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Derivatives Markets:
Sources of Vulnerability in U.S. Financial Markets

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Abstract:

This paper studies the ways in which derivatives markets pose several types of public interest concerns to the US economy by creating new and greater sources of vulnerability. The first and most obvious concern is the way in which derivatives markets expand risk-taking activity relative to capital. By enhancing the efficiency of transactions and the leveraging of capital, derivatives can increase speculation just as well as they lower the cost of hedging. Secondly, derivatives markets can provide new opportunities for destructive activities such as fraud and manipulation; and they can facilitate unproductive activities such as outflanking prudential financial market regulations, manipulating accounting rules and evading or avoiding taxation. The third concern involves the creation of new types and levels of credit risk as OTC derivatives contracts are traded in order to shift various types of market risk. The new credit risk is not subject to collateral (i.e. margin) requirements, and is not handled in the most economically efficient manner. The fourth concern is the liquidity risk, especially in the interest rate swaps market, which is susceptible to creditworthiness problems at one or more of the major market participants. The last concern is systemic risk, arising especially from the OTC derivative markets, and the strong linkages between derivatives and underlying asset and commodity markets. The paper will conclude with a proposal for prudential regulatory measures that will address these public interest concerns.

I. INTRODUCTION

Derivatives are financial contracts that are designed to create market price exposure to changes in an underlying commodity, asset or event. In general they do not involve the exchange or transfer of principal or title.[1] Rather their purpose is to capture, in the form of price changes, some underlying price change or event. The term *derivative* refers to how the price of these contracts are *derived* from the price of some underlying security or commodity or from some index, interest rate, exchange rate or event. Examples of derivatives include futures, forwards, options and swaps, and these can be combined with each other or traditional securities and loans in order to create *hybrid instruments* or structured securities (see Appendix I below for a primer on derivative instruments). Derivatives are traded on derivatives exchanges, such as the Chicago Mercantile Exchange which employs both open outcry in "pits" and electronic order matching systems, and in over-the-counter markets where trading is usually centered around a few dealers and conducted over the phone or electronic messages.[2]

Derivatives play a useful and important role in hedging and risk management, but they also pose several dangers to the stability of financial markets and thereby the overall economy.

As a testament to their usefulness, derivatives have played a role in commerce and finance for thousands of years. The first known instance of derivatives trading dates to 2000 B.C. when merchants, in what is now called Bahrain Island in the Arab Gulf, made consignment transactions for goods to be sold in India.[3] Derivatives trading, dating back to the same era, also occurred in Mesopotamia (Swan, 1993). The trading in Mesopotamia is evidenced by many clay tablets in the cuneiform writing, and these are available at the British Museum, the Louvre and were some of the many items stolen from museums in Baghdad during the U.S invasion in 2003. A more literary reference comes some 2,350 years ago from Aristotle who discussed a case of market manipulation through the use of derivatives on olive oil press capacity in Chapter 9 of his *Politics.*[4]

Derivatives trading in an exchange environment and with trading rules can be traced back to Venice in the 12th Century.[5] Forward and options contracts were traded on commodities, shipments and securities in Amsterdam after 1595.[6] The Japanese traded futures-like contracts on warehouse receipts or rice in the 1700s. In the US, forward and futures contracts have been formally traded on the Chicago Board of Trade since 1849. As of 2003, the world's largest derivative exchange is the Eurex which is an entirely electronic trading "exchange" that is based in Frankfurt, Germany.

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[1]) The most common exception to this general rule is foreign exchange swaps in which that actual currency is exchanged, and to a lesser extent when futures or options are held to maturity so as to require delivery of the underlying item.

[2]) For a description of the OTC market see Dodd (2002).

[3]) This is the claim made by the Futures Industry Association in their 1984 publication *An Introduction to the Futures Markets*, and it is cited in Markham (1994) and Markham (1987).

[4]) It is not entirely clear from the available translation whether these derivatives were options or forward contracts. See Appendix II for the relevant section of the text.

[5]) See Swan (1993).

