk profile and strategy, and to encourage early supervisory intervention if capital does not provide a sufficient buffer. Supervisors would encourage banks to develop internal capital assessment processes that are conceptually sound and robust. But at the same time, supervisors would have the ability to require banks to hold capital in excess of the minimum depending on the quality of bank management, its track record in managing risks, and business cycle effects as well as the overall macroeconomic environment.

The third pillar, *market discipline*, is viewed as an additional lever—supplementing and supporting supervision—to strengthen the safety and soundness of the banking system. A precondition for effective market discipline is informative disclosures of capital levels and of the nature and magnitude of risk exposures that would enable market participants to encourage banks to hold adequate capital.

regulators and supervisors can provide to market participants about industry or market-wide vulnerabilities. Supervisors might make information available to financial institutions about prevalent types of position taking in key markets that could serve as input to firms' stress testing exercises with a view to more accurately assessing the simulated market dynamics in response to economic shocks. Those performing market surveillance could also disclose information on aggregate market positions to indicate market excesses and concentrations. Indeed, with global markets, closer coordination among supervisors and those performing market surveillance could be beneficial.

Further improvements in information on the extensive off-balance-sheet activities by financial institutions could prove useful for both supervision and surveillance. As supervisors intensify their information gathering efforts, particularly with regard to OTC derivatives, and refine their methods of assessing risk exposures related to derivatives in individual institutions, a finer reporting network for surveillance purposes could be established based on the information collected in the course of the supervisory process and subject to confidentiality rules and laws. Such a system could provide those responsible for surveillance—including major central banks—with more timely and more detailed information on off-balance-sheet activity (transactions flows and outstandings) by internationally active financial institutions than is currently available through direct reporting. A more reliable and timely system of surveillance of off-balance-sheet activities would also assist supervisors in locating risks in institutions and markets.

Improving the Analytical Understanding of Modern Financial Systems

As noted by U.S. Federal Reserve Chairman Alan Greenspan (well ahead of last fall's mature market turbulence), "We do not as yet fully understand the new system's dynamics. We are learning fast, and need to update and modify our institutions and practices to reduce the risks inherent in the new regime."[33] Current proposals do not take a broad view of the potential impact of financial structural changes—the modernization and globalization of finance—on the structure of modern financial institutions, the nature of market dynamics, the interplay of private and regulatory incentive structures, and the changing nature of private and systemic financial risk.

Many of the current analytical frameworks were designed to assess and monitor risk exposures, risk concentrations, leverage, financial fragility, and systemic risk stemming from balance-sheet items associated with traditional banking activities. Credit risk remains the predominant financial risk for banks and needs to be better understood and modeled, especially as it now also takes on different forms, much of it off balance sheets. Analytical frameworks also need to be developed to better understand the role of leverage, the nature of

[33]See Greenspan (1998).

existing gaps and incompatibilities between private and regulatory incentive structures, and the resulting changes in market dynamics. For example, as part of market surveillance, it would be useful to have an analytical framework for weighing the efficiency enhancements of leverage against the higher risks and market volatility that it can create. The public sector, and in particular central banks, could take a lead role in developing an informative analytical framework, which would be useful for shaping disclosure requirements and to determine what information should be collected and processed at the individual institution level and various levels of aggregation.

Other Challenges for the Public Sector

There are other important challenges for the public sector's role in strengthening supervision and surveillance: at the nexus of micro- and macro-prudential oversight; in the gaps between regulators and the regulated; and possibly in gaps between frameworks for ensuring monetary stability and financial stability.

First, financial system stability depends on the soundness of individual financial institutions, especially those that are systemically important. There may be unexploited synergies between macro-prudential—concerned with financial system stability—and micro-prudential oversight—concerned with the soundness of individual financial institutions. Although meetings occur regularly in international forums, more extensive discussions between supervisors of the internationally active banks could have helped to detect the predominance of creditor and counterparty exposures to LTCM and other hedge funds, and possibly have helped to prevent the buildup of problems last fall. Supervision could benefit from market intelligence gathered through market surveillance to obtain a market perspective on the risks faced at the firm level, while those performing market surveillance could benefit from knowing about financial institutions' market-related activities. Better coordination between macro-prudential market surveillance and micro-prudential financial supervision, and (public) disclosure of information gathered from supervisory activities, could help to limit the accumulation of market imbalances.

Second, because of advantages in the way they use information and technology, and their access to resources, financial institutions have informational advantages over regulators. Competition spurs financial firms to create new financial products, from which they earn rent, by utilizing state-of-the-art financial and information technologies, and they have more knowledge about their own positions and trading strategies than do supervisors. By contrast, the capabilities of public authorities to assess the implications of these financial innovations lag the private sector's capabilities to exploit those innovations. In essence, there are asymmetries between regulators and those they regulate in the understanding of changes to financial businesses and in the application of new financial and information technologies. Widening gaps are limiting the ability of regulators and supervisors to monitor global financial markets, oversee financial institutions and activities, and enforce regulations. Moreover, in view of the national orientation of supervisory, regulatory, and surveillance structures, the globalization of financial markets and the rise of financial conglomerates have

also widened jurisdictional gaps. Thus, as noted earlier, continuing efforts are required to update supervisory tools and regulatory frameworks, at a minimum to prevent these gaps from widening, and preferably to reduce them.

Third, there are close linkages between monetary stability and financial stability. Although it is unlikely that monetary policies in the major countries contributed directly to this buildup, they may have played a role. In discussions during the past two years, private market participants in the major international financial centers often noted that there was ample liquidity in international financial markets driving spread compression. Without judging whether this is correct, there may be channels through which national monetary policies have an unintended impact on the global pool of liquidity. For example, while low Japanese interest rates of 0.5 percent may have been appropriate for promoting aggregate demand in Japan in 1997–98, they also were associated with the heavy reliance on the yen carry trade, which supplied liquidity to several regions via swaps in international capital markets. Similarly, monetary policies in other major financial centers have likely contributed to global liquidity from time to time.

