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Challenges for Central Banks:
Global Finance and Changing Technology

Remarks by

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**CHALLENGES FOR CENTRAL BANKS:
GLOBAL FINANCE AND CHANGING TECHNOLOGY**

I am grateful to the Centre for Business and Policy Studies and the Riksbank for providing me this opportunity to visit Stockholm and address the Monetary Policy Forum. My topic is the challenges facing central bankers in the 1990s, of which--speaking from personal experience--there appears to be no shortage.

The Riksbank is the oldest "continuously functioning" central bank in the world, tracing its roots back more than three centuries. By that standard, the Federal Reserve with a record of somewhat more than 80 years is a rank newcomer. Clearly, your longevity testifies eloquently to your ability in having met successfully the challenges of the past.

Despite somewhat different starting points, and recognizing important differences in our respective economic histories, it is fair to say that in recent years a tendency has emerged toward convergence--not just between our two institutions, but among central banks in general--in a number of important respects. First and foremost has been the growing recognition of the importance of price stability to the achievement of sustainable maximum economic growth. In addition, central banks are concentrating increasingly on the

necessary foundations for stable and efficient financial markets

Doubtless a major factor driving us to convergence is the common challenges presented by an integrated global economy. In recent years global economic integration has accelerated on a multitude of fronts. The result, I believe, is that central banks of industrial countries now face economic environments that are more alike than they are different.

As a result of changes in communications and information technology, and the new instruments and risk-management techniques they have made possible, financial markets undoubtedly are far more efficient today than ever before. In particular, an ever wider range of financial and nonfinancial firms today can manage their financial risks quite effectively, allowing them to concentrate on managing the economic risks associated with their primary businesses. Still, for central bankers with responsibilities for financial market stability, the new technologies and new instruments have presented new challenges. Some argue that market dynamics have been altered in ways that increase the likelihood of significant market disruptions. Whatever the merits of this argument, there is a clear sense that the new technologies, and the financial instruments and techniques they have made possible, have strengthened interdependencies

between markets and market participants, both within and across national boundaries. As a result, a disturbance in one market segment or one country is likely to be transmitted far more rapidly throughout the world economy. This tendency poses a number of challenges to central banks as they discharge their responsibility for the stability of the world's interdependent financial system.

It wasn't always thus. In earlier generations information moved slowly, constrained by the state of communications technology. Financial crises in the early nineteenth century, for example, particularly those associated with the Napoleonic Wars, were often related to military and other events in faraway places. A European or American investor's speculative position could be wiped out by a military setback, and he might not even know about it for days or even weeks, which, from the perspective of central banking today, might be considered bliss.

As the nineteenth century unfolded, communications speeded up. By the turn of the century events moved more rapidly, but their speed was at most a crawl by the standard of today's financial markets. The environment now facing the world's central banks--and, of course, private participants in financial markets as well--is characterized by instant communication. Complex financial instruments--derivative instruments, in one form or another--are being developed to

take advantage of the gains in communications and information technology. Such instruments would not have flourished as they have without the technological advances of the past several decades. They could not be priced properly, the markets they involve could not be arbitrated properly, and the risks they give rise to could not be managed at all, to say nothing of properly, without high-powered data processing and communications capabilities.

This afternoon I should like to take a few minutes to trace the roots of this extraordinary expansion of global finance, endeavor to assess its benefits and risks, and suggest some avenues which central bankers and other policymakers can usefully explore in order to contain some of its potentially adverse consequences.

Finance, of course, is not an end in itself. It is the institutional structure that we have developed over the centuries to facilitate the production of goods and services. Accordingly, to understand better the evolution of today's burgeoning global financial markets we need first to understand the extraordinary changes that have emerged in the past century or more in what we conventionally call the real side of economies: the production of goods and services. The same technological forces currently driving finance were first evident in the production process and have had a profound effect on what we produce and how we do it.

Technological change or, more generally, ideas have significantly altered the nature of output so that it has become increasingly conceptual and less physical. A much smaller proportion of the measured real gross domestic product constitutes physical bulk today than in past generations.

In the United States, for example, the weight of our gross domestic product today measured in tons is only modestly higher than several decades ago. The huge rise in the real, or price-adjusted, value of output since then is the result much more of the generation and development of ideas than of the exploitation and transformation of physical resources. Because the accretion of knowledge is, with rare exceptions, irreversible, this trend almost surely will continue into the twenty-first century and beyond.

The changes in what we usually view as physical product have been dramatic. The purpose of production, of course, has remained the same - to serve human needs and values. But output of comparable utility now generally is smaller and lighter. Our radios used to be activated by large vacuum tubes, today we have pocket-sized transistors to perform the same function. Thin fiber optics have replaced huge tonnages of copper wire. Advances in architecture and engineering, as well as the development of lighter but stronger materials, now give us the same working space in

buildings but with significantly less concrete, glass, and steel tonnage than was required in an earlier era. The process is interactive. The development of the insights that brought us central heating enabled lighter-weight apparel fabrics to displace the heavier cloths of the past. The breakthroughs in medical research that have revolutionized health care are only the beginning of a growing list of almost wholly conceptual elements in our economic output.

