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Understanding Financial Stability: Towards a Practical Framework[1]

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I. INTRODUCTION AND MOTIVATION

Safeguarding financial stability is now widely recognized as an important part of maintaining macroeconomic and monetary stability, and as important for achieving sustainable growth. Many advanced-country central banks, as well as the International Monetary Fund, devote considerable resources to monitoring and assessing financial stability and to publishing financial stability reports. A casual reading of these publications would suggest that financial stability practitioners share some common understandings. To cite a few, it is more or less taken for granted that:

- finance is fundamentally different from other economic functions such as exchange, production, and resource allocation;
- finance contributes importantly to other economic functions and facilitates economic development, growth, efficiency, and ultimately social prosperity;
- financial stability is an important social objective – a public good – even if it is not widely seen as being on a par with monetary stability (see Tobin (1992));
- monetary and financial stability are closely related, if not inextricably intertwined, even though there is no consensus on why this is so.

There is also a growing academic literature, much of it covering specific financial stability topics in considerable depth and some of it providing rigorous anchors for debating substantive and policy issues. For example, there are extensive literatures on banking dealing with the special role and fragility of banks in finance, the costs and benefits of deposit insurance, and the causes, consequences, and remedies for bank failures. There are also new and growing literatures on market sources of financial fragility and systemic risk more generally (for example, see Allen (2006)).

Despite considerable practical and intellectual progress in recent years, compared to macroeconomic and monetary analysis, financial stability analysis is still in a formative stage of development. The various literatures taken together do not yet provide cohesive and practical approaches or tool kits for assessing financial stability, for analyzing systemic issues and controversies, and for designing policies to optimize the net social benefits of finance. In short, the discipline lacks a widely accepted and useful framework.

Nevertheless, the practice of assessing and safeguarding financial stability is ongoing. This paper is organized to address the following questions.

- Why have concerns about financial stability increased in recent decades?
- What are the important conceptual challenges faced by policy makers in safeguarding financial stability?
- What are the essential ingredients of a practical framework for safeguarding financial stability in real time, and the challenges in implementing such a framework?

II. Why Have Financial Stability Issues Become Important Recently?

Since the early 1990s, safeguarding financial stability has become an increasingly dominant objective in economic policymaking, as illustrated by the financial stability reports published by more than thirty three central banks and several international financial institutions (including the IMF), as well as by the more prominent place given to financial stability in the organizational structures and mandates of many of these institutions. [2] The greater emphasis on financial stability is related to several major trends and structural changes in financial systems during the past several decades reflecting the expansion, liberalization, and subsequent globalization of financial systems—all of which have increased the possibility of larger adverse consequences of financial instability on economic performance.

First, financial systems expanded at a significantly higher pace than the real economy. In advanced economies, total financial assets now represent a multiple of annual economic production. Table 1 illustrates this expansion during 1970–2000 for a heterogeneous group of advanced economies with relatively mature financial systems. For example, while currency remained relatively steady as a percentage of GDP over the 30-year period, total assets in financial institutions grew from 110 percent of GDP in 1980 to 377 percent in 2000 in the United Kingdom, from 182 percent in 1980 to 353 percent in 2000 in Germany, and from 111 percent in 1980 to 257 percent in 2000 in the United States. The growth of assets in the equity and bond markets is just as phenomenal. While differences between countries reflect their more market- or bank-oriented financial systems, most aggregates have increased. The broad measures of an economy's total financial assets invariably involve some double counting due to claims between financial institutions, but even these mutual holdings are relevant for financial stability because they represent the links, interactions, and complexities in the financial system.

Second, this process of financial deepening has been accompanied by changes in the composition of the financial system, with a declining share of monetary assets (aggregates), an increasing share of non-monetary assets, and, by implication, greater leverage of the monetary base. The amount of currency relative to GDP has been broadly stable or decreased in all countries except Japan. In the United States, even the sizes of both M1 and M2 have fallen as financial innovation has progressed. For outlier Japan, the increasing importance of narrow money in the 1990s may be attributable to greater incentives to hold money due to the Japanese financial sector's fragile state and enduring deflationary pressures.

[2] See Oosterloo, de Haan, and Jong-A-Pin (2006).

Table 1. Development of Key Financial Aggregates
(In percent of GDP)

	1970	1980	1990	2000
United States				
1 Currency	6	5	5	6
2 M1	21	15	14	11
3 M2	60	57	56	50
4 M3	65	72	72	73
5 Total bank assets[1]	54	54	53	58
6 Total financial institution assets	...	111	171	257
7 Equity	34	25	35	132
8 Bonds	47	53	108	157
6+7+8	...	189	314	546
United Kingdom				
1 Currency	8	5	3	4
2 M4	52	50	86	93
3 Total bank assets[1]	51	47	108	156
4 Total financial institution assets	...	110	242	377
5 Equity	41	23	57	167
6 Bonds	52	31	33	74
4+5+6	...	164	332	618
France				
1 Currency	10	5	4	3
2 M1	29	24	25	23
3 M2	44	51	44	44
4 M3	62	69	74	65
5 Total bank assets[1]	...	...	...	...
6 Total financial institution assets	...	...	...	...
7 Equity	6	4	14	84
8 Bonds	14	19	42	55
6+7+8	...	...	...	...
Canada				
1 Currency	4	3	3	3
2 M1	11	9	7	11
3 M2	38	47	56	48
4 M3	46	63	64	65
5 Total bank assets[1]	...	...	...	...
6 Total financial institution assets	...	...	...	...
7 Equity	9	18	26	87
8 Bonds	33	52	68	76
6+7+8	...	...	...	...

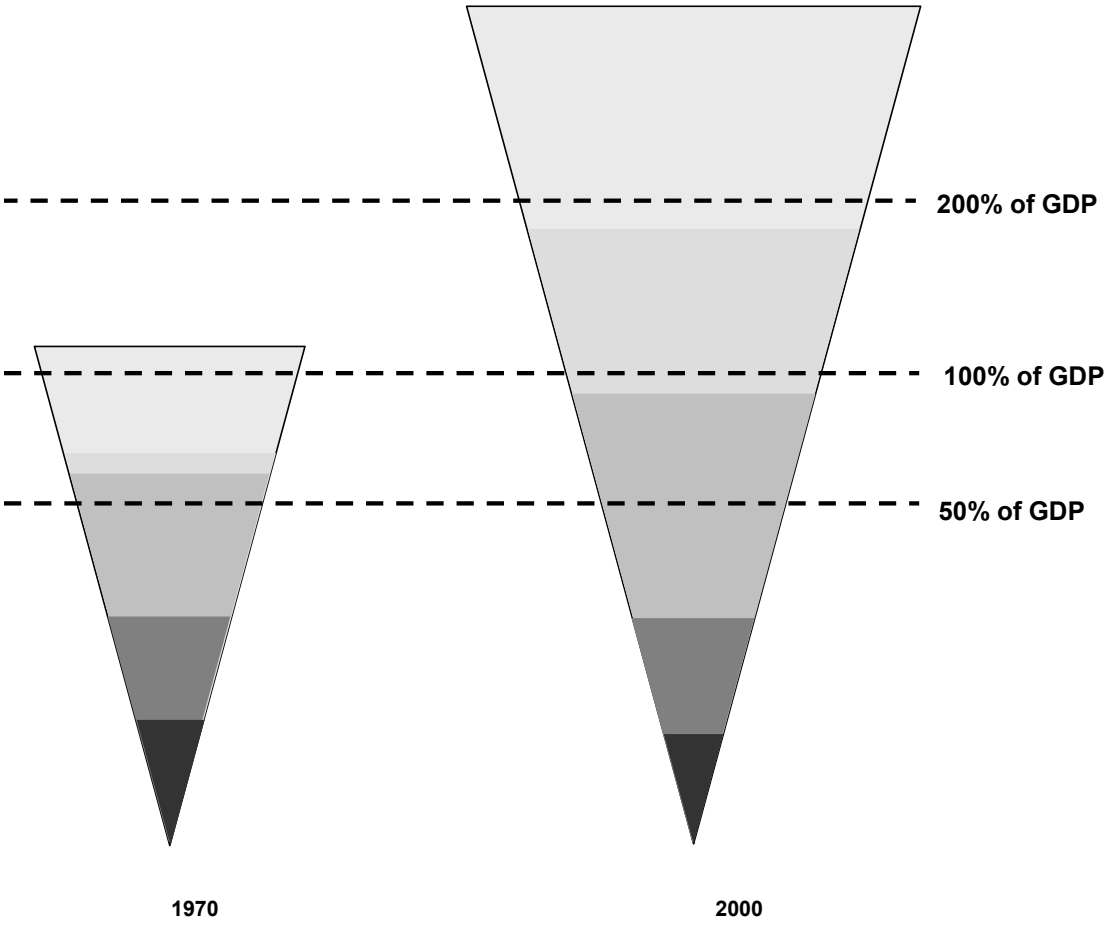
	1970	1980	1990	2000
Germany				
1 Currency	5	6	7	6
2 M1	15	17	22	28
3 M2	25	29	39	...
4 M3	42	48	59	68
5 Total bank assets[1]	121	160	216	303
6 Total financial institution assets	...	182	259	353
7 Equity	11	7	17	48
8 Bonds	26	37	67	112
6+7+8	...	226	343	513
Japan				
1 Currency	8	9	10	13
2 M1	29	29	27	48
3 M2	74	86	114	127
4 M3	127	136	180	219
5 Total bank assets[1]	66	77	134	127
6 Total financial institution assets	122	157	269	260
7 Equity	41	25	76	70
8 Bonds	23	60	78	124
6+7+8	186	242	423	454
Italy				
1 Currency	10	7	6	7
2 M1	44	42	35	18
3 M2	76	79	67	...
4 M3	76	89	88	...
5 Total bank assets[1]	...	...	...	...
6 Total financial institution assets	...	...	...	...
7 Equity	7	3	10	57
8 Bonds	...	39	65	108
6+7+8	...	...	...	...
Netherlands				
1 Currency	8	6	7	5
2 M1	23	21	25	35
3 M2	...	...	...	...
4 M3	53	60	77	92
5 Total bank assets[1]	71	129	184	254
6 Total financial institution assets	116	191	285	431
7 Equity	41	16	38	185
8 Bonds	11	25	73	85
6+7+8	168	232	396	701

Note: Currency is coins and bank notes in circulation; M1, M2, M3, and M4 are national definitions. Total assets of financial institutions consist of total bank assets and (depending on data availability) assets of insurers, pension funds, and mutual funds. Equity is total stock market capitalization; bonds are total debt securities outstanding (government and corporate).