Because national monetary policies affect the global pool of liquidity, they may also at times support, if not encourage, a buildup of leverage and position taking in international markets beyond prudent levels. Current analytical and policy frameworks for conducting monetary and financial policies in the major countries are unlikely to detect growing imbalances of this kind. Thus, there may be important gaps in the ability to monitor international monetary and financial developments: on the one hand, at the nexus of monetary and financial stability, and on the other hand, at the nexus of achieving domestic and international stability. These issues may also require careful consideration by national monetary and supervisory authorities and international bodies composed of national authorities that address related issues regularly in international meetings and forums.

Overall Assessment and Conclusion

Current reform proposals emphasize improving transparency and disclosure and strengthening private risk management, with the objective of enhancing market discipline. One reason leverage and risk concentrations may have produced potential systemic problems is that corrective market mechanisms apparently did not sufficiently limit growing imbalances within financial institutions and across financial markets. Ultimately, vulnerabilities became large enough that they had to be contained. Various proposals for reform are now under active discussion and consideration by official forums, including the newly created Financial Stability Forum, and many of the issues raised in this chapter are likely to be addressed. The key challenge for private financial institutions and for public policy is to maintain the efficiency-enhancing aspects of modern finance and to reduce the tendency for the system to experience financial excesses and virulent market dynamics.

An initial approach should be to identify concrete and pragmatic ways in which the existing lines of defense against systemic problems can be bolstered and, if necessary,

reformed. More information would improve the ability of financial institutions to strengthen quantitative and qualitative tools for managing financial risk. Better and more timely public disclosure of appropriate information, including about the risk exposures of the financial institutions, could also potentially improve the ability of private stakeholders to assess risks and act accordingly in pricing risk and allocating portfolios. Likewise, the ability of supervisors and those responsible for surveillance to exercise adequate oversight could also be improved, with more accurate and comprehensive information about the size and nature of exposures across the complete range of an institution's activities, including both balance-sheet and off-balance-sheet activities. The ability to understand, measure, monitor, and control the buildup of leverage and other aspects of risk taking should be an important part of this agenda.

This, however, is only part of the solution. To know what information is required requires analytical frameworks capable of understanding, assessing, and monitoring modern finance. Authorities can contribute by developing analytical frameworks for understanding, measuring, calibrating, and controlling the degree of leverage in financial systems, including by rigorously pursuing both monetary and financial stability objectives and through prudential oversight and market surveillance. There are no simple solutions to these analytical problems, and they need not be seen as part of a supervisory effort to "run their businesses for them." Just like the institutions they monitor, supervisors also require new tools and techniques and better and more comprehensive information, not necessarily exclusively for examining individual institutions. No one has a comprehensive picture of the positions building up in OTC derivative markets or of the credit with which these positions are leveraged. National market surveillance also can be improved to be better able to obtain market-wide and system-wide views of growing vulnerabilities that extend beyond inferences from price data about unobserved market activity: data on transactions or some measure of demands and supplies would also be useful.

In a market economy, financial decision making is driven by incentives. The incentives faced by modern financial institutions, especially those that are globally active, are a complex composite of laws, regulations, supervisory guidelines, and private incentive structures. The financial playing field has been greatly transformed by the modernization and globalization of finance, and financial institutions are continuously engaged in a learning process about how to profit from these changes. During periods of learning, understanding of risks can lag behind technical capabilities and opportunities, and the effectiveness of internal discipline can thus become impaired. Moreover, just as regulators have lagged behind financial institutions, incentive structures may have become less effective in achieving their desired objectives and may be affecting behavior in unintended or even unexpected ways.[34] To some extent the proposed revisions to the Basel Accord are recognition of this possibility, but more needs to be done in other areas. Tangible reforms to regulatory incentives are

[34]If incentives were effective and appropriate, the private sector might then have good reason to obtain the information it needs to make more prudent decisions.

difficult to identify without first reexamining the applicability of the existing rules of the game, in light of the modernization and globalization of finance. This may not be urgently required, but it seems to be a prerequisite for proposing long-lasting improvements to the effectiveness of market and regulatory discipline. Although challenging, it would also be beneficial to have a clearer sense of how incentives, risk taking, market structure, and market dynamics interact in modern financial systems.

In the meantime, financial markets will continue to evolve. Private market participants now have gained experience from the financial excesses and market turbulence of last fall and appear to be reforming internal risk management and control systems. Top management also seems to have been more clearly setting risk tolerances to send clear signals to the various lines of business that make up modern financial institutions. Mechanisms need to be put in place, and monitored sufficiently within the firm and through supervisory oversight, to limit imprudent risk taking and its consequences. No doubt, the next financial problem will be driven by some other aspect of risk taking, so vigilance and flexibility are required.

Finally, there should be little doubt that, at the margin, moral hazard also played a role. Moral hazard is an inevitable consequence of ensuring financial stability. Given that financial stability is a public good, the public sector necessarily must provide insurance to protect against systemic problems. Without this insurance, private market participants may not collectively achieve an optimal level of risk taking and financial intermediation, in part because they cannot adequately protect themselves privately against systemic risk. With insurance comes a degree of moral hazard, but the combination of insurance and moral hazard should provide an equilibrium outcome with higher social welfare than without it. To limit moral hazard and maintain the welfare-improving equilibrium, the public sector must also effectively monitor and limit risk-taking behavior that would impinge on the balance of welfare considerations; in particular, those individual institutions who are most capable of exploiting the public sector safety net.