[6]) See Edward Chancellor (1999) for an excellent analysis of the meaning of the 1595 laws.

Today the size of derivatives markets is enormous, and by some measures it exceeds that for bank lending, securities and insurance. Data collected by the Bank of International Settlements (BIS) show that the amounts outstanding in the over-the-counter (OTC) market exceed $197.2 trillion and those at derivatives exchanges exceed $38.2 trillion for a total of $236 trillion by the end of 2003. Trading volume on derivatives exchanges through the end of 2003 exceeded $873.7 trillion (see Tables 1 and 2 from BIS data).

According to these measurements, the size of the derivatives market is huge. So big that it challenges descriptions akin to description of the size of space. Douglas Adams, author or *The Hitchhiker's Guide to the Galaxy*, tried to say it like this, "Space is big. Really big. You just won't believe how vastly hugely mind- bogglingly big it is. I mean, you may think it's a long way down the road to the chemist, but that's just peanuts to space." Thus one benchmark is to compare the market to the $11 trillion size of the US gross domestic product. Thus outstanding amounts are 19 times the size of the US economy, while trading volume on exchanges is over 79 times the US GDP.

Today, derivatives are used to hedge the risks normally associated with commerce and finance. Farmers can use derivatives the hedge the risk that the price of their crops fall before they are harvested and brought to the market. Banks can use derivatives to reduce the risk that the short-term interest rates they pay to their depositors will rise and reduce the profit they earn on fixed interest rate loans and securities. Mortgage giants Fannie Mae and Freddie Mac – the world largest end-users of derivatives – use interest rate swaps, options and swaptions to hedge against the prepayment risk associated with home mortgage financing. Electricity producers hedge against unseasonable changes in the weather. Pension funds use derivatives to hedge against large drops in the value of their portfolios, and insurance companies sell credit protection to banks and securities firms through the use of credit derivatives.

In addition to risk management, derivatives markets play a very useful economic role in price discovery. Price discovery is the way in which a market establishes the price or prices for items traded in that market, and then disseminates those price as information throughout the market and the economy as a whole. In this way market prices are important not just to those buying and selling but also those producing and consuming in other markets and in other locations and all those affected by commodity and security price levels, exchange rates and interest rates.

This price discovery process gives rise to the public interest concern, and historically it has been the motivation for the regulation of derivatives markets in the United States. Until it was amended as part of a major deregulation of derivatives markets in 2000, Section 3 of the Commodity Exchanges Act, entitled “The Necessity of Regulation,” stated that derivatives prices are "affected with a national public interest." "The prices in such transactions are generally quoted and disseminated throughout the United States... for determining the prices to producer and consumer of commodities and the products and by-products thereof and to facilitate the movements thereof in interstate commerce."

Along with these economic benefits come costs or potential economic costs. As an indication of the dangers they pose, it is worthwhile recalling a shortened list of recent disasters. Long-Term Capital Management collapsed with $1.4 trillion in derivatives on their books. In the process it froze up the U.S dollar fixed income market. Sumitomo Bank in Japan used derivatives in their manipulation of the global copper market in the mid-1990s. Barings Bank, one of the oldest in Europe, was quickly brought to bankruptcy by over a billion dollars in losses from derivatives

trading. Derivatives dealer Enron collapsed in 2001 – the large bankruptcy in US history at the time – and caused collateral damage throughout the energy sector. In the process it was disclosed how Enron and other energy merchant, i.e. energy derivatives dealers, used derivatives to manipulate electricity and gas markets during California's energy crisis. The use of derivatives for tax evasion were also brought to light. In 2002, the Allied Irish Bank's Allfirst lost $750 million trading in foreign exchange options. Both the Mexican financial crisis in 1994 and the East Asian financial crisis of 1997 were exacerbated by the use of derivatives to take large positions involving the exchange rate. In 2003, New York Attorney General Elliot Spitzer disclosed how derivatives were used to capture gains from "late trading" and "market time" of mutual funds offered by Bank of America.