Sources: Thomson Financial, IMF, Bank for International Settlements, Merrill Lynch, Salomon Smith Barney, and various national sources.

The simple average expansion of the financial systems shown in Table 1 is illustrated in Figure 1, in which total assets of financial institutions are reflected by the triangle's surface. Figure 1 shows rather dramatically that between 1970 and 2000 the size of these assets almost tripled relative to GDP. Note also how the average of the financial systems has become more highly leveraged, in the sense that the broader monetary and financial assets represent a much greater share of the triangle in 2000 than in 1970 relative to central bank money (or currency).

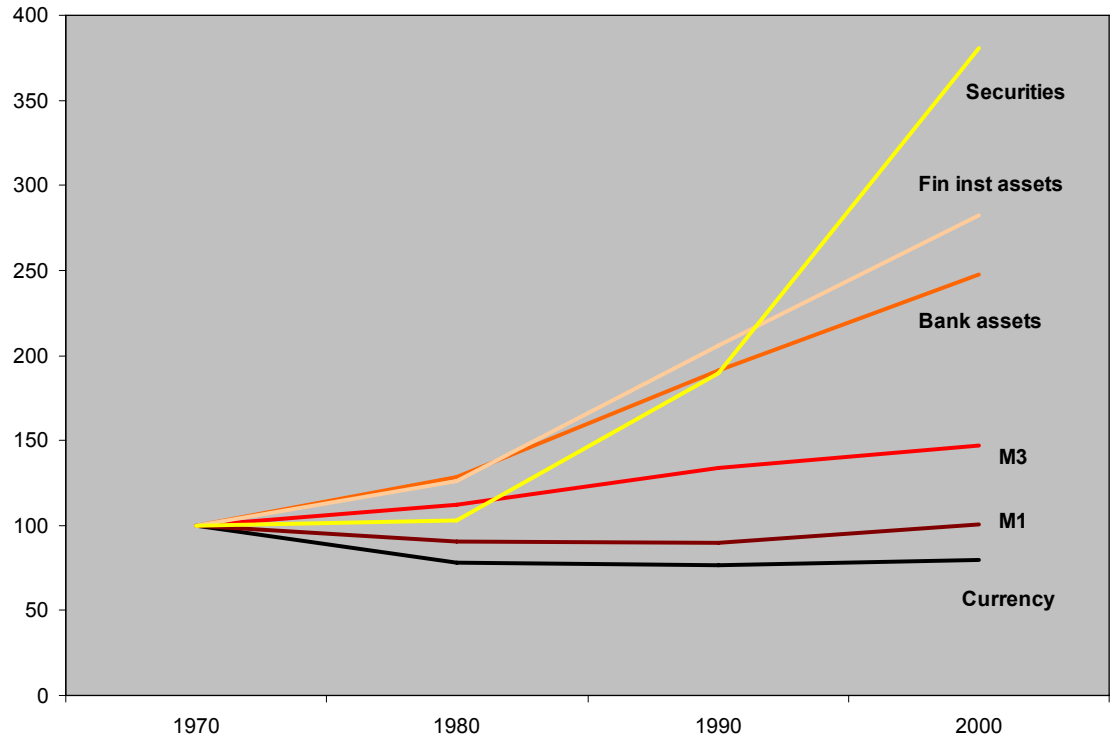
Figure 1. Composition of Key Financial Aggregates in 1970 and 2000
(In percent of GDP, average of the United States, Germany, the United Kingdom, Japan, France, Italy, Canada, and the Netherlands)



Source: Table 1.1.

Figure 2 shows the change in composition of the financial system over the past decades by expressing key financial aggregates as a percentage of their value in 1970 (all deflated by GDP). Clearly, the relative importance of monetary aggregates has decreased, while non-monetary components have increased rapidly.

Figure 2. Development of Key Financial Aggregates, 1970-2000
(Average for the US, Japan, Germany, the UK, France, Italy, Canada and the Netherlands, 1970=100)

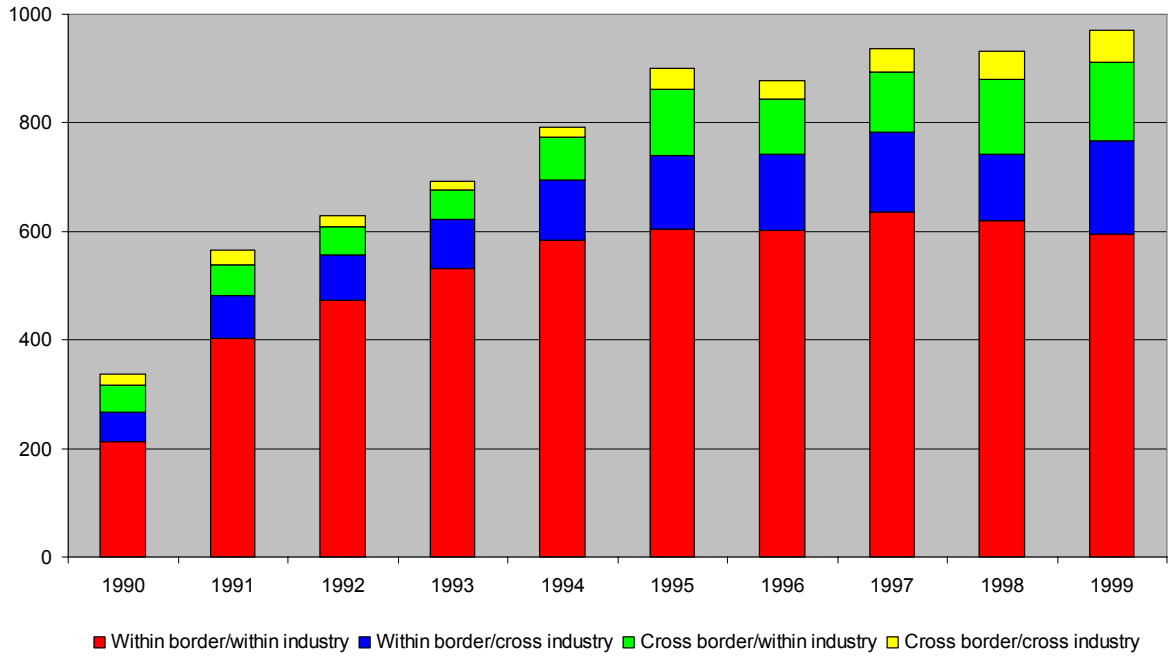


Source: Table 1.1

Third, as a result of increasing cross-industry and cross-border integration, financial systems are more integrated, both nationally and internationally. Financial institutions now encompass a broader range of activities than that of a traditional bank, which takes deposits and extends loans. This is reflected in the rise in financial conglomerates, which provide a vast array of banking, underwriting, brokering, asset-management, and insurance products and/or services.[3] In the 1990s, the number of mergers and acquisitions within the financial sector soared (Figure 3).

[3] See the various issues of the IMF's *International Capital Markets* report and Group of Ten (2001).

Figure 3. Financial Sector Mergers and Acquisitions, 1990-1999
(Number of M&As in G10 countries)



Source: Group of Ten, 2001.

Some of these transactions involved different industries or countries, especially in Europe where roughly half the deals in this period were either cross-border, cross-industry, or both (Table 2). In addition, cooperation between financial institutions intensified through joint ventures and strategic alliances.[4] The greater international orientation of financial systems is also reflected in the increasing size of cross-border transactions in bonds and equity relative to GDP (see Table 3). On this score, the amount of outstanding international debt securities surged over the past decades (Table 4).

Table 2 Financial Sector Mergers and Acquisitions, 1991-1999
Distribution (percentages)

	North America	Europe	Japan/Australia
Within border/within industry	80	53	64
Within border/cross industry	12	19	16
Cross border/within industry	6	21	14
Cross border/cross industry	2	8	5
Total	100	100	100

Source: Group of Ten (2001)

[4] Van der Zwet (2003) discusses this blurring of distinctions between financial sectors and across countries, including by looking at variables such as the share of financial institutions' cross-border and cross-sector revenues.