The appropriate balance between market discipline and official intervention involves difficult trade-offs between different objectives. On the one hand, financial safety nets appear to have significantly lessened the deadweight losses and collateral damage associated with financial crises earlier this century. On the other hand, the safety nets themselves may be contributing to excessively risky behavior and may involve potentially large costs to taxpayers. A complicating factor in seeking to rely more on supervision and regulation is that the large globally active financial institutions are able to circumvent regulation through gaps between the information sets of supervisors and the institutions themselves. Banking supervision, official market surveillance, and systemic risk management are the tools for monitoring. The buildup of financial vulnerabilities that only became evident once the turbulence occurred last autumn was a wake-up call: existing frameworks for banking supervision, official markets surveillance, and managing systemic risk may not be sufficient for the modern financial system.

Ultimately, the part of the insurance provided by the public sector that may create the most obvious moral hazard is that the public sector has in the past intervened to save institutions, either directly or indirectly through markets. One possibility for limiting moral hazard is to take more frequent decisions that reduce the perception that interventions are the rule and failures the exception, for example, by gradually but deliberately reducing the size and scope of the safety net. The U.K. authorities may not have deliberately had this in mind when Barings was allowed to fail, but there can be little doubt that it had a sobering impact on U.K. financial institutions. The more general objective would be to have greater involvement of the private sector in preventing systemic problems, not just through improved private risk management to protect themselves, but also through greater awareness that their actions have systemic implications and are affected by systemic problems created by others. Given that the scope of official financial safety nets is unlikely to be reduced quickly or entirely, the ability to monitor, supervise, and surveil modern financial systems remains critical.

Appendix 1

Off-Balance-Sheet Leverage

Leverage is the magnification of the rate of return (positive or negative) on a position or investment beyond the rate obtained by a direct investment of own funds in the cash market. Leverage is of concern because (1) by definition it creates and enhances the risk of default by market participants; and (2) it increases the potential for rapid deleveraging—the unwinding of leveraged positions—which can cause major disruptions in financial markets by exaggerating market movements.[35]

For private and systemic risk management, and market surveillance, it would be useful to have broad measures of the extent of leveraged positions in capital markets. This knowledge would allow market participants to assess the potential for rapid price movements resulting from exogenous adverse market shocks that may cause investors to deleverage in an attempt to mitigate their losses. Anticipation of possible turbulent deleveraging might limit the buildup of unsustainable leverage. Hence, a publicly available measure for overall leverage by institutions and in markets could enhance self-stabilizing forces without necessitating disclosure of proprietary position data to the public. Since leverage in modern financial markets can easily be assumed by using derivative contracts, it is useful to have a measure that captures not only on-balance-sheet leverage but also the leverage implicit in off-balance-sheet transactions. Despite its importance, empirical measures of leverage are difficult to implement.

Leverage is traditionally measured by the ratio of a firm's total assets relative to its equity. Calculating this ratio is straightforward if the firm only relies on balance sheet transactions, such as bank loans. However, if the firm uses off-balance-sheet transactions, such as derivative instruments, the measurement of leverage is more complicated. This appendix first explains how the leverage that is implied by the most common derivative instruments could be measured. More complicated derivatives, such as swaps and structured notes, can generally be decomposed into spot market, forward, and option positions and will therefore not be considered separately. The appendix also presents methods for aggregating leverage within an institution and within markets.[36]

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[35]See International Monetary Fund (1998b), Box 3.3.

[36]Leverage has the capacity to increase risk. For a given equity base, leverage allows the borrower to build up a larger investment position and thus higher exposure to market risk. Since leverage increases the potential loss triggered by a given adverse price movement, leveraged investors are likely to adjust their positions sooner than pure equity investors. The simultaneous unwinding of large leveraged positions may, in turn, trigger further price movements and therefore increase risk.

Leverage Implicit in Plain Vanilla Derivative Instruments

To assess leverage resulting from a derivative contract, the contract can be decomposed into its cash market equivalent components. The basic derivative instruments—forwards and options—can be replicated by holding (and, in the case of options, constantly adjusting) positions in the spot market of the underlying security, and by borrowing or lending in the money market. This replication of the contract maps the individual components into own-funds equivalents (equity) and borrowed-funds equivalents (debt), which can be used to measure the leverage contained in long and short forward positions and option contracts.

Consider, as an example, a long forward contract on a security that, for simplicity, provides no (interest or dividend) income. Purchasing a security forward is equivalent to borrowing cash at the risk-free interest rate, supplementing the borrowed funds with own funds in the amount that would otherwise be spent on the forward contract, and investing the total amount in the underlying asset. In the replicating portfolio, own funds are equivalent to the market value of the contract;[37] the sum of own and borrowed funds is equivalent to the contract's current notional value.[38] Hence, the leverage ratio implicit in a forward contract is defined as the current notional value relative to the contract's market value. As a short forward position is tantamount to a short position in the underlying asset, its leverage ratio—defined in the same way as that of a long forward ratio—is negative. To compare leverage ratios for short positions and long positions, it is therefore necessary to take the absolute value of leverage ratios for short positions. Leverage ratios for long and short option positions can be calculated in a similar fashion (see Table 4.1).

[37]The market value of a derivative contract, in turn, might be financed by on-balance-sheet debt and on-balance-sheet equity.

[38]The *current notional value* of a derivative contract is defined as the product of the number of underlying shares and their current market price. By contrast, the *notional amount* refers to the product of the number of underlying shares and the delivery (exercise) price specified in the contract.