The account, however brief, of these many economic ills gives the impression that derivatives unleash a virtual Pandora's Box of troubles upon financial markets and the world at large. But the point is not to cause despair. As in the case of the opening of Pandora's Box, amongst the evils released was also one virtue – hope. Hence this essay will conclude with a set of regulatory proposals designed to reign in excesses, detect and deter fraud and manipulation, help prevent crises and result in more efficient derivatives markets.

TABLE 1

OTC DERIVATIVES: Amount Outstanding

Global markets, by instrument, in billion US $

	1998	1999	2000	2001	2002	2003*
Foreign exchange	18,011	14,344	15,666	16,748	18,460	24,484
Forwards and forex swaps	12,063	9,593	10,134	10,336	10,719	12,387
Currency swaps	2,253	2,444	3,194	3,942	4,503	6,371
Options	3,695	2,307	2,338	2,470	3,238	5,726
Interest rate contracts	50,015	60,091	64,668	77,568	101,658	141,991
Forward rate agreements	5,756	6,775	6,423	7,737	8,792	10,769
Interest rate swaps	36,262	43,936	48,768	58,897	79,120	111,209
Options	7,997	9,380	9,476	10,933	13,746	20,012
Equity-linked contracts	1,488	1,809	1,891	1,881	2,309	3,787
Forwards and swaps	146	283	335	320	364	601
Options	1,342	1,527	1,555	1,561	1,944	3,186
Commodity contracts	415	548	662	598	923	1,406
Gold	182	243	218	231	315	344
Other commodities	233	305	445	367	608	1,062
Forwards and swaps	137	163	248	217	402	420
Options	97	143	196	150	206	642
Other	10,389	11,408	12,313	14,384	18,330	25,510
Total: OTC Derivatives	80,318	88,202	95,199	111,178	141,679	197,177

* Through end of 2003

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TABLE 2

EXCHANGE-TRADED DERIVATIVES

Notional principal in billions of US dollars

Amounts Outstanding

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
FUTURES											
All markets	5,087	5,976	6,082	6,212	7,840	8,355	8,302	8,354	9,665	10,323	13,714
Interest rate	4,943	5,808	5,876	5,979	7,587	8,031	7,925	7,908	9,265	9,951	13,132
Currency	35	40	34	38	42	32	37	74	66	47	80
Equity index	110	128	172	196	211	292	340	372	334	326	502
North America	2,535	2,854	2,881	2,548	3,223	3,527	3,553	4,283	5,906	5,866	7,701
Interest rate	2,457	2,768	2,787	2,439	3,083	3,366	3,358	4,053	5,697	5,655	7,386
Currency	30	32	25	31	38	28	32	36	36	45	65
Equity index	48	54	68	78	103	134	163	195	174	166	250
OPTIONS											
All markets	2,670	2,922	3,200	3,806	4,567	5,580	5,288	5,904	14,095	13,487	23,037
Interest rate	2,361	2,623	2,742	3,278	3,640	4,624	3,756	4,734	12,493	11,760	20,801
Currency	76	56	120	133	119	49	22	21	27	27	38
Equity index	232	243	338	395	809	907	1,510	1,148	1,575	1,700	2,198
North America	1,826	1,970	1,972	2,293	3,125	3,828	3,377	3,885	10,293	7,823	11,804
Interest rate	1,613	1,773	1,705	2,013	2,439	3,124	2,259	3,117	9,220	6,661	10,382
Currency	75	53	40	44	32	18	13	14	18	21	19
Equity index	138	143	227	235	655	686	1,105	754	1,054	1,142	1,404