Table 3. Cross-Border Transactions in Bonds and Equities
(In percent of GDP)

	1975–79	1980–84	1985–89	1990–94	1995–99	2000–03	2001	2002	2003
United States									
Bonds	4.0	9.4	63.6	93.9	139.0	188.0	161.4	208.4	262.1
Equities	1.9	3.6	9.9	14.7	45.0	90.8	87.4	85.0	82.1
Japan									
Bonds	2.2	9.8	115.3	72.9	63.7	70.2	73.7	73.8	77.8
Equities	1.1	4.4	14.9	9.6	17.2	36.5	36.7	33.1	35.3
Germany									
Bonds	5.3	9.7	37.8	86.5	208.7	350.5	378.7	351.1	394.0
Equities	1.9	3.4	11.7	14.9	48.6	132.6	133.6	115.6	112.2
France									
Bonds	...	6.8	21.9	108.6	233.5	293.9	288.1	299.3	362.0
Equities	...	2.4	12.1	16.9	56.1	150.7	140.2	138.1	154.0
Canada									
Bonds	1.2	3.9	29.3	104.5	216.6	149.5	135.6	157.0	175.8
Equities	3.3	6.5	14.8	19.2	52.3	122.8	101.9	151.5	132.1
Italy[1]	0.9	1.4	9.4	114.7	518.8	1,126.5	821.9	1,197.0	1,705.2

Sources: Bank for International Settlements, and national balance of payments data.
Note: Gross purchases and sales of securities between residents and nonresidents.
1/ No breakdown in bonds and equities is available.

Table 4. Outstanding International Debt Securities by Nationality of Issuer
(In percent of GDP)

	1970	1980	1990	2000	2003	2004
United States	0.1	0.7	3.1	17.8	27.9	28.6
Japan[1]	0.0	1.5	10.5	6.0	6.3	6.4
Germany[2]	0.1	0.4	4.5	47.9	80.5	86.4
France[1]	0.1	2.1	7.8	24.0	42.2	45.9
Italy	0.1	0.5	4.6	19.4	35.8	40.6
United Kingdom[1]	0.2	2.3	14.9	40.8	63.0	68.0
Canada	0.2	13.4	18.6	27.9	31.0	29.9
Netherlands	0.6	2.4	13.0	79.4	112.6	118.6
Sweden[1]	0.3	7.5	20.1	44.5	52.4	52.4
Switzerland[2]	0.5	1.7	4.5	41.2	49.0	72.9
Belgium	0.4	2.1	15.0	57.3	82.5	85.9

Sources: Bank for International Settlements, IMF, *World Economic Outlook* database.
1/ Figure in 1970 column is from 1971.
2/ Figure in 1970 column is from 1972.

Fourth, the financial system has become more complex in terms of the intricacy of financial instruments, the diversity of activities, and the concomitant mobility of risks. Deregulation and liberalization created scope for financial innovation and enhanced the mobility of risks. In general, this greater complexity, especially the increase in risk transfers,

has made it more difficult for market participants, supervisors, and policymakers alike to track the development of risks within the system and over time.

To illustrate the globalization of finance further, and the greater mobility of risks across global markets, Table 5 and Table 6 present the worldwide development and use of derivatives instruments since the mid-1980s, for exchange-traded derivatives, and since the 1990s, for over-the-counter derivatives. Regarding exchange traded derivatives, in nominal terms, total notional amounts outstanding have increased more than 60 times since the mid-1980s, while the number of derivative contracts traded has increased more than sevenfold. Regarding over-the-counter derivatives, the notional value of contracts increased from $80 trillion at end-December 1998 to nearly $285 trillion at end-December 2005; a tripling of the notional value of contracts in 8 years. The gross market value of these contract – or replacement value – which is a proxy for the credit-risk or counterparty exposures associated with these notional values increased from around $3 trillion at end- December 1998 to around $9 trillion at end- December 2005, also a tripling. Note that the majority of derivative transactions were interest-rate contracts.

Table 5. Exchange-Traded Derivative Financial Instruments:
Notional Principal Amounts Outstanding and Annual Turnover

	1986	1990	1995	2000	2005	2006 Q3
Notional principal amounts outstanding			(In billions of U.S. dollars)			
Interest rate futures	370.0	1,454.8	5,876.2	7,907.8	20,708.7	24,699.0
Interest rate options	144.0	595.4	2,741.8	4,734.2	31,588.2	43,369.3
Currency futures	10.2	17.0	33.8	74.4	107.6	139.9
Currency options	39.2	56.5	120.4	21.4	66.1	68.0
Stock market index futures	13.5	69.1	172.2	377.5	802.9	985.6
Stock market index options	37.8	93.6	337.7	1,148.4	4,542.6	6,316.5
Total	614.8	2,286.4	9,282.0	14,263.8	57,816.2	75,578.4
North America	514.6	1,264.4	4,852.3	8,168.0	36,394.2	45,898.7
Europe	13.1	461.4	2,241.2	4,197.9	17,982.4	24,631.4
Asia-Pacific	87.0	560.5	1,990.1	1,611.8	3,014.0	4,534.8
Other	0.1	0.1	198.4	286.2	425.5	513.5
Annual turnover			(In millions of contracts traded)			
Interest rate futures	91.0	219.1	561.0	781.2	2,110.4	669.3
Interest rate options	22.2	52.0	225.5	107.7	430.8	146.7
Currency futures	19.9	29.7	99.6	43.5	143.0	55.5
Currency options	13.0	18.9	23.3	7.0	19.4	6.4
Stock market index futures	28.4	39.4	114.8	225.2	918.7	291.6
Stock market index options	140.4	119.1	187.3	481.5	3,139.8	773.4
Total	314.9	478.2	1,211.5	1,646.0	6,762.0	1,942.9
North America	288.7	312.3	455.0	461.3	1,926.8	648.9
Europe	10.3	83.0	354.8	718.6	1,592.8	466.5
Asia-Pacific	14.3	79.1	126.4	331.3	2,932.4	722.2
Other	1.6	3.8	275.5	134.9	310.0	105.4

Source: Bank for International Settlements.

Table 6. Global Over-the-Counter Derivatives Markets: Notional Amounts and Gross Market Values of Outstanding Contracts by Counterparty, Remaining Maturity, and Currency 1/
(In billions of U.S. dollars)

	Notional Amounts			Gross Market Values		
	End-Dec. 1998	End-Dec. 2000	End-Jun. 2006	End-Dec. 1998	End-Dec. 2000	End-Jun. 2006
Total	80,309	95,199	369,906	3,232	3,183	10,074
Foreign exchange	18,011	15,666	38,111	786	849	1,134
By counterparty						
With other reporting dealers	7,284	5,729	15,281	336	271	367
With other financial institutions	7,440	6,597	15,120	297	357	471
With nonfinancial customers	3,288	3,340	7,710	153	222	296
By remaining maturity						
Up to one year 2/	15,791	12,888	29,578	…	...	...
One to five years 2/	1,624	1,902	5,841	…	...	...
Over five years 2/	592	876	2,692	…	...	...
By major currency						
U.S. dollar 3/	15,810	14,073	31,771	698	771	967
Euro 3/	…	5,981	15,348	…	361	472
Japanese yen 3/	5,319	4,254	9,510	370	274	242
Pound sterling 3/	2,612	2,391	5,219	62	82	148
Other 3/	12,283	4,633	14,374	442	210	439
Interest rate 4/	50,015	64,668	262,296	1,675	1,426	5,549
By counterparty						
With other reporting dealers	24,442	31,494	114,474	748	638	2,219
With other financial institutions	19,790	27,048	115,089	683	610	2,613
With nonfinancial customers	5,783	6,126	32,734	244	179	718
By remaining maturity						
Up to one year 2/	18,185	24,107	90,582	…	...	...
One to five years 2/	21,405	25,923	101,795	…	...	...
Over five years 2/	10,420	14,638	69,918	…	...	...
By major currency						
U.S. dollar	13,763	19,421	88,094	370	486	2,149
Euro	…	21,311	103,607	…	477	2,358
Japanese yen	9,763	13,107	32,214	212	232	472
Pound sterling	3,911	4,852	19,079	130	113	296
Other	22,578	5,977	19,302	963	118	276
Equity-linked	1,488	1,891	6,783	236	289	671
Commodity 5/	408	662	6,394	43	133	718
Other	10,387	12,313	35,969	492	485	1,707

Source: Bank for International Settlements.
1/ All figures are adjusted for double-counting. Notional amounts outstanding have been adjusted by halving positions vis-à-vis other reporting dealers. Gross market values have been calculated as the sum of the total gross positive market value of contracts and the absolute value of the gross negative market value of contracts with non-reporting counterparties.
2/ Residual maturity.
3/ Counting both currency sides of each foreign exchange transaction means that the currency breakdown sums to twice the aggregate.
4/ Single-currency contracts only.
5/ Adjustments for double-counting are estimated.

These trends and developments reflect important advances in finance that have contributed substantially to economic efficiency, both nationally and internationally. They evidently also have had implications for the nature of financial risks and vulnerabilities and the potential impact of risks and vulnerabilities on real economies, as well as implications for the role of policymakers in promoting financial stability. Consider financial system and market developments in the 1990s and early 2000s—a period during which global inflation pressures subsided and in many countries were eliminated. During this period, reflecting in part the above-mentioned trends, national financial systems around the world either experienced, or were exposed to, repeated episodes of unpleasant financial-market dynamics including asset-price volatility and misalignments; volatile if not unsustainable financial and capital flows; extreme market turbulence, at times leading to concerns about potential systemic consequences; and a succession of costly country crises in 1994–95, 1997, 1998, 1999, and in the early 2000s (Table 7). The experiences of, and fallout from, these financial stresses and strains occurred within both advanced countries with highly sophisticated financial markets and developing countries with financial systems of varying degrees of immaturity and dysfunction. As these developments were occurring, economic and financial policymakers became increasingly concerned that global financial stability was becoming more difficult to safeguard.