Table 4.1. Leverage Ratios in Basic Derivative Instruments

Derivative	Long Position	Short Position
Forward contract	$\frac{\text{current notional value}}{\text{market value of contract}}$	$\frac{-\text{ current notional value}}{\text{market value of contract}}$
Call option[1]	$\frac{\text{(delta) x (current notional value)}}{\text{option price}}$	$\frac{-\text{(delta) x (current notional value)}}{\text{option price}}$
Put option[2]	$\frac{-\text{(delta) x (current notional value)}}{\text{option price}}$	$\frac{\text{(delta) x (current notional value)}}{\text{option price}}$

[1] The "delta" of an option—also called the "hedge ratio"—is defined as the rate of change of the option price with respect to the price of the underlying asset.

[2] The delta of a put option, Δ_t^p, is related to the delta of an equivalent call option ($\Delta_t^p = \Delta_t^c - 1$).

As the price of the underlying asset changes, the value of the forward contract—and thus the value of equity—will change, which implies a continually changing leverage ratio. This is similar to on-balance-sheet leverage: as the value of the underlying security increases (decreases), the investor's equity rises at a faster rate than the value of the assets, thereby reducing the leverage ratio, and vice versa. The leverage ratio could ultimately reach infinity when losses equal the equity in the position.[39] However, for exchange-traded derivatives the ratio is bounded as a result of margin requirements. Futures margin requirements range between 2 percent and 8 percent, implying maximum leverage ratios between 50 and 12.5. Although leverage in forward contracts is typically not bounded by margin requirements, it may be limited by overall credit and trading limits that institutions have with each other.

Aggregate Leverage of a Financial Institution

The mapped asset components can be aggregated for an institution and expressed relative to its on-balance-sheet equity. There are at least two ways of aggregating assets to arrive at an overall measure of leverage for a financial institution: the "gross leverage ratio" and the "net leverage ratio." Both ratios add the spot market asset equivalent components in

[39]Note that the leverage ratio in this appendix is defined to remain at infinity when losses exceed equity, even though the mathematical ratio would change signs.

some form to on-balance-sheet assets before dividing by on-balance-sheet equity.[40] To the extent that the institution's overall equity is positive, the leverage ratio will be less than infinity, even though some of its positions may have infinite leverage.

The "gross leverage ratio" adds the absolute amount of short (negative) asset equivalents to that of long (positive) positions. Hence, this ratio, in general, overstates the total market exposure, as short positions may offset long positions to some extent. Subtracting short asset positions from long asset positions yields the "net leverage ratio," which is smaller than the gross leverage ratio. Both ratios measure the relationship between an investor's exposure and that investor's equity. While the net leverage ratio may more accurately reflect the market risk of a leveraged investor, it does not take into account credit and liquidity risk inherent in the individual contracts. By contrast, the gross leverage ratio incorporates all those risks.

As a third measure of leverage, the U.S. President's Working Group on Financial Markets proposed the value at risk of an entity's portfolio relative to its equity. It is, however, not a measure of leverage per se. Rather, it is a measure of risk and addresses whether an institution's equity is sufficient to cover potential losses due to market risk. Hence, it could be called the "risk coverage ratio." Unlike the leverage ratio, this ratio does not capture the extent to which the institution has pooled economic resources from outside debt investors and therefore its systemic importance. To judge the "riskiness" of an institution, it would be useful to know all three ratios.[41] Regulators are currently considering whether disclosure of these ratios ought to be required.

It is impossible to precisely measure leverage for institutions active in derivative markets without full knowledge of their positions, including hedges. However, data filed by commercial banks and trust companies in the United States with the OCC allow an approximation. As gross market values of derivative positions (not subject to netting) are itemized as assets and liabilities on the balance sheet, changes in the value of these positions directly affect the firm's equity. Hence, the ratio of current notional values outstanding to the equity of the institution indicates the extent of off-balance-sheet gross leverage. The sum of this ratio and the conventional balance sheet leverage ratio can serve as an approximation to the overall gross leverage ratio. The net leverage ratio cannot be calculated without further information about the nature of the positions.

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[40]Alternatively, the off-balance-sheet gross and net leverage ratios could be calculated by dividing the sum of asset equivalent components by the sum of equity equivalent components. Positions that have an infinite leverage ratio will contribute only to the numerator and not to the denominator.

[41]Two important shortcomings are that these ratios, by their nature, need to be reported by the financial institutions themselves and that estimates of value at risk used for the risk coverage ratio data are predicated on very specific assumptions.

Gross off-balance-sheet leverage of the top 25 U.S. banks, which in 1998 held approximately 99 percent of the total notional amount of derivatives in the domestic banking system and 38 percent of derivatives outstanding worldwide, exceeded the leverage of the remaining domestic commercial banks by a wide margin.[42] For the latter group the ratio ranged around 0.1, indicating virtually no derivatives activity.[43] In the aftermath of the 1996 bond market turbulence and the associated deleveraging, leverage among the top 25 banks increased gradually from 70 in 1996 until the second quarter of 1998 (see Figure 4.1). It surged by 18 percent to 91 in the third quarter of 1998.[44] The increase was largely due to an upsurge in derivatives exposures rather than a decrease in capital (see Figure 4.1). In contrast, traditional balance-sheet leverage ranged between 6 and 7 during the same period. While the gross leverage ratio only provides an upper bound to net leverage, the relative movements confirm the concentration of off-balance-sheet leverage among a few banks and a significant increase of leverage during the third quarter of 1998.