Turnover, Volume of Transactions

FUTURES											
All markets	48,617	68,682	56,038	60,935	76,799	75,574	61,990	72,695	117,532	119,771	152,945
Interest rate	46,008	65,415	52,681	56,923	72,195	69,990	55,734	66,652	111,133	112,237	142,948
Currency	715	812	680	655	642	591	605	553	675	614	1,101
Equity index	1,893	2,455	2,678	3,358	3,963	4,993	5,651	5,490	5,723	6,920	8,895
North America	21,465	35,487	25,639	24,615	35,951	37,657	29,143	37,093	65,120	61,950	74,264
Interest rate	19,963	33,595	23,690	22,207	33,266	34,751	25,765	33,621	61,616	57,630	68,942
Currency	676	632	481	530	574	484	519	379	493	550	1,005
Equity index	825	1,260	1,468	1,879	2,111	2,422	2,859	3,094	3,011	3,769	4,317
OPTIONS											
All markets	10,214	14,262	12,130	12,986	16,160	18,352	13,979	17,074	46,087	50,057	54,510
Interest rate	8,232	11,787	9,497	10,233	12,497	14,659	9,366	12,302	38,722	39,942	41,517
Currency	336	281	367	234	226	93	67	51	98	91	132
Equity index	1,646	2,194	2,267	2,519	3,436	3,600	4,546	4,721	7,267	10,024	12,861
North America	6,356	10,252	7,208	8,292	11,484	12,862	9,017	11,513	33,241	29,250	28,851
Interest rate	4,931	8,314	5,311	6,401	8,751	10,359	6,043	8,528	29,376	24,918	24,753
Currency	334	270	195	161	142	64	48	36	48	54	71
Equity index	1,092	1,668	1,703	1,730	2,592	2,438	2,927	2,949	3,818	4,277	4,027

* Through end of 2003

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II. PUBLIC INTEREST CONCERNS

The presence of derivatives markets, and more recently their extraordinary growth, raise some important concerns about the vulnerability of the financial sector and the overall economy. These concerns are listed in Figure 1 below, and they are then addressed more accordingly in the section that follows.

FIGURE 1
PUBLIC INTEREST CONCERNS

1) Increases leverages and lowers expense of risk taking
   a) Risk taking is an externality and thus is a market imperfection that is not solved by the market alone
   b) Derivatives make risk shifting, and hence risk taking, cheaper and more efficient.
   c) Derivatives are sometimes used to outflank prudential regulations and taxation.
2) Destructive Activities
   a) Destructively used to commit fraud on the market
   b) Destructively used to manipulate markets and distort the price discovery process
3) Unproductive Activities
   a) Unproductively used to outflank prudential regulations
      i) lower capital requirement
      ii) lower collateral and margin requirement
      iii) avoid restrictions on assets and liabilities
   b) Unproductively used to manipulate accounting rules
   c) Unproductively used to avoid or evade taxation.
4) Credit risk
5) Liquidity risk
6) Systemic risk

Each of these concerns is linked to one or more concepts of market failure or market imperfections. These are the externality of risk taking, the externality of the information content of prices, the absence of destructive competition and systemic risk.

The first danger posed by derivatives comes from the leverage they provide to both hedgers and speculators. Derivatives transactions allow investors to take a large price position in the market while committing only a small amount of capital – thus the use of their capital is leveraged.

Leverage makes it cheaper for hedgers to hedge, but it also makes speculation cheaper. Instead of buying $1 million of Treasury bonds or $1 million of stock, an investor can buy futures contracts on $1 million of the bonds or stocks with only a few thousand dollars of capital committed as margin. The returns from holding the stocks or bonds will be the same as holding the futures on the stocks or bonds. This allows an investor to earn a much higher rate of return on their capital by taking on a much larger amount of risk.

Taking on these greater risks raises the likelihood that the investor makes or loses large amounts of money. If they suffer large losses, then they are threatened with bankruptcy. If they go bankrupt, then the people, banks and other institutions that invested in them or lent money to

them will face possible losses and in turn face bankruptcy themselves. This spreading of the losses and failures is known as *systemic risk*, and it is an economy wide problem that is made worse by leverage and leveraging instruments such as derivatives.

Another danger involves transparency. Some derivatives are traded on formal futures and options exchanges which are closely regulated. Other derivatives are traded over-the-counter (OTC) in markets that are almost entirely unregulated. In the OTC markets there is very little information provided by either the private market participants or collected by government regulators. The prices and other trading information in these markets are not made freely available to the public like is the case with futures and options exchanges. Instead that information is hoarded by each of the market participants.