The increasing substitution of concepts for physical effort in the creation of economic value also has affected how we produce that economic output, computer-assisted design systems, machine tools, and inventory control systems provide examples. Offices are now routinely outfitted with high-speed information-processing technology.

These changes also have influenced where, as well as what, is produced. Economic value has always reflected location. Coal in London was always of more value than coal at Newcastle. The quintessential production of value in the United States at the turn of the twentieth century was the combining of vast quantities of iron ore from Minnesota's Mesabi range with the coal of western Pennsylvania to make steel in the Pittsburgh area. I might add, parenthetically, that much of the ore was dug from the Minnesota ranges by earlier generations of Swedish emigrants to the United States in the nineteenth century.

The comparable value creation at the turn of the twenty-first century will surely involve the transmission of information and ideas, generally over complex telecommunication networks. This will create considerably greater flexibility of where services are produced and where employees do their work.

The growing contribution of intellectual products to output has been reflected in--as well as caused by--the explosive growth in information-gathering and processing techniques. They have greatly extended our analytical capabilities and have had enormous consequences for virtually all facets of our economic lives. For instance, the proportion of American workers directly using a computer at work has jumped from one-fourth to almost one-half since 1984. More broadly, over the past decade, the growth in demand for workers who can efficiently absorb information and perform analytical tasks apparently outstripped the growth in supply. In American and British statistics on wages and labor market experience, we see a relative rise in the monetary returns to those individuals with higher levels of education and skill training. Evidence from other industrial countries is less conclusive at this point, but I strongly suspect that the economic forces involved are global in nature. Similar patterns are showing up here in Sweden, and in Canada, Germany, and Australia.

The shift toward conceptual output is not simply a change in the composition of production and employment away from goods-producing industries and toward the service sector. Nor does it appear to be primarily a consequence of changes in the demand for goods in world markets. In fact, the relatively strong growth of demand for workers with conceptual skills compared with the demand for those with physical skills has been occurring in all types of industries, even manufacturing. A half century ago, for example, to move heavy coils of steel strip around a plant often required a good deal of human brawn. Today, instructions transmitted through a computer keyboard are used to accomplish the same task.

Indeed, an important aspect of this shift toward a more conceptual gross domestic product is the increasing difficulty we have in differentiating between, for example, manufacturing and service products. We in the United States classify as manufactured products computer chips that embody principally conceptual and programming skills. From a value-added perspective these chips are largely indistinguishable from wholly nonmaterial, computer-related service products.

As the relative cost of transporting goods falls dramatically as a consequence of downsizing, the conceptual content of output becomes a major factor in the increasingly rapid globalization of merchandise trade. International

trade in, say, construction gravel or scrap metal is limited by weight or bulk. High-value computer products, in contrast, make up a rising share in world trade. Obviously, the less the bulk and the lower the weight, the easier goods are to move, especially over long distances and across national boundaries. Thus, in the United States we have estimated that, after we adjust for average price changes, pounds shipped per real dollar of both U.S. exports and imports are now less than half of what they were in 1970. The downsizing of American trade is, of course, a reflection of the extent to which conceptualization is also dominating the economies of our trading partners throughout the world. Not inconsequentially, downsizing has extraordinary implications for our environment, since it is the extensive use of physical resources that has created much of our pollution and waste disposal difficulties as our populations have increased.

Of course, a significant part of the pronounced expansion in international trade has resulted from the breaking down of trade barriers over the years, but the political processes that have led in that direction to a significant extent have been pushed by the technological changes in the composition of goods and services.

Not unexpectedly, as goods and services have moved across borders, the necessity to finance them has increased.

dramatically. But what is particularly startling is how large the expansion in cross-border finance has become, relative to the trade it finances. To be sure, much cross-border finance supports investment portfolios, doubtless some largely speculative, but in the end, even they are part of the support systems for efficient international movement of goods and services. The relative expansion in cross-border financial transactions is, in fact, another manifestation of conceptual trade, as a single financial product is broken into many pieces that, in turn, are traded.

Specifically over the decade 1983-1993, world trade measured in nominal dollars increased by about 125 percent. The stock of cross-border assets held by banks at the end of 1993, measured in nominal dollars and adjusted for changes in reporting coverage, was more than 3-1/2 times as large as at the end of 1983.