Leverage in Markets

To determine the potential for financial market turbulence stemming from deleveraging it is useful to estimate the extent of leveraged positions in a particular market. In practice, it is not possible to gather such data without individual position data, particularly for off-balance-sheet transactions. However, the recent BIS survey of foreign exchange and derivatives market activity (see Box 2.1) allows approximations of the extent of leverage in certain derivatives markets on a global basis. The survey reports total gross notional amounts and total gross market values outstanding at the end of June 1998 in various segments of the foreign exchange derivative and interest rate derivative markets. Notional amounts are aggregated in a similar fashion as suggested for the gross leverage ratio. Based on the definitions of leverage introduced above, the notional amounts outstanding divided by the gross market value approximates the gross leverage ratio.[45]

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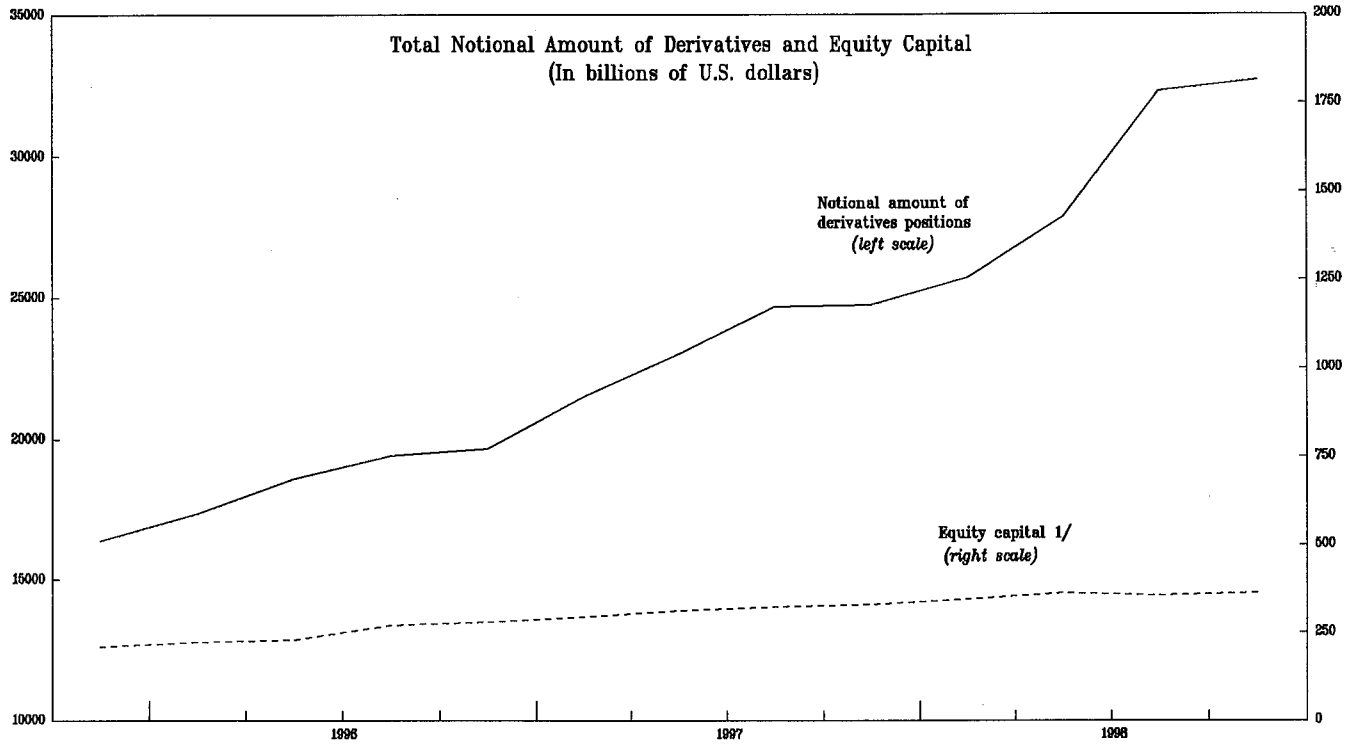
[42]Risk-based capital, the sum of Tier 1 and Tier 2 capital, was derived from data from the Office of the Comptroller of the Currency.