As a result of this lack of information in the OTC market, it substantially reduces the ability of the government and other market participants to anticipate and possibly preempt building market pressures, major market failures, or manipulation efforts.

Yet another danger involves the use of derivatives to evade, avoid, dodge or out-flank financial market regulations designed to improve economic stability. In the cases of this decade's financial crises in Mexico and East Asian, the financial institutions in those countries used derivatives called total rate of return swaps to out-flank financial regulations limiting those institutions exposure to foreign exchange risk. Derivatives can also be used to evade tax laws and manipulate accounting rules my restructuring the flow of payments so that earning are reported in one period instead of another. Foreign exchange derivatives can also be used to improve the ability of speculators to mount an attack on a developing country's exchange rate system. In 1997, speculators employed both foreign exchange derivatives and equity-linked derivatives on Hong Kong's stock market in order to launch their attack on Hong Kong's fixed exchange rate regime. Thus when the Hong Kong monetary authority tried to defend its currency by raising interest rates, the speculators profited when the higher interest rates pushed down the price of stocks.

III. FINANCIAL MARKET IMPERFECTIONS

US financial markets are efficient in comparison to the rest of the world. Nonetheless they are not perfect, and of particular importance they are far from the perfection that is assumed as the basis for modern financial economics. This theory forms the basis of a strict laissez-faire approach to financial markets such that it characterizes government regulation as being generally inefficient, unproductive, outmoded and overall bad.

As a matter of empirical fact and actual experience, US financial markets suffer from several imperfections. And these imperfections are of such material consequence that the markets can be improved through government regulation and oversight.

RISK TAKING

There is an external diseconomy from the activity of risk taking. It is an inherent property of risk taking in financial markets that it can have a deleterious impact not only on those entities that are not party to the transactions and even those that do not participate in the market.

This is akin to negative external diseconomies such as pollution and congestion.

Markets can discipline internal risk management and the risk-reward relationship for ownership of internalized risk taking activities. Financial markets price securities and other transactions based on their risk-reward characteristics. Financial markets also produce incentives for risk management through the use of collateral, margin and capital.

Market cannot address and solve the collateral damage of bankruptcy and lesser events such as failure to perform on transactions obligations. This affects not only the immediate counterparties, who are supposed to internalize the credit risk of their counterparties, but also other non-counterparties in the market and others who are not in the market.

In financial markets, risk taking has an externality because bankruptcy affects more than the failing firm. Part of the impact on other firms is anticipated by their holding capital in reserve against just such problems. However, reserve capital is costly and competition between market participants drives them to avoid holding any excess capital. Therefore bankruptcy losses in excess of what they anticipate will adversely impact those firms and in turn the other firms and individuals that do business with them. This is most clearly a problem for “too big to fail” firms. If they are driven to bankruptcy or are unable to perform their usual market functions, then it will have an adverse affect on the overall economy unless the government must steps in to restore market order.

Linkages between the various investors and financial institutions are inherent in financial markets. My risk becomes your risk becomes his and her risk. The ability of market-based competition is limited to discipline market participants against taking on more risk or too much risk. Sometimes competition punishes above normal risk taking as more and more investors decline to do business with the exceptionally risky investor. Other times competition drives down the standard for prudent investing as the competition for capital and customers pushes investors to seek higher returns by moving into riskier investments. Although competitive

markets work sometimes, it is the times that they fail which justify the role of the government to provide minimal prudential regulatory standards.

Externality of risk and bankruptcy extends not just to other individual investors but also to the economy as a whole when it strikes key financial institutions such as banks that are critical to clearing payments, dealing in or clearing US Treasury securities, underwriting and dealing in other bonds or interest rate derivatives. The problem is that the cost to the individual for their risk taking is less than the social cost.

Derivatives, especially OTC derivatives, make it worse by reducing transparency.

The externalities inherent in the risk-taking activities in financial markets makes it economically necessary for the government to play a role in setting prudential standards. Competitive markets alone will not do this. This role of the government, though is not justified by some paternalistic motive to protect fools from themselves. Rather it justified by need to protect the rest of us from the fools.