Data showing the rapid growth of cross-border banking alone understate the true extent of international financial integration because they refer only to the growth of assets reported on banks' balance sheets. They do not include cross-border financial services provided by nonbank intermediaries. Annual issuance of international securities (bonds and equities) was more than four times as great in 1994 as a decade earlier. Securities settlements through Euroclear and Cedel increased six-fold between 1988 and

1994--much of this reflecting rapid growth of transactions in European government bonds, including repurchase agreements. Moreover, these data covering the past decade do not include the more recent growth in various cross-border off-balance-sheet instruments, such as interest-rate and currency swaps and options or standby letters of credit. A cooperative survey by major central banks shows that global foreign exchange turnover tripled between 1986 and 1992, a new survey is being conducted this month by central banks around the world. In the area of off-balance-sheet business, data published by the Bank for International Settlements indicate that in the five-year period through 1993 the notional principal of currency and interest-rate swaps expanded nearly five-fold. While the notional principal amounts of such instruments can be misleading measures of the riskiness of these activities, they do convey a meaningful sense of their growth.

Such rapid growth in cross-border banking and finance, however measured, should not be surprising given the extent to which low-cost information processing and communications technology have improved the ability of customers in one part of the world to avail themselves of borrowing, depositing, or risk-management opportunities offered anywhere in the world on a real-time basis.

These developments enhance the process whereby an excess of saving over investment in one country finds an appropriate outlet in another. In short, they facilitate the drive to equate risk-adjusted rates of return on investments worldwide. They thereby improve the worldwide allocation of scarce capital and, in the process, engender a huge increase in risk dispersion and hedging opportunities.

The evolving nature of the financing of expanding cross-border trade suggests the potential for a far larger world financial system than currently exists. If we can resist protectionist pressures in our societies in the financial arena as well as in the interchange of physical goods, we can look forward to the benefits of the international division of labor on a much larger scale in the 21st century.

What we don't know for sure, but strongly suspect, is that the accelerating expansion of global finance may be indispensable to the continued rapid growth in world trade in goods and services. It is becoming increasingly evident that many layers of financial intermediation will be required if we are to capture the full benefits of our advances in finance. Certainly, the emergence of a highly liquid foreign exchange market has facilitated basic forex transactions, and the availability of more complex hedging strategies enables producers and investors to achieve their desired risk.

positions. This owes largely to the ability of modern financial products to unbundle complex risks in ways that enable each counterparty to choose the combination of risks necessary to advance its business strategy, and to eschew those that do not. This process enhances cross-border trade in goods and services, facilitates cross-border portfolio investment strategies, enhances the lower-cost financing of real capital formation on a worldwide basis and, hence, leads to an expansion of international trade and rising standards of living.

But achieving those benefits surely will require the maintenance of a stable macroeconomic environment. An environment conducive to stable product prices and to maintaining sustainable economic growth is a central responsibility of central banks. How well we do our job has implications for participants in financial markets because we provide the backdrop against which individual market participants make their decisions. Perhaps the most important development that has occurred in recent years has been the shift from an environment of inflationary expectations built into both business planning and financial contracts toward an environment of lower inflation. It is important that that progress continue.

Few now question the overall benefits for economic growth and stability of the dramatic slowdown in the rate of

price inflation on a worldwide basis over the past decade. Fewer should question the need to maintain a credible long-run commitment to price stability. In the context of rapid changes affecting financial markets, disruptions are inevitable. The economic consequences of these disruptions will be minimized if they are not further compounded by financial instability associated with fluctuations in underlying inflation trends. Thus, as international financial markets continue to expand, central banks have twin objectives: achieving macroeconomic stability and maintaining safe and sound financial institutions that can take advantage of stability while exploiting the inevitable new technological advances.

The changing dynamics of modern global financial systems require that central banks address the inevitable increase of potential systemic risk. It is probably fair to say that the very efficiency of global financial markets, engendered by the rapid proliferation of financial products, also has the capability of transmitting mistakes at a far faster pace throughout the financial system in ways that were unknown a generation ago, and not even remotely imagined in the nineteenth century.

Certainly, the recent Barings Brothers episode shows that large losses can be created quite efficiently. Today's technology enables single individuals to initiate massive

transactions with very rapid execution. Clearly, not only has the productivity of global finance increased markedly, but so, obviously, has the ability to generate losses at a previously inconceivable rate.

Moreover, increasing global financial efficiency, by creating the mechanisms for mistakes to ricochet throughout the global financial system, has patently increased the potential for systemic risk. Why not then, one might ask, bar or contain the expansion of global finance by capital controls, transaction taxes, or other market inhibiting initiatives? Why not return to the less hectic and seemingly less threatening markets of earlier years?

Endeavoring to thwart technological advance and new knowledge and innovation through the erection of barriers to the spread of knowledge would, as history amply demonstrates, have large, perhaps adverse, unintended consequences. Suppressed markets in one location would be rapidly displaced by others outside the reach of government controls and taxes. Of greater importance, risktaking, so indispensable to the creation of wealth, would undoubtedly be curbed, to the detriment of rising living standards. We cannot turn back the clock--and we should not try to do so.