Table 7. Market Turbulence and Crises in the 1990s and Early 2000s

1992	ERM Exchange rate crises involving Italy and the United Kingdom.
1994	Bond market turbulence in G-10 Countries.
1994-95	Mexican (t*esobono*) Crisis. Failure of Barings.
1996	Bond market turbulence in United States.
1997	U.S. equity market correction.
1997-98	Asian crises (Thailand, Indonesia, South Korea).
1998	Russian default. Long-Term Capital Management crisis and market turbulence.
1999	Argentina and Turkey crises.
2000	Global bursting of equity price bubble.
2001	Corporate governance problems—Enron, Marchoni, Global Crossing, etc. September 11 Terrorist Attack.
2001-2	Argentina crisis and default. Parmalat.

Source: Schinasi (2006a)

These episodes were a rude awakening to some if not many policy makers to the stability implications of these overwhelmingly beneficial structural changes. It is not too dramatic to say that these stability implications were a wake up call to many about the darker side of modern finance. Several lessons can be taken from these episodes, and three such episodes are representative of what can be learned: bond market turbulence in 1994; the Asian crises in 1997-98; and the Russian and Long-Term Capital Management (LTCM) hedge fund crises in the autumn 1998.

First, the bond market turbulence of 1994 is an example of how a long anticipated monetary policy change – which was delayed in part for financial system concerns – led to turbulence not just in US financial markets – and the deepest most liquid market for US treasury securities – but also in European and Asian markets. When the U.S. Federal Reserve System increased policy interest rates by 25 basis points on February 6, 1994, the long end of the US treasury yield curve increased by more than 175 basis points and Europe followed suit as well. This created significant turbulence in global financial markets for several weeks, and even posed, to some, the risk of systemic financial consequences. The lesson is that monetary policy changes in one country can lead to financial stability considerations, and in the extreme to the risk of systemic global financial consequences.

A second example is the Asian Crises. This is an example of how exchange rate policies can lead to massive economic and financial disruptions in economies that were seen as growth machines for close to a decade. These were seen at the time as one crises, but in my mind they were quite separate. What connected them was that once Thailand went into crises, international investors understood that finance and financial stability is an economic fundamental factor that must be considered in international investment portfolio decisions. They hypothesized that if Thailand had a weak financial system and could grow fast, maybe other Asian economies had the same problem. When they paid attention to this, they decided that both Indonesia and South Korea had some of the same underlying weaknesses.

Finally, the combination of the Russian default and the collapse of the hedge fund LTCM demonstrated how a default by a country like Russia on a relatively small amount of debt ultimately became part of a scenario – one of credit spread tightening and then liquidity runs – that not only led to the collapse of a relatively large hedge fund (but small financial institution) but also threatened the systemic stability of some of the deepest, most liquid, and most efficient securities markets in the world, notably in the US securities markets.

The bottom line seems to be that there have been periods of structural changes which have created a new and ever changing financial landscape that is not fully understood. The 1990s and early 2000s demonstrated clearly some of the characteristics of this new modern financial landscape and suggests that a more systematic approach to safeguarding financial stability is required.

The turbulence experienced during the 1990s and early 2000s raised, and continues to challenge us with, questions about the structure and nature of the existing regulatory and supervisory regimes around the world for addressing some of the problems that surfaced. Table 8 summarizes the main public-policy issues and concerns raised by the turbulence

during these decades. There are three broad areas where policy issues arise to varying degrees from cross-border banks, FX and other global markets, and hedge funds: protecting investors and markets, dealing with safety net issues and moral hazard, and assessing and mitigating cross-border and systemic risk. All three issues are very important for banks generally and cross-border banks in particular and for global markets. Investor protection and safety net issues are seen widely as not being relevant for hedge funds, while many, though not all, believe that hedge funds can pose systemic risk. The potential systemic risk associated with the collapse of the hedge fund LTCM is a case in point.

Table 8. Public Policy Issues and Concerns

Issues and Concerns	Cross-Border Institutions	International Markets	Hedge Funds
Protection/ Integrity?	Investor Protection	Market Integrity	No; Possibly for Retail Investors (of funds of funds)
Moral Hazard from Safety Net?	Yes; and Home/Host Burden Sharing Issues	Possibly from G-3 Central Bank Liquidity	No
Cross-Border and Systemic Risks?	Maybe; Depends on Size, Complexity, etc.	Yes, via OTC markets and infrastructure linkages	Yes?, via opacity, complexity, and w/ institutions and markets

Source: Schinasi (2006b).

Taking this classification as given, how are these risks and public policy concerns addressed through financial policies? That is, to what extent are the tools of financial policies used to address these concerns? Table 9 is one, perhaps exaggerated way of answering this question.

As indicated in the column labeled “Cross-Border Institutions” of Table 9, large cross-border banking groups – including the large internationally active banks – are probably the most closely regulated and supervised organizations on the planet, and for good reasons.

- These institutions pose financial risks for depositors, investors, markets, and even unrelated financial stakeholders because of their size, scope, complexity, and of course their risk taking.

- Some of them are intermediaries, investors, brokers, dealers, insurers, reinsurers, infrastructure owners and participants, and so on and on and on all rolled up into a single complex institution.

Table 9. Oversight Regimes

Oversight	Cross-Border Institutions	International Markets	Hedge Funds
Regulation	National with cooperation	Not really; over-the-counter transactions	No
Supervision	National and Home/Host Issues	n.a.	No
Surveillance	Indirect, as participant	Direct; National and International	Indirect, as participant
Market Discipline	Partially	Primarily	Exclusively

Source: Schinasi (2006b).

- They are systemically important: all of them nationally, many of them regionally, and about twenty or so of them globally.

- Protection, safety net, and systemic risks issues are key pubic policy challenges.

- Oversight occurs at the national level, through both market discipline and official involvement, and at the international level through committees, groups, and so on familiar to all of this.

As a result, banks generally, and cross-border and global banks are probably the most closely watched financial institutions in the world.

At the other extreme of regulation and supervision are hedge funds, as can be seen in the right-most column of Table 9.

- They are neither regulated nor supervised. Many of the financial instruments hedge funds use strategically and tactically are not subject to securities regulation and the markets in which they transact are by-and-large the least regulated and supervised. This is part of their investment strategy and it defines the scope of profit making.

- Hedge funds are forbidden in some national jurisdictions. In jurisdictions where they are partially regulated, this is tantamount to being forbidden – given the global nature and fungibility of the hedge-fund business model.

- Their market activities are subject to market surveillance just like other institutions, but this does not make transparent who is doing what, how they are doing it, and with whom they are doing it.

- Investor protection is not an issue for most individual hedge funds, as they restrict their investor base to wealthy individuals and institutions willing to invest in relatively high minimum amounts.

- Investor protection is becoming an issue with the advent of funds-of-hedge-funds that allow minimum investments of relatively small amounts less than $100,000 or even less than $50,000.

- Probably beginning with the Asian crisis and then LTCM, and intensifying with the their tremendous growth over the past several years, hedge funds are increasingly being seen as potentially giving rise to systemic risk concerns, a theme I will return to later.

Global markets fall in between being and not being regulated and supervised. What is meant by global markets? Examples are, the FX markets and their associated derivatives markets (both exchange-traded and over-the-counter) and the G-3 fixed-income markets as well as others associated with international financial centers (pound, Swiss franc, etc) as well as their associated derivatives markets. Dollar, euro, and yen government bonds are traded more-or-less in a continuous global market, and the associated derivatives activities are also global.

Global markets are only indirectly regulated. They are subject to surveillance through private international networks and business-cooperation agreements, through information sharing by central banks and supervisory and regulatory authorities, and through official channels, committees, and working groups. Parts of these markets are linked to national clearance, settlement, and payments infrastructures, so they are also subject to surveillance through these channels. The risks they potentially pose are less of a concern to the extent that the major players in them – the large internationally active banks – are effectively supervised and market-disciplined by financial stakeholders. And, both investor protection and systemic risk are challenging public-policy issues.

Regarding infrastructure, the financial activities discussed in all three papers pass through the third transmission channel, at least their balance sheet transactions involving securities trading. Large internationally active typically are major participants in domestic and international clearance, settlement, and payments infrastructures – both public and private – as well as the major trading exchanges. Many of them co-own parts of the national and international infrastructures and have a natural interest in their performance and viability. Incentives are to some extent aligned to achieve both private and collective net benefits.[5]

[5] The phrase 'to some extent' needs to be emphasized. Consider, for example, that the G-10 central banks decide to get out of the business altogether of providing clearance, settlement, and payment services on foreign-exchange transactions – as might have been considered years ago when they challenged private institutions to solve the Herstatt problem. If this decision was taken, then the major international banks would have the incentive to organize fully the clearance, settlement, and payment on FX transactions. But if this were to happen, then this organization could become too big to fail or even to liquidate in a timely manner without global systemic consequences.

Increasingly, however, internationally active banks are becoming more heavily involved in over-the-counter transactions, which do not pass through these infrastructures. This poses systemic risk challenges.

III. WHAT ARE THE CONCEPTUAL CHALLENGES?

To summarize the discussion so far, financial structural changes have brought tremendous benefits for the world economy. But there is also a darker side of modern finance, as revealed in the experiences during the 1990s and early 200s. The costs of these experiences have not been evenly distributed to emerging markets, developing countries, transition countries and mature markets, but costs have been spread around. The U.S. was not spared, even though it has the deepest, most liquid markets in the world, nor was Europe spared and Japan certainly wasn't spared. Oversight regimes still by-and-large have a national focus, so there are challenges for which the nationally oriented regimes are not keeping pace, such as financial innovation. Private finance can be likened to a greyhound running fast around a track; whereas, supervision and regulation is more of a bloodhound slowly sniffing out the clues, not quite able to keep pace with the greyhound.