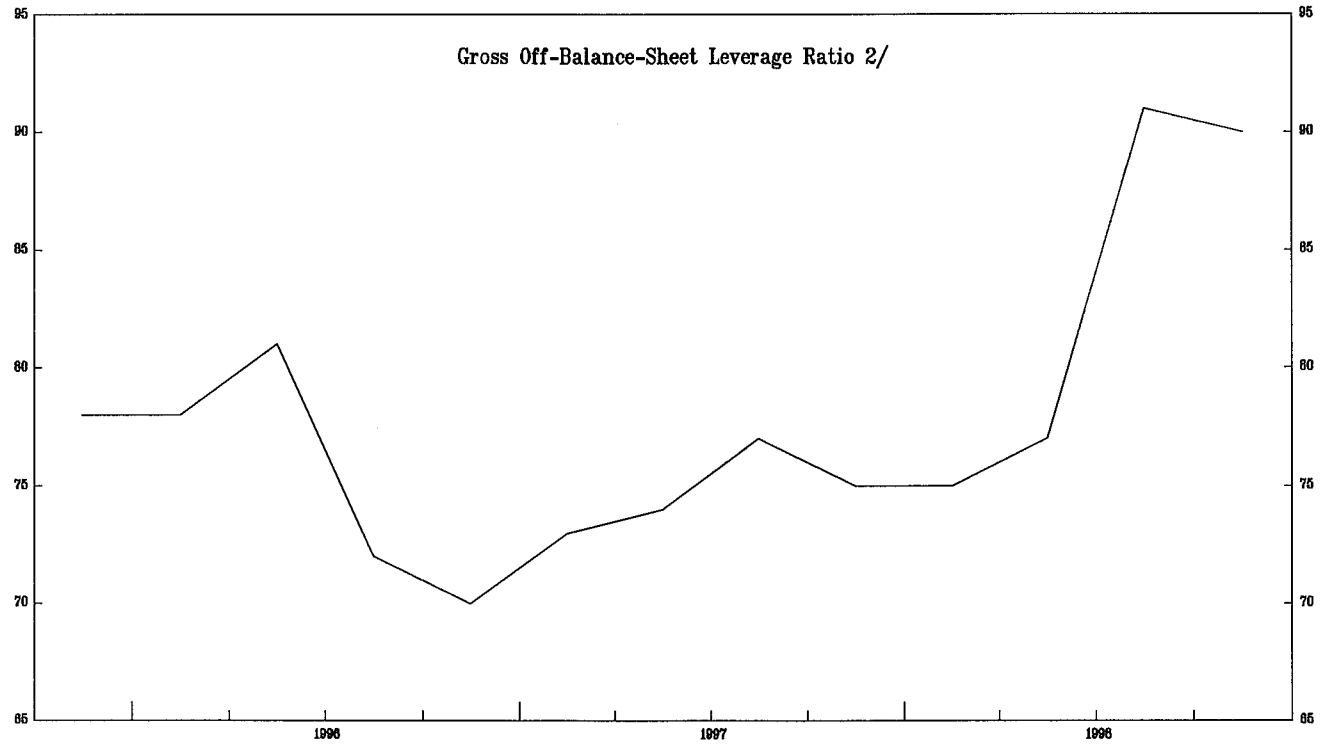
[43]The reported figures overstate the gross leverage ratio because the “delta”of option contracts is assumed to be 1 (owing to lack of data) and because the reported notional amounts are valued at exercise (delivery) prices, and not at current market prices.

[44]One globally active bank reached a ratio as high as 579.

[45]See footnote 43.

Figure 4.1. United States: Top 25 Commercial Banks -- Notional Amount of Derivatives, Equity Capital, and the Gross Off-Balance-Sheet Leverage Ratio, Fourth Quarter 1995-Fourth Quarter 1998





Source: Office of the Comptroller of the Currency.

1/ Tier 1 plus Tier 2 capital.

2/ The gross off-balance-sheet leverage ratio is defined as the ratio of notional amount of derivatives outstanding divided by equity capital (Tier 1 plus Tier 2 capital).

The data indicate that the overall approximate gross leverage ratio increased from 22 in 1995 to 28 in 1998 (see Table 4.2).[46] Interest rate derivative contracts had higher leverage ratios than foreign exchange derivative contracts, reflecting the fact that the latter—unlike the former—typically involve an exchange of principal. In addition, interest rates tend to be less volatile than exchange rates, so that market values of interest rate contracts (for a given notional amount) tend to be smaller than those of foreign exchange contracts. The latter also represent exposure to both currency and interest rate risks, which also contributes to a higher market value relative to the notional amount. The high degree of leverage in option contracts can mostly be attributed to the lack of information about the delta.

[46]This compares to a ratio of 36 for the top seven U.S. commercial banks at the end of the second quarter of 1998.

Table 4.2. Global Positions and Approximate Gross Leverage Ratios in OTC Derivatives Markets by Type of Risk Instrument[1]

	Notional Amounts[2]		Gross Market Values[2]		Approximate Gross Leverage Ratio		
	March 1995	June 1998	March 1995	June 1998	March 1995	June 1998	Percentage change
	(In billions of U.S. dollars)						
Foreign exchange contracts	13,095	22,055	1,048	982	12	22	80
Outright forward and forex	8,699	14,658	622	584	14	25	79
Currency swaps	1,957	2,324	346	255	6	9	61
Options	2,379	5,040	71	141	34	36	7
Other	61	33	10	2	6	17	170
Memorandum item:							
Exchange-traded contracts	119	103	...	...	...	...	...
Interest rate contracts [3]	26,645	48,124	647	1,354	41	35	-14
Forward rate agreements	4,597	6,602	18	39	255	169	-34
Swaps	18,283	32,942	562	1,186	33	28	-15
Options	3,548	8,528	60	126	59	68	14
Other	216	52	7	2	31	26	-16
Memorandum item:							
Exchange-traded contracts	9,722	13,107	...	...	...	...	...
Equity-linked contracts	579	1,341	50	201	12	7	-42
Forwards and swaps	52	180	7	22	7	8	10
Options	527	1,161	43	180	12	6	-47
Commodities contracts	318	506	28	39	11	13	14
Gold	147	228	10	9	15	25	72
Other commodities	171	278	18	30	10	9	-2
Forwards and swaps	120	165	13	...	9	...	...
Options	51	113	5	...	10	...	...
Credit-linked and other Contracts[4]	...	118	...	4	...	30	...
Estimated gaps in reporting	6,893	...	432	...	...	...	...
Total contracts	47,530	72,143	2,205	2,580	22	28	29

Source: Bank for International Settlements.

[1]Adjusted for inter-dealer double-counting.
[2]The surveys of March 1995 and June 1998 are not fully comparable because of differences in the reporting basis (locational reporting in 1995; worldwide consolidated reporting in 1998) and in the number of participating countries (26 in 1995; 43 in 1998).
[3]Single-currency contracts only.
[4]Not adjusted for double-counting.