One of the most glaring illustrations of this notion is the failure of LTCM

> "Had the failure of LTCM triggered the seizing up of markets, substantial damage could have been inflicted on many market participants, including some not directly involved with the firm, and could have potentially impaired the economies of many nations, including our own." Alan Greenspan before the House Banking Committee in October, 1998.

TABLE 3

OTC DERIVATIVES: Credit Exposure

in billion US $

	1998	1999	2000	2001	2002	2003*
Gross Market Values	3,232	2,813	3,183	3,788	6,360	6,987
Gross Credit Exposure	1,329	1,023	1,080	1,171	1,511	1,986

* Through end of 2003

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Notice that the amount of credit risk is small in proportion of the total outstanding, but very large in absolute terms.

Failure of major financial institutions would undermine payments and settlements system of US economy. Costs of failure would far exceed those to share holdings and even those with direct financial transactions who are holding capital or collateral against those credit exposures.

EXTERNALITY OF INFORMATION

A second type of imperfection, and another that violates the assumption of no externalities, comes from the inherent *externalities of information* that is generated by the price formation process in financial markets. Prices are information, and that information has all three characteristics of an externality: ownership; technical; and public goods. Even some non-price market information, such as volume, open interest, volatility, serves as important externalities to other parts of the economy.

The first characteristic is of ownership externality. Price and market information is like the nectar produced by Meade's apple blossoms and which becomes an externality in the production of honey elsewhere in the economy. Pricing information is used throughout the financial markets in order to price other assets and derivatives, to make forecasts, to make investment decisions about physical investment plant and equipment and so on.

An excellent illustration of this is how the interest rate swaps market produces prices (interest rates) on the term structure of interest rates and this is in turn used as a benchmark for pricing securities in the mortgage backed securities (MSB), asset backed securities (ASB) and corporate bond markets. Similarly, futures prices from a variety of commodities are used by a wide range of investors as an indicator of future inflation.

The *price discovery* process results in the establishment of prices that are used throughout the economy as the basis for forming expectations decisions and making decisions. When the prices in other markets are used in a very direct way to set prices in other markets, this is known as price basing. For example, the prices of many commodities though the US are set by quoting a basis spread above the prices set on the futures exchange. The price of number 2 yellow corn in Iowa might be priced at $0.08 below the near month futures price on number 1 yellow corn traded at the Chicago Board of Trade for delivery along the Southern Illinois River.

This type of externality, known as ownership externality, arises, as in the bee and blossom metaphor, from the absence of ownership rights to the information. The market participants in which the price is discovered derive some private benefit from the information in the price, but the social benefit is larger still. Baumol (1964) defines an externality when A's activities produce a benefit for B such that the marginal social benefit exceeds the private benefit of A, and that A is not compensated by B for that activity. This externality can cause a competitive equilibrium to fail to be Pareto optimal because not enough of A's activities will be produced.

The second characteristic is of technical externality. Product innovation, liquidity and risk shifting transactions in one market affect the efficiency of pricing and trading in other markets. This is much like the ways that production at nearby firms in an industry can generate a skilled labor force that lowers the production costs at firms that employ those skills.

This is best illustrated in financial markets by the way that interest rates derivatives such as futures on Treasury securities traded at the CBOT and futures on eurodollar interest rates traded at the CME. These instruments are an important factor in the ability of interest rate swap markets to maintain liquidity and reduce the risks (and hence bid-ask spreads) of market making trades. Other comparable examples include the role of money markets for the repurchase agreement (repo) markets and securities lending markets that in turn add so much to the cash markets for Treasury securities and stocks.

The third characteristic is of *public goods externality*. The information contained in financial market prices is like a public good in that the consumption of that information goods does not preclude the consumption by others. It is like knowledge and research.

Grossman (1977, p. 447) makes this point on the way to other, although not contradictory, conclusions, "where all the relevant information is revealed via the price system, it is clear that there are informational externalities." He goes on to explain how if derivatives, or other financial market, prices generate information as an externality then other competing entities can get free information. Grossman's concern is that since social benefit exceeds the private benefit, then this externality will result is insufficient information being produced.