This situation calls for some kind of more systematic way of assessing the sources of risk and vulnerabilities. A more disciplined process is required, key concepts need to be defined as precisely as is practical, measures of the degree of financial stability or instability need to be developed, and there need to be internally consistent ways of adding this all up. The challenges of assessing risks and vulnerabilities in financial systems, and the likelihood of threats to financial stability can be likened to asking geophysicists to come up with reliable models for predicting earthquakes, with the obvious additional complexity that finance involves human trust, decisions, and fallibility (see Shubik (1999 and 2001). The assessment of risks, and the identification of financial vulnerabilities requires an analytical framework, for which there currently is no consensus. This part of the paper proposes a number of definitions that are essential for developing such an analytical framework.

A. What is the Financial Stability Challenge?

There are many ways in which to characterize the challenges faced in achieving and maintaining financial stability. Moreover, the nature of the challenge will depend to some extent on the structure and maturity of the economic system. For mature financial systems, the financial stability challenge can be characterized as:

> *maintaining the smooth functioning of the financial system and its ability to facilitate and support the efficient functioning and performance of the economy*.

To achieve financial stability, it is necessary to have in place mechanisms designed

> *to prevent financial problems from becoming systemic and/or threatening the stability of the financial and economic system, while maintaining (or not undermining) the economy's ability to sustain growth and perform its other important functions.*

The challenge is not necessarily to prevent all financial problems from arising.

- First, it is not practical to expect that a dynamic and effective financial system would avoid instances of market volatility and turbulence, or that all financial institutions would be capable of perfectly managing the uncertainties and risks involved in providing financial services and enhancing financial stakeholder value.

- Second, it would be undesirable to create and impose mechanisms that are overly protective of market stability or overly constraining of the risk-taking of financial institutions. Constraints could be so intrusive and inhibiting that they could reduce the extent of risk-taking to the point where economic efficiency is inhibited. Moreover, the mechanisms of protection or insurance could, if poorly designed and implemented, create the moral hazard of even greater risk taking.

Maintaining the economy's ability to sustain growth and perform its other important functions is an important aspect of the challenge of financial stability. The achievement and maintenance of financial stability should be balanced against other and perhaps higher-priority objectives such as economic efficiency. This reflects the notion that finance is not an end in itself but plays a supporting role in improving the ability of the economic system to perform its functions.

That the challenge is a balancing act can be seen by considering that the likelihood of systemic problems could be limited in practice by designing a set of rules and regulations that restrict financial activities in such a way that the incidence or likelihood of destabilizing asset price volatility, asset market turbulence, or individual bank failures could be eliminated. But it is also likely that this type of 'stability' would be achieved at the great expense of economic and financial efficiency.

This reasoning leads to the impression, if not conclusion, that there is an *ex ante* trade-off between achieving on the one hand economic and financial efficiency and on the other economic and financial stability. That is, if one is concerned solely with 'stability', then it may be possible to achieve and maintain it by trading off some efficiency.

The possibility of an *ex ante* trade-off can be illustrated by narrowing the definitions of stability and efficiency. Consider a market for a good whose price is sensitive to incoming information. This characterizes many asset prices. One could in principle limit the variability of the asset price by imposing restrictions in the market that would inhibit the ability of traders to price-in every small piece of information. But from a trader's and investor's perspective, such restrictions would be inhibiting the efficiency of the market's ability to price and allocate resources in the presence of uncertainty.

On the other hand, it is possible to try to maintain efficiency, and even enhance it, while at the same time allowing the financial system room to innovate, evolve, and better support the economic system. If the cost of doing so is greater asset price volatility or capital

flow volatility, it is up to society to choose a point along this trade-off. This is beyond the scope of this paper, however.

Some have characterized the difference between the American financial system and the European financial system as choices of different points along this trade-off. The American system is more market oriented in that the financing of both household and corporate activities is accomplished more through markets than in Europe, where there is much greater reliance on bank funding and less reliance on tradable securities (although this is changing). While one might argue that the American system of finance has led to greater economic productivity and efficiency, this greater efficiency is accompanied by greater asset market volatility and turbulence, and a greater observed propensity to financial stress.

From a broader perspective, the challenge of achieving and maintaining financial stability goes well beyond the stability of asset prices, or prices more generally. This is not to say that authorities, and central banks in particular, should not be concerned with asset price volatility, and price volatility more generally, because they determine the value of money. Instead, the point is that the challenge of financial stability is broader than, and in fact encompasses, the need to limit the impact of price instability on the functioning of the overall financial system. In fact, if the financial system is stable, then it will be able to tolerate higher levels of asset price volatility, as well as other financial problems, including in financial institutions. To jump immediately to the highest level of generality, one can see the challenge of financial stability as managing the risk of a system-wide problem, or what is known as systemic financial risk. But what is this, and how should we think of it? This will be defined more rigorously towards the end of what follows in the next section.

B. What are the Required Conceptual Elements of a Framework?

A framework for financial stability can best be understood as a set of definitions, concepts, and organizing principles that impose discipline on the analysis of the financial system. An important component of a framework for safeguarding financial stability is the early identification of risks and vulnerabilities that might threaten the maintenance of stability.

An effective framework would seem to require three important standards. First there must be rigorous definitions and understandings of key concepts, such as what is meant by the terms financial system, financial stability and instability, and systemic, just to name a few. Second, to be most useful for monitoring and policy, the framework's concepts and definitions ultimately must be either directly measurable or correlated with measures: in other words the concepts and definitions must have useful and policy relevant empirical counterparts. Third, the set of definitions, concepts, and organizing principles along with their empirical counterparts must serve the purpose of ensuring internal consistency in the identification of sources of risks and vulnerabilities and in the design and implementation of policies aimed at resolving difficulties should they emerge.

It is important to define appropriately the relevant concepts, especially what is meant by the financial system, financial stability and instability, and systemic risk.

What is meant by 'financial system'? Broadly, the financial system can be seen as comprised of three separable but closely related components. First there are financial intermediaries that pool funds and risks and then allocate them to their competing uses. Increasingly, financial institutions provide a range of services and not just traditional banking services of taking deposits and making loans. Now institutions such as insurance companies, pension funds, hedge funds, and financial-nonfinancial hybrids (such as General Electric) supply a range of financial services. Second, there are financial markets that directly match savers and investors, for example through the issuance and sale of bonds or equities directly to investors. Third, there is the financial infrastructure, comprised of both privately-and publicly-owned and operated institutions – such as clearance, payment, and settlements systems for financial transactions – as well as monetary, legal, accounting, regulatory, supervisory, and surveillance infrastructures.[6]

Notably, both private and public persons participate in financial markets and in vital components of the financial infrastructure. Governments borrow in markets, hedge risks, operate through markets to conduct monetary policy and maintain monetary stability, and own and operate payments and settlement systems. Accordingly, the term 'financial system' encompasses both the monetary system with its official understandings, agreements, conventions, and institutions as well as the processes, institutions, and conventions of private financial activities.[7] Any analysis of how the financial system works and how well it is performing its key functions requires an understanding of these components.

From this definition, one could reasonably expect that financial-stability and monetary-stability considerations are related in some meaningful ways. These relationships will become more transparent in what follows.

What is meant by the term 'financial stability'? There is as yet no widespread agreement on a useful working definition of financial stability. Some authors define financial instability instead of stability,[8] and others prefer to define the problem in terms of managing systemic risk rather than as maintaining or safeguarding financial stability.[9] Consistent with some aspects of these alternative definitions, Schinasi (2004b and 2006a) proposes and analyzes a definition of financial stability that has three important characteristics.

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[6] On the role of the legal system see for example, Levine (1999), Leahy and others, and Beck and others.

[7] This particular formulation is an adaptation of 'international financial system' in Truman (2003).

[8] See for example the definitions of Chant et al (2003) , Crockett (1996), the Deutsche Bundesbank (2003), Duisenberg (2001), Ferguson (2002), Foot (2003), Large (2003), Mishkin (1999), Norges Bank (2003), Padoa-Schioppa (2003), Schwartz (1986), and Wellink (2002) that are surveyed in Schinasi (2004b and 2006). Davis (2002) develops a typology of instability.

[9] From a policy perspective, a positive approach focusing on financial stability is more useful than a negative one focusing on financial instability (see Schinasi (2006) pps. 91-93).

- First, the financial system is efficiently and smoothly facilitating the inter-temporal allocation of resources from savers to investors and the allocation of economic resources generally.

- Second, forward-looking financial risks are being assessed and priced reasonably accurately and they are also being relatively well managed.

- Third, the financial system is in such condition that it can comfortably if not smoothly absorb financial and real economic surprises and shocks.

If any one or a combination of these characteristics is not being maintained, then it is likely that the financial system is moving in the direction of becoming less stable, and at some point might exhibit instability. For example, inefficiencies in the allocation of capital or shortcomings in the pricing of risk can, by laying the foundations for imbalances and vulnerabilities, compromise future financial system stability.

All three of these aspects of the definition can and do entail both endogenous and exogenous elements. For example, surprises that can impinge on financial stability can emanate both from within and from outside the financial system. Moreover, the inter-temporal and forward-looking aspects of this particular way of defining financial stability serve to emphasize that threats to financial stability arise not only from shocks or surprises but also from the possibility of disorderly adjustments of imbalances that have built endogenously over a period of time – because, for example, expectations of future returns were mis-perceived and therefore mis-priced.[10]

There are several important implications of defining financial stability in this way.