Appendix 2

Impact of HLIs on Small and Medium-Sized Markets

In addition to the systemic issues posed by high levels of leverage, recent attention has also been paid, especially in the Pacific Rim countries, to the impact of HLIs on some of the small and medium-sized financial markets.[47] A number of countries, including Australia, Hong Kong SAR, South Africa, and Malaysia, have expressed concern about the implications of the size and concentration of positions taken by a number of HLIs (especially hedge funds) in their markets, and there have been suggestions that the aggressive tactics of some of these institutions have contributed to excess volatility and mispricing in foreign exchange rates.[48] There have, in addition, been numerous newspaper reports questioning the activities of hedge funds in various countries, including in the Pacific Rim,[49] and a frequently heard market view is that the large hedge funds "hunt in packs."

Responding to similar concerns raised two years ago, the IMF undertook a study of the role of hedge funds in the Asian crisis, and there has also been some research outside the IMF on the activities of hedge funds in Asia.[50] While recognizing that lack of data seriously hampered the analysis, the IMF study reached the conclusion that "popular press" accounts of hedge funds seriously exacerbating the Asian crisis were exaggerated, drawing on anecdotal evidence, discussions with market participants, and return data for hedge funds. In addition, the study suggested that sharp distinctions between hedge funds and other highly leveraged players were overdone and that the proprietary trading desks of some of the internationally active commercial and investment banks frequently engaged in similar activities to hedge funds; moreover, in terms of size, hedge funds were not obviously the largest institutional investors in many of the Asian currency markets, nor were they—contrary to popular accounts—always ahead of the pack in taking positions against currencies.[51] The study, however, only covered the period through the end of 1997, and some

[47]The buildup in large positions against a number of Pacific Rim countries by some HLIs during 1998 is discussed in Chapter III (see Box 3.2).

[48]See, for example, Reserve Bank of Australia (1999).

[49]See Krugman (1998).

[50]See Eichengreen and others (1998); and Brown, Goetzmann, and Park (1998).

[51] By contrast, the Reserve Bank of Australia's discussion of hedge funds takes the view that hedge funds are fundamentally different from other HLIs because they are lightly regulated and do not have longer-term relationships with countries. The latter is argued to lead to more aggressive trading strategies.

HLIs, including hedge funds, may subsequently have significantly expanded the nature and scope of their activities giving rise to the concerns noted above.[52]

In assessing the concerns about HLI activities, it is useful to distinguish between issues raised by the large differences in size between many small markets and the large internationally active institutional investors, and issues of market integrity related to the large and concentrated positions some HLIs may have taken in particular markets. The significant asymmetries in size between some international investors and the markets in which they operate clearly present difficult policy dilemmas for many countries. Large swings in capital flows between advanced and emerging markets have, on several occasions, been driven by autonomous shifts in sentiment in the large advanced countries and may have been an important source of volatility in recipient countries' foreign exchange and domestic asset markets.[53] The surges in capital inflows have presented particular problems when international investors are seen as exhibiting herd-type behavior and the capital inflows can be quickly and easily reversed.[54] Even though HLIs appear to have played a role in these episodes, many other institutions also have been involved—most likely playing a larger role on account of their number and size—and broader systemic issues are raised about the structure and operation of international capital markets.[55] The concerns are being addressed, at least in part, through efforts by the international community and national regulators to improve transparency in order to lessen the role of herding; proposed improvement in Basel bank risk weights on country exposures; and strengthening financial systems and infrastructures in capital-importing countries. The implications for market dynamics of the significant differences in size between "smaller" markets and the larger institutional investors nevertheless remains an important issue.

An especially contentious issue is whether some HLIs have aggressively tried to manipulate some small and medium-sized markets—acting either alone or in collusion—and whether these efforts have been a major and systematic source of volatility and inefficiency. Although the particular strategies that HLIs employ is proprietary information, anecdotal evidence from a number of private market participants is consistent with the possibility that some institutions have employed very aggressive tactics, including when they took out very

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[52] Under its Articles of Agreement, the IMF is given the responsibility of ensuring that countries do not manipulate exchange rates but has no explicit responsibilities regarding possible private manipulation.

[53]Whether an open capital account will expose a small country to more or less asset price volatility depends importantly on whether shocks are predominantly internal or external in origin. If domestic shocks dominate, overall volatility may decrease.

[54] See Schadler and others (1993).

[55] See Mussa and others (1999).

large short positions in a number of Pacific Rim currencies during 1998; little, however, is known in general about the strategies of different institutions. The large apparent size and concentration of the positions taken by a number of HLIs in Pacific Rim markets last year has been seen by a number of national authorities as giving these institutions excessive market power. The possibility that some large investors may, in these circumstances, try to manipulate markets cannot be dismissed a priori given many highly publicized cases of attempted market manipulation in the large advanced financial markets, including on organized exchanges.

There is, however, as discussed below, a substantive issue of whether foreign exchange markets are as susceptible to private manipulation as individual domestic asset markets and whether manipulation can be systematically profitable. Moreover, in determining the feasibility and profitability of such strategies, consideration needs to be given to the exchange rate regime and the terms at which the official sector intervenes in the foreign exchange market.

In the classic case of domestic financial market manipulation, speculators either seek to corner an asset that is in finite supply and profit by squeezing short sellers (a "bear" squeeze) or they abuse insider knowledge and/or spread false information, typically about conditions in a particular industry or market.[56] Even though most foreign exchange trading occurs in unregulated OTC markets, there are reasons to think that these kinds of abuses would be more difficult in these markets. Not only are the underlying assets—domestic and foreign money—widely held, the types of macroeconomic information that usually drive exchange rates are much more generally available and potentially easier to verify than for a particular commodity or firm. At least in principle, therefore, these differences would tend to make foreign exchange markets less prone to private manipulation than domestic asset markets.