Rather, we should recognize that, if it is technology that has imparted the current stress to markets, technology can be employed to contain it. Enhancements to

financial institutions' internal risk-management systems arguably constitute the most effective countermeasure to the increased potential instability of the global financial system

The availability of new technology and new derivative financial instruments clearly has facilitated new, more rigorous approaches to the conceptualization, measurement, and management of risk for such systems. There are, however, limitations to the statistical models used in such systems owing to the necessity of overly simplifying assumptions. Hence, human judgments, based on analytically looser but far more realistic evaluations of what the future may hold, are of critical importance in risk management. Although a sophisticated understanding of statistical modeling techniques is important to risk management, an intimate knowledge of the markets in which an institution trades and of the customers it serves is turning out to be far more important.

In one sense, risk-management systems were exposed to a very severe real-life stress test in 1994, when sharp increases in interest rates created large losses in fixed income markets. I assume that as a consequence, firms' models and judgments are sounder today than those that prevailed in early 1994. But the Barings episode suggests that further improvements to internal risk-management systems

as well as internal controls are needed, in some instances very significant improvements

As recent history also demonstrates, the key danger is that large and rapid movements of portfolio capital have the potential to disrupt the central market mechanisms for ensuring financial contract performance. If a spasm of selling cannot readily be absorbed because of payment and settlement system inadequacies, uncertainties accelerate, inducing additional spasms and a broadening contagion of the disruption.

If the central market mechanisms hold up and liquidity of underlying markets is preserved, risk-management failures at individual institutions are unlikely to give rise to systemic problems. For example, the failure of Barings Brothers did not create systemic problems because the Asian futures clearinghouses continued to meet their obligations, albeit with difficulty, and the liquidity of the underlying markets for Japanese stocks and bonds was not significantly impaired.

Experience with other recent market events supports the same conclusions. Several studies of the 1987 stock market crash concluded that the greatest threat to the liquidity of the markets during that turbulent period was the potential for a default by a major participant in the settlement systems for equities or equity derivatives. Again

in 1990, the most serious threats to the orderly liquidation of the Drexel Burnham Lambert Group were posed by weaknesses in settlement arrangements

Fortunately, significant changes in payment systems are on the horizon that will allow securities settlement systems to be strengthened and thereby lessen the likelihood of a loss of market liquidity. In particular, the central banks of the European Union countries are publicly committed to developing real-time gross settlement systems for large-volume payments as soon as possible. This will create new opportunities for depositories in these countries to redesign their securities transfer systems as real-time gross settlement systems or as net settlement systems with multiple settlements throughout the day. If depositories wish to take advantage of such opportunities, however, they will need to rethink fundamentally the design and operation of their systems, including their ability to complete settlements in the event of a default by a major participant.

Extending the Group of Thirty's existing efforts on securities settlement to address the legal foundations of book-entry transfer systems and the design and operation of securities depositories, especially the design of risk-management systems, should be seriously considered.

In these and other ways, we must assure that our rapidly changing global financial system retains the capacity

to contain market shocks. This is a never-ending process which will require vigilance on the part of both private market participants and public regulatory authorities.

In summary, central banks have a collective responsibility for maintaining the stability of the world's interdependent financial system. This is our mandate whether written into law or not, it extends beyond monetary management and non-inflationary growth, beyond management of payment systems, to the very health of the international financial system. The potential for systemic risks in the global financial system implies that provision of adequate liquidity is essential to effective containment of disturbances. These risks also may require closely coordinated, forceful, and timely responses among central banks. I can cite numerous illustrations from the recent past--for example, the sharing of information and cooperation during the debt crises of the 1980s--in which coordination among central banks was essential in defusing potentially damaging crises. Given the shortening of the available response time that seems to have occurred in recent years, heightened awareness of problem areas and the ability to detect weaknesses before they become full-blown crises also are of paramount importance. In this connection, G-10 central banks have worked effectively through the BIS to review market developments that may affect banks' safety and

soundness, to identify systemic risks, and to develop and implement guidelines for appropriate risk management

A substantive role for central banks in the oversight of the financial system, often acting jointly with each other, has prevented some incipient problems from developing and has ameliorated others. When systemic problems do arise in the future, the ability of central banks to coordinate their responses will depend upon the maintenance of close contacts and sound working relationships grounded upon comprehensive in-house experience and expertise

Clearly, the challenges of the changing international environment in which we operate dictates that we need to maintain and strengthen the sound working relationships that we have enjoyed in recent years across the full range of central bank functions. These relationships epitomize the kinds of contacts that will be essential in meeting the common challenges ahead of us in the rest of this decade and into the 21st century