First, judgments about the performance of the financial system entail how well the financial system is facilitating economic resource allocation, the savings and investment process, and ultimately economic growth. There are two-way linkages; the real economy can be positively or negatively affected by the financial system, and the performance of the financial system can be affected by the performance of the real economy. A framework useful for assessing financial stability must pay attention to these linkages.

Disturbances in financial markets or at individual financial institutions need not be considered threats to financial stability if they are not expected to damage economic activity at large. In fact, the incidental closing of a (minor) financial institution, a rise in asset-price volatility, and sharp and even turbulent corrections in financial markets may be the result of competitive forces, the efficient incorporation of new information, and the economic system's self-correcting and self-disciplining mechanisms. By implication, in the absence of contagion and the high likelihood of systemic effects, such developments may be viewed as welcome – if not healthy – from a financial stability perspective. Just as in Schumpeterian

[10] That financial stability should not be thought of simply as a static concept of shock absorption capacity has been emphasized, among others, by Minsky (1982) and by Kindleberger (1996).

business cycles, where the adoption of new technologies and recessions have both constructive and destructive implications, a certain amount of instability can be tolerated from time to time because it may encourage long-term financial system efficiency. [11]

Second, financial stability is a broad concept, encompassing the different aspects of the financial system – infrastructure, institutions, and markets. Because of the interlinkages between these components, expectations of disturbances in any one component can affect overall stability, requiring a systemic perspective. Consistent with the definition of the financial system, at any given time, stability or instability could be the result of either private institutions and actions, or official institutions and actions, or both simultaneously and/or iteratively.

Third, financial stability not only implies that the financial system adequately fulfills its role in allocating resources, transforming and managing risks, mobilizing savings, and facilitating wealth accumulation and growth, but also that within this system the flow of payments throughout the economy functions smoothly (across official and private, retail and wholesale, and formal and informal payments mechanisms). This requires that money – both central bank money and its close-substitute, derivative monies (such as demand deposits and other bank accounts) – adequately fulfills its role as means of payment and unit of account and, when appropriate, as a (short-term) store of value. In other words, financial stability and what is usually regarded as a vital part of monetary stability overlap to a large extent. [12]

Fourth, financial stability requires the absence of financial crises and the ability of the financial system to limit and deal with the emergence of imbalances before they constitute a threat to stability. In a well-functioning and stable financial system, this occurs in part through self-corrective, market-disciplining mechanisms that create resilience and that endogenously prevent problems from festering and growing into system-wide risks. In this respect, there may be a policy choice between allowing market mechanisms to work to resolve potential difficulties and intervening quickly and effectively – through liquidity injections via markets, for example – to restore risk-taking and/or to restore stability. Thus, financial stability entails both preventive and remedial dimensions.

Last, but not least important, financial stability can be thought of as occurring along a continuum – reflecting different possible combinations of conditions of the financial system's constituent parts. An analogy is the health of an organism, which also occurs along a continuum. A healthy organism can usually reach for a greater level of health and well being, and the range of what is normal is broad and multi-dimensional. In addition, not all states of un-health (or illness) are significant, systemic, or life threatening and some illnesses, even temporarily serious ones, allow the organism to continue to function reasonably productively and return to a state of health without permanent damage. One implication of seeing financial stability in this way is that maintaining financial stability does not

[11] See Schumpeter (1934).

[12] See Padoa-Schioppa (2003) and Schinasi (2003) on the role of central banks in financial stability.

necessarily require that each part of the financial system operates persistently at peak performance; it is consistent with the financial system operating on a 'spare tire' from time to time.[13]

The concept of a continuum is relevant because finance fundamentally involves uncertainty, is dynamic (meaning both inter-temporal and innovative), and is composed of many interlinked and evolutionary elements (infrastructure, institutions, markets). Accordingly, financial stability is expectations-based, dynamic, and dependent on many parts of the system working reasonably well. What might represent stability at one point in time might be more stable or less stable at some other time, depending on other aspects of the economic system – such as technological, political, and social developments. Moreover, financial stability can be seen as being consistent with various combinations of the conditions of its constituent parts, such as the soundness of financial institutions, financial markets conditions, and effectiveness of the various components of the financial infrastructure.

What is meant by systemic risk? According to the G-10 Report on financial consolidation and risk,

> "Systemic financial risk is the risk that an event will trigger a loss of economic value or confidence in, and attendant increases in uncertainly about, a substantial portion of the financial system that is serious enough to quite probably have significant adverse effects on the real economy. Systemic risk events can be sudden and unexpected, or the likelihood of their occurrence can build up through time in the absence of appropriate policy responses. The adverse real economic effects from systemic problems are generally seen as arising from disruptions to the payment system, to credit flows, and from the destruction of asset values."[14]

The G-10 study notes that this definition encompasses much of what is in the literature but it is stricter in two respects. One is that the negative externalities of a systemic event extend into the real economy. They are not confined to the financial system. The second is that this extension into the real economy occurs with relatively high probability. The emphasis on real effects reflects the view that it is the output of real goods and services and the accompanying employment implications that are the primary concern of economic policymakers. "In this definition, a financial disruption that does not have a high probability of causing a significant disruption of real economic activity is not a systemic risk event."

Taken together, a good understanding of what is meant by financial stability and what is meant by financial instability can serve to define boundaries around the scope of the analysis. The safeguarding of financial stability should not be understood as a zero tolerance

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[13] See Greenspan (1999).

[14] Group of Ten (2001).

of bank failures or of an avoidance of market volatility but it should avoid financial disruptions that lead to real economic costs. [15]

IV. Towards a Practical Framework for Assessing Financial Stability

With working definitions of the financial system, financial stability, and systemic risk in hand, it is now possible to discuss the key role of financial stability assessments in safeguarding financial stability. The core objectives of a framework for safeguarding financial stability are the *prevention* and *resolution* of systemic financial problems. That is, safeguarding financial stability fundamentally requires a framework to *prevent* problems from occurring and/or to *resolve* problems if prevention fails.

A key to prevention is the early identification of risks to stability and of potential sources of vulnerability in the financial system before they lead to unsustainable and potentially damaging imbalances and consequences. For example, weaknesses and vulnerabilities could exist in any of the components of the financial system – institutions, markets, infrastructure – and could entail all three simultaneously. Along with identifying potential sources of risks and vulnerabilities, it is also desirable to attempt to calibrate their intensity and potential for (or probability of) leading to financial-system problems and possible systemic effects. Financial stability assessments are a key part of prevention.

The key to resolution is to have mechanisms in place and policy tools available to remedy situations in which the financial system seems to be in the early stages of moving towards instability. Such tools would include moral suasion and intensified supervision and/or market surveillance, for example. Should remedial measures fail, or undetected endogenous factors or unanticipated exogenous factors lead to instability, tools should be available for resolving problems and instabilities quickly and with minimum collateral damage, either to the financial system or the economy. Such tools would include emergency liquidity assistance.

A. A Practical Framework

A schematic that might be considered as a reasonable "model" of such a framework for prevention and resolution is presented in Figure 4. Both prevention and resolution of financial difficulties are part of the framework, although resolution is well beyond the scope of this paper and is not discussed. [16]

In order to prevent problems from occurring or becoming significant enough to pose a risk to financial stability, it would be desirable if the approach taken were to entail a

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[15] Papers that focus on aspects of systemic risk are Hoelscher and Quintyn (2003) and Summer (2003).

[16] See pp. 114-118 in Schinasi (2006) for a brief discussion of the resolution phase. Also see the conference papers discussed at a recent conference held at the Federal Reserve Bank of Chicago on *International Financial Instability: Cross-Border Banking and National Regulation*, which deals in part with the challenges in resolving cross-border banking problems in a world in which regulation and supervision are nationally oriented.