Notwithstanding the above, it has been suggested that some HLIs have spread misinformation to try to manipulate foreign exchange markets after they have built up large short positions in particular currencies and that these strategies are typically followed when market sentiment is weak. In what follows, we focus on the case in which speculators seek to push a currency down.[57] It has been argued, for example, that some HLIs—acting either collectively or alone—quietly build up short positions against a currency in the spot, forward, or swap market and then seek to close out their positions at a profit after spreading false information or adverse economic projections that cause a loss of confidence in the targeted

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[56]International Monetary Fund (1993, 1994).

[57]In principle, manipulation could involve either domestic currency appreciation or depreciation. The example of pushing a currency down is chosen because it corresponds to the cases of concern and, as argued later, any manipulation is more likely under unsettled and nervous market conditions than in normal times.

currency.[58] The information spread is argued to include rumors of changes in government policies or exchange rates, targeted wash sales,[59] or publicizing a buildup in short positions in the belief that the reputation of the HLIs as aggressive operators will panic other investors. These strategies are argued to be pursued most often in fragile market conditions where sentiment is already weak and it is not difficult to generate concerns about exchange rates. HLIs—and especially hedge funds—are typically singled out by national authorities as the main entities engaging in such activities.

There is unfortunately only limited theoretical work on the mechanics of these kinds of currency attacks and the conditions under which they might generate profits for speculators. Generally, for such strategies to be profitable, it must be possible for speculators to build up positions against a currency without significantly moving prices against themselves and then to be able to trigger large-scale selling of the targeted currency by other investors (independent of fundamentals) to allow a close out of positions at a profit. In standard models of floating exchange rates, it is generally difficult for speculators to do this since the buildup and closing out of positions will tend to move prices against them and the reactive investors who lose money eventually learn from their mistakes. But such strategies may still be possible under such regimes and have been argued to have been used in some Pacific Rim countries. In recent second-generation models of balance of payments crises with multiple equilibria, speculators are able to force the collapse of pegged or managed exchange rate regime if they are able to launch a large enough currency attack.[60] These models point to the possibility that manipulation might be easier in regimes where there is some government exchange market intervention and speculative attacks might be self-fulfilling. The full implications of these kinds of models, however, have not yet been worked through and it would be premature to draw strong conclusions about the feasibility of systematic manipulation. Moreover, the profitability of speculative attacks in these models is influenced importantly by the authorities' intervention strategies and, in particular, by whether interest rates are raised to defend a currency so as to reduce the possibility of one-way bets and increase the cost of taking short positions.

The strategies that may have been used by some HLIs in the Pacific Rim require the targeted currencies' markets to be liquid enough to allow a large (and undetected) buildup in short positions and require a large pool of reactive market participants who will follow the

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[58]The double play against the Hong Kong dollar involved simultaneously taking short positions in the domestic stock market and attacking the domestic currency. The return from the play was intended to derive from the resulting higher domestic interest rates pushing equity prices down. See Box 5.1 in Chapter V and International Monetary Fund (1998a).

[59]A wash sale involves the simultaneous purchase and sale of an asset with the trader making public the sell side of the transaction.

[60]See Krugman and Obstfeld (1997).

actions of speculators. On this basis, it has been argued that medium-sized foreign exchange markets may be more prone to manipulation than small or very large markets since they can provide enough liquidity[61] to allow the gradual buildup in positions while at the same time not having the same degree of stabilizing speculation as the large advanced markets.

Beyond the problem of a lack of data on speculative currency positions, one of the major difficulties in empirically assessing the concerns that have been expressed about HLIs is to distinguish between the kind of strategic currency attacks that a number of countries have argued take place and the pressures triggered by genuine concerns about underlying economic fundamentals (observational equivalence). It is also difficult to distinguish empirically between the coordinated taking of positions against a currency and more general herding behavior related to similar assessments of economic conditions and policies. These difficulties are compounded by the fact that the period in 1998 when Pacific Rim currencies are argued to have been manipulated was a time when there were serious concerns about economic fundamentals related to the possible spreading of the Asian crisis, and a large number of investors were taking a negative view of economic prospects.

Against this background, it remains unclear to what degree certain HLIs have from time to time colluded in efforts to try to manipulate foreign exchange markets and whether such efforts can be a major systematic source of volatility and inefficiency. Reflecting the importance of the concerns raised, however, the Financial Stability Forum's working group on HLIs is expected to report on its assessment of the issues early next year. At this point, several preliminary observations can be made.

First, there is a need for additional analytical and empirical work to better understand the conditions under which private manipulation of exchange rates might be feasible and profitable—on a systematic or unsystematic basis—and the implications of large and concentrated positions in some countries' foreign exchange markets. Among the issues to be more fully addressed are whether official exchange rate intervention may facilitate such strategies, the particular circumstances and market conditions under which manipulation might be profitable and how any manipulation might take place.

Second, detailed case studies are needed both of particular episodes where manipulation is argued to have taken place and of other episodes of large concentrations of positions to better understand the market dynamics involved when there are large leveraged players in the market.

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[61]This conclusion is qualified in the event that the official sector is a major participant in the market. The large buildup in speculative positions against the Thai baht in 1997—a relatively small market—was facilitated by the central bank's willingness to buy baht forward at an effectively unchanged price. See International Monetary Fund (1998a).

Finally, it needs to be recognized that even if manipulation is not systemically feasible or profitable, the possibility that it may be attempted—especially when sentiment is fragile—can be an important and valid source of concern for countries.

Any initiatives adopted by countries to address their concerns about the activities of certain HLIs need to take into account that HLIs can be important providers of market liquidity and that, by virtue of their ability to take contrarian positions, they may be an important stabilizing force when markets have under- or overshot their equilibrium values. Ultimately, the solutions taken to address the concerns will need to balance issues of market integrity with the need to encourage sufficient stabilizing speculation and avoid the domination of markets by a few large players.

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