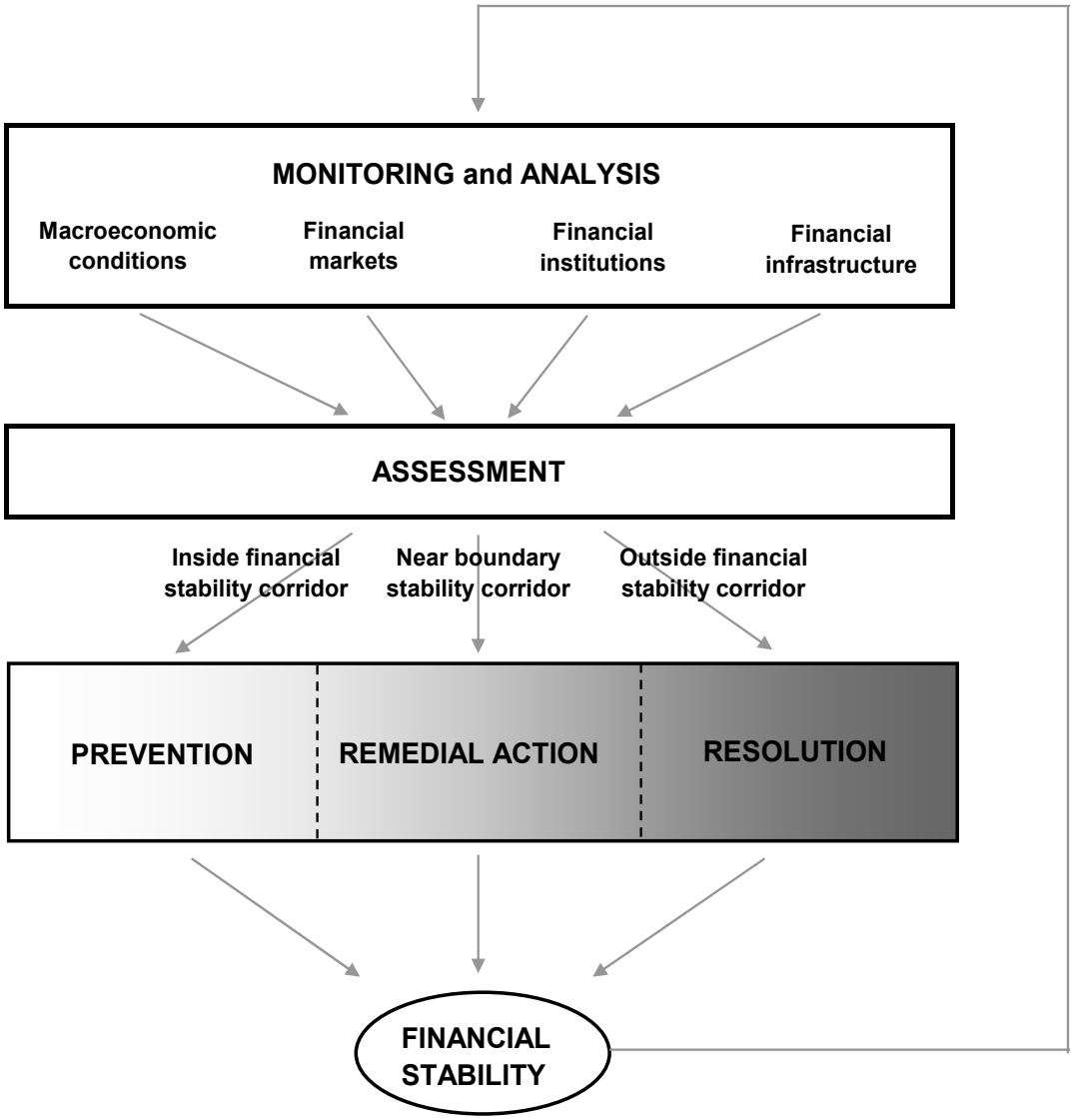
continuous process of information gathering, technical analysis, monitoring, and assessment. Because of the linkages between the real economy and the financial system, and also the various components of the financial system, this continuous process would be most useful if it encompassed both economic and financial dimensions, and institutional knowledge about institutions, markets, and the financial infrastructure. In effect, the process needs to be comprehensive and analytical (see the top bar in Figure 4). Note that ongoing and more fundamental research into the changing structure of the financial system and its changing linkages to the real economy, as well as the further development of measurement techniques for detecting growing imbalances and calibrating risks and vulnerabilities, are vital for keeping up to date this important monitoring phase.

The process entails information gathering about, and monitoring of, the macro-economy (and at times microeconomic aspects as well) and the various aspects of the financial system through supervisory, regulatory, and surveillance mechanisms. Each of the financial-system monitoring components could entail both macro- and micro-prudential characteristics. For example, when it comes to gathering information about and monitoring individual institutions, the supervisory process could be aided by knowledge about where the economy is along the business and credit cycles and how markets have been performing overall: the reason being that the macro-economy and markets provide the background against which the operational performance of individual institutions should be assessed. Likewise an assessment of the condition of financial markets could be different depending on whether the major institutions operating in the markets were well capitalized and profitable or not. This is another way of observing that there are tradeoffs, even in the assessment process in safeguarding financial stability.

The reason for gathering information, analyzing it, and continuously monitoring the various components of, and influences on, the financial system is systematically and periodically to make assessments of whether the financial system is more or less performing its main functions well enough to be judged to be within a corridor of financial stability along the continuum discussed earlier. Such an assessment could lead to three conclusions each of them having quite different implications for action (see the middle bar in Figure 4 labeled assessment and the arrows). The financial system can be judged to be in a zone or corridor of financial stability, as approaching a boundary of stability/instability, or outside a zone or corridor of stability. Within the third category, the financial system could be further judged to be in a position in which self-corrective processes and mechanisms are judged to be likely to move the system back toward the corridor of stability or alternatively to need prompt remedial and even emergency measures to reverse the instability. [17]

[17] As Kindleberger (1996) puts it: "....markets work well, on the whole, and can normally be relied upon to decide the allocation of resources and, within limits, the distribution of income, but that occasionally markets will be overwhelmed and need help".

Figure 4. Framework for Maintaining Financial System Stability



Source: Schinasi (2006a) and Houben, Kakes, and Schinasi (2004).

One could also develop a delineation of financial conditions and potential difficulties according to their intensity, scope, and potential threat to systemic stability. For example, potential financial difficulties can be thought of as falling into one of the following fairly broad categories:

- difficulties in a single institution or market not likely to have system-wide consequences for either the banking or financial system;

- difficulties that involve several relatively important institutions involved in market activities with some nontrivial probability of spillovers and contagion to other institutions and markets; and

- problems likely to spread to a significant number and types of financial institutions and across usually unrelated markets for managing liquidity needs, such as forward, interbank, and even equity markets.

Problems occurring within each of these categories would require different diagnostic tools and policy responses, ranging from doing nothing to intensifying supervision or surveillance of a specific institution or market, to liquidity injections into the markets to dissipate strains, to interventions into particular institutions.

B. Challenges in Implementing a Framework

While categories of possible assessments may be easy to discuss in principle, they are difficult to identify in actual practice. How should the boundary of stability be defined and measured, for example? When does an isolated small problem threaten to become a systemic one? There would also seem to be a bias to be prudent and overreach in identifying both potential sources of risks and vulnerability and overestimate their likelihood and importance. Thus, it would be useful to establish some ground rules or guidelines for disciplining the continuous process of information gathering, analysis, and monitoring, and most importantly for identifying sources of risks and vulnerabilities. A check list of disciplining principles for identifying risks and vulnerabilities and for assessing where along the stability spectrum the financial system might be could include the following:[18]

- Is the process systematic?
- Are the risks identified plausible?
- Are the risks identified systemically relevant?
- Can linkages and transmission (or contagion) channels be identified?
- Have risks and linkages been cross-checked?
- Has the identification of risks and the assessment been time consistent?

In practice, the process of assessing financial stability entails a *systematic* identification and analysis of the sources of risk and vulnerability that could impinge on stability in the circumstances in which the assessment is being made. For example, consider the comprehensive list of sources of risks in Table 10. An operationally significant distinction is made between endogenous sources of risk that are present within the financial system and exogenous sources of risk that might emanate from outside the realm of finance.

In keeping with the broad definition of the financial system outlined above, endogenous sources of risk can arise either in financial institutions, or in financial markets, or

[18] These ideas are developed in detail in Fell and Schinasi (2005).

in the infrastructures, or in any combination. For instance, credit, market or liquidity risks may be present in financial institutions which, if they materialize, could hamper the process of reallocating financial resources between savers and investors. Financial markets can be a source of endogenous risk not only because they offer alternative sources of finance to non-financial sectors but also because they entail systemic linkages between financial institutions, and more directly between savers and investors. Financial infrastructures are also an important endogenous source of risk, in part because they entail linkages between market participants as well, but also because they provide the institutional framework in which financial institutions and markets operate.

Outside the financial system, the macroeconomic environment can be an exogenous source of risk for financial stability because it directly influences the ability of economic and financial actors (households, companies, and even the government) to honor their financial obligations. Financial stability assessments should entail a systematic and periodic process of monitoring of each of these sources of risks, both individually and collectively by taking account of cross-sector and also cross-border linkages. This process should satisfy at least the list above.

There are also formidable measurement and modeling challenges in the ability to assess the strength and robustness, or to calibrate the plausibility and importance of the various risks, or to appraise quantitatively the potential costs should risks materialize. In actual practice many shortcuts and qualitative judgments must be made in order to produce an overall assessment.

For most macroeconomic or monetary policy objectives (unemployment, external or budgetary equilibrium, price inflation, etc.) there is a widely-accepted measurable (set of) indicator(s) that define, and measure deviations from, the objective, even if still subject to methodological and analytical debate and even controversy. In the case of both macroeconomics and monetary economics it took each of them some twenty-to-thirty years of practice, trial, and error, measurement and modeling development, and fundamental research to accomplish this. As noted in the introduction, financial stability analysis is still in an infant stage of development. Thus, by contrast, there is as yet no widely-accepted set of measurable indicators of financial stability that can be monitored and assessed over time. In part, this reflects the multifaceted nature of financial stability, as it relates to both the stability and resilience of financial institutions, and to the smooth functioning of financial markets and settlement systems over time.[19] Moreover, these diverse factors need to be weighed in terms of their potential ultimate influence on real economic activity. But it also reflects the relatively young age of the discipline of assessing financial stability. Because measurement is not highly developed yet, it is reasonable to see the current practice of making financial stability assessments more as an art form than as a rigorous discipline or science.

[19] Sets of indicators have been developed, and are widely used, for assessing the soundness of banking institutions. See for example the IMF Soundness Indicators, both core and encouraged sets in IMF (2003), and the IMF's guide on financial soundness indicators (accessible for the IMF website), IMF (2004).

Table 10. Sources of Risk to Financial Stability

Endogenous	**Exogenous**

Institutions-based:
• Financial risks
  ○ Credit
  ○ Market
  ○ Liquidity
  ○ Interest rate
  ○ Currency
• Operational risk
• Information technology weaknesses
• Legal/integrity risk
• Reputation risk
• Business strategy risk
• Concentration risk
• Capital adequacy risk
 	
Market-based:
• Counterparty risk
• Asset price misalignment
• Run on markets
  ○ Credit
  ○ Liquidity
• Contagion
 	
Infrastructure-based :
• Clearance, payment and settlement system risk
• Infrastructure fragilities
  ○ Legal
  ○ Regulatory
  ○ Accounting
  ○ Supervisory
• Collapse of confidence leading to runs
• Domino effects
	Macroeconomic disturbances:
	• Economic-environment risk
	• Policy imbalances
	Event risk
	• Natural disaster
	• Political events
	• Large business failures

Source: Schinasi (2006a) and Houben, Kakes, and Schinasi (2004).

Challenges in measuring financial system stability reach well beyond the challenges of measuring the degree of stability in each individual sub-component of the financial system. Financial stability requires that the constituent components of the system – financial institutions, markets, and infrastructures – are jointly stable. Weaknesses and vulnerabilities in one component may or may not compromise the stability of the system as a whole, depending on size and linkages – including the degree and effectiveness of risk-sharing between different components. Moreover, as different parts of the system perform different tasks, there are challenges to aggregating information across the system. For example, in diversified financial systems - where both financial institutions and markets are important providers of finance - there is no commonly accepted way of aggregating information on the degree of stability in both the banking system and financial markets to form an overall assessment of system stability. If the banking system is functioning well but, at the same time, there are signs of strains in financial markets, the overall assessment of financial system

stability is likely to be ex ante ambiguous, particularly if the respective shares of the two components as providers of finance are similar. The more complex and sophisticated is a financial system, the more complex is the task likely to be of measuring overall stability in a precise way.

Financial stability assessments carry a higher degree of uncertainty than ordinarily associated with forecasts based on macro-econometric models. This is because there are formidable practical challenges to measuring, modeling, and assessing the consequences of rare events.

- First, if past crises were prevented or tackled by policy actions, assessments of the likely costs of a selected scenario, based on simulations drawn from historical data-sets, will likely prove to be biased unless sufficient account is taken of policy reaction functions. It is doubtful that past policy responses to episodes of financial stress could be summarized by a mechanical reaction function, particularly if the authorities were mindful of avoiding the moral hazards that typically follow from predictable behavior. Moreover, even in cases that did not lead to policy responses, the frequency of crises in historical data sets may be too low to facilitate precision in estimating the likely 'policy neutral' consequences of a stylized scenario.

- Second, confidence intervals around the expected output losses associated with the materialization of a specified scenario may be neither well defined statistically, nor defined at all. For instance, simulations based on historical episodes tend to be founded on statistical relationships that reflect the central tendency of probability distributions, rather than the tails. Moreover, for hypothetical scenarios, which have not occurred in the past, it may not be possible to compute a confidence interval around the simulation because the events themselves may be subject to Knightian uncertainty – or unquantifiable risk.[20]

- Third, most macro-econometric models used for stress-testing tend to be built on the basis of log-linear relationships. For simulations, this means that a doubling of the size of a shock will result in a proportionate change in the effect. However, in reality, it can never be excluded that in situations of financial stress, unpredictable non-linearities may surface, for instance due to threshold effects.

- Fourth, as witnessed during the near collapse of Long Term Capital Management in 1998, unexpected linkages may surface during crises – such as correlations between financial markets that ordinarily tend to be uncorrelated. Given such uncertainties, the real economic costs associated with a particular scenario could well prove to be larger than those predicted by an empirical model. Such considerations would suggest that the output of any stress-testing exercise should only be viewed as indicative of how, or if, the financial system would endure adverse disturbances. In order to avoid complacency, this calls for a high degree of caution and judgment in forming financial assessments.

[20] See Knight (1921)

In order to advance the practice of financial stability assessment from what is essentially an art towards a science, progress is necessary on at least three fronts: data, models, and understanding of linkages. A priority for data gathering must be micro balance sheet data covering financial institutions, households, and firms. While a picture of the aggregate risks borne within each of these sectors can be useful for financial stability analysis, far more important is an understanding of the way in which the risks are distributed across sectors and especially whether or not concentrations or pockets of vulnerabilities can be pinpointed. In mature economies, the availability and comprehensiveness of such data is rather mixed, particularly for the household sector.

Two areas where more and better analytical research on financial stability modeling appears necessary include models for identifying risks and vulnerabilities and models for assessing the consequences of adverse disturbances.[21] Concerning the identification of risks, the literature suggests that it is doubtful that models will ever be capable of predicting crises, particularly precise timing. Nevertheless, this should not stand in the way of developing models for assessing vulnerabilities. Even simple single indicator approaches can be useful for gauging risks to financial stability (see Campbell and Shiller (2001)) and current work holds promise for the development of more comprehensive frameworks for pinpointing the sets of variables (see IMF (2004)) and the conditions that raise the likelihood of financial stress (for example, see Aspachs, Goodhart, Segoviano, Tsomocos, and Zicchino (2006)). As for the prediction of crises, it cannot be excluded that drawing on the intellectual advances made in other disciplines in the modeling of complex and discontinuous processes – such as the prediction of earthquakes – may offer insights for financial stability assessment.

V. CONCLUDING REMARKS

The purpose of this paper was to explore the various challenges in safeguarding financial stability, which have become more important over the past twenty years or so. As discussed, there are formidable conceptual challenges in defining financial stability and in analyzing it. From the perspective of assessing the performance of financial systems, and their likelihood of encountering difficulties, the financial-stability discipline – if it can yet be labeled as such – does not yet know how to integrate knowledge and information about financial institutions and financial markets. Nor does it know how to conceptualize usefully, and model empirically the important systemic linkages between financial processes and the real economic process finance is designed to facilitate. In short, the discipline lacks a widely accepted framework. Current practice probably compares with the way monetary policy assessment was practiced by central banks two or three decades ago – before there was a widely-accepted, rigorous framework.

The challenges that lie ahead for financial stability analysis concern both measurement and theory. The challenges are formidable, in part because financial stability assessments must not only take stock of disturbances as they emerge, but also identify and

[21] See Sahajwala and Van den Berg (2000) for an overview of early warning systems used by some G-10 authorities, and Persson and Blåvarg (2003) on the use of financial market indicators.

examine the vulnerabilities that could lead to such disturbances occurring in the future. A forward-looking approach is required in order to identify the potential build-up of financial imbalances and to account for the transmission lags in policy instruments. The real difficulty is that financial crises are inherently difficult, if not impossible, to predict, in part because of contagion effects and likely non-linearities in both the build-up of imbalances and their transmission to the real economy. In addition, financial stability risks often reflect the far reaching consequences of unlikely events. This implies that the focus of the attention is not the mean, median or mode of possible outcomes but the entire distribution of outcomes, in particular the 'left tail'.

While many conceptual and methodological challenges lie ahead, it is important to acknowledge that significant progress has been made in recent years. Even though there is no obvious framework for summarizing developments in financial stability in a single quantitative measure, a growing number of central banks around the world are making financial stability assessments and publishing financial stability reports, many of them based on a broad and forward-looking conception of financial stability.

The challenges to financial stability posed by the globalization of finance, the increasing use of sophisticated instruments, and the entrance of new large participants in global markets, separately and collectively, lead to the strong conclusion that further and continuous reforms are desirable and should be aimed at striking a better balance between relying on market discipline and relying on official or private-collective action. In some countries—most of them advanced countries with mature markets—a rebalancing toward greater reliance on market discipline is desirable. In other countries—many with poorly developed markets—strong efforts need to be made to improve the financial infrastructure through private-collective and government expenditures and commitments, and to target the role of government to enhance the effectiveness and efficiency of market mechanisms for finance.

Reforms in the following specific areas would go a long way in improving the prospects for safeguarding financial stability where it presently exists, and in promoting it where it is yet to be achieved.

- Improve internal governance at the board-of-directors level, management and risk controls, and the alignment of incentives of board, management, and staff — by realigning private incentives within all financial institutions.

- Reduce moral hazard and other adverse incentives — by reevaluating and reforming existing regulatory incentives and their consistency with private market incentives.

- Improve market discipline and strengthen private-collective and official surveillance and supervision — by enhancing financial transparency through disclosure by a wide range of financial and nonfinancial entities.

- Reduce informational asymmetries and the tendency toward adverse selection — by improving financial market transparency.

- Reduce, and if possible eliminate, legal uncertainties where laws are still ambiguous (such as with closeout procedures for credit derivatives and other complex structured financial instruments)—by introducing new legislation developed in a coordinated fashion by private financial industry, official, and legislative representatives.

- Improve the ability to monitor, assess, and safeguard financial stability, and to restore it when this fails — by aggressively developing and implementing comprehensive and appropriately targeted frameworks, analytical tools, and the necessary data and information.

- Reduce opportunities for international regulatory arbitrage, and eliminate international gaps of information and analyses — by enhancing international cooperation and coordination in financial-system regulation, surveillance, and supervision.

The complexity of the challenges and the rapidity and creativity with which new financial instruments are developed and disseminated require a systemic approach to safeguarding financial stability such as was examined earlier in the paper and analyzed in detail elsewhere. The financial system, working within the context of the broader economic, social, and political systems, affects the performance of the economy and well-being of society. In turn, those systems must operate hand in hand to safeguard the stability of the financial system, and the constellation of tools they provide must be used to ultimately ensure economic stability.

Ultimately, the goal is to maintain financial stability so that the financial system is capable of performing its three key functions: the intertemporal allocation of resources from savers to investors and the allocation of economic resources generally; the assessment, pricing, and allocation of forward-looking financial risks; and the absorption of financial and real economic shocks and surprises.

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