Earlier, Samuelson (1954, 1955) analyzed prices in a competitive equilibrium would fail to generate a Pareto Optimal outcome in the presence of public goods. Public goods are such that all marginal rates of substitution are equal, and not additive, in the aggregation of consumption and production. No price can achieve Pareto optimality, he showed, because a price high enough to induce production would be a price that would result in insufficient distribution and consumption. Bator (1958, p. 371) states this point well, "The set of prices which would induce profit-seeking competitors to produce the optimal bill of goods, would be necessarily inefficient in allocating that bill of goods."

These ideas applied to financial markets illuminate a problem. Private firms tend to hoard certain types of information about themselves and others.[7] Notice that OTC financial market prices are the least distributed. Yet efficient market prices depend upon perfectly informed market participants (investors).

This part of the economic foundation of the need for market transparency. In regards the nature of prices as a public good, prices and non-price market information are crucial to the creation of a *transparent* financial market place. Transparency is considered a fundamental condition to improve market safety and soundness. Yet like other public goods, the social benefit is greater than the private benefit of producing it and so too little is produced and consumed. The result, is that the competitive equilibrium in the unfettered marketplace will result in less than optimal amount of such information.

The private collection and distribution of information is limited for the following reasons. Another private firm lacks any authority or than the offer of cash payment to coax the information from market participants. That firm will also lack the complete faith and trust of market participants to protect the proprietary nature of the information and otherwise limit its distribution accordingly; to not trade ahead by using the information; and to distribute true and honest figures on the market. A private firm cannot easily establish a legacy so that a data series is consistently collected and distributed over a number of years and into the indefinite future. Lastly, the private firm must charge a price sufficient to cover its costs and this limits, often sharply, the distribution of the data and thus does not result in a market that is uniformly well informed. On the other hand, the government can overcome all these limitations and so it is no wonder that the government is responsible for much of the data collection and distribution today.

[7]) Of course there are other types of information that they pay to distribute through such activities as advertising and public relations.

Alternatively, when the prices are distorted by fraud or manipulation then the externality is a negative diseconomy and the role is akin to that of inflation.

Moreover, the availability of that information and its integrity is critical. Financial markets have at times been plagued by false reports and rumors. The movie "Trading Places" illustrated the critical importance of a false Department of Agriculture crop report on oranges and hence frozen orange juice. Other problems arise when the information is not equally available to all. Privately collected information tends to be hoarded or narrowly distributed.

The current policy response has been for the US government to take important measures to improve transparency and the production of market information. In response to the market crash in 1929, the Securities Act of 1933 and the Securities Exchange Act of 1934 improved the quantity and quality of market information by requiring public disclosure and quarterly reporting for the public issuance and trading of securities. It also prohibited false reports on the market for securities and futures. Similarly, the prohibition against insider trading is based on the economic rationale that markets are efficient when information is equally available and insider information is the opposite of that. In addition, the government funds research, collects data on market fundamentals and distributes it broadly and cheaply. This includes information on prices, output and even crop forecasts. The rationale is that it gives everyone the same access to information about the economic factors that underlie market performance.

The externality of information that extends its importance beyond its immediate market means that fraud and manipulation are not self-policed by the market and that it is a matter of pubic interest – not just a problem for those who are defrauded or suffer the losing end of the manipulation – because they threaten the integrity of the markets i.e. of the price discovery process. Keep in mind that manipulation does not have to be grand in the old fashion way, but can consist of small changes in prices. If prices of winter wheat are off only 3 cents a bushel, and we produce and sell at home and for export 1,612 million bushels, then it will be a $48.36 million cut in income for the farmers on the winter wheat crop alone. That same 3 cents applied to the 9.5 billion bushels of corn would affect income by $285 million – almost six times the impact. That would equal 1% of the nation's net farm income for all crops.

Similarly, consider a manipulation of 3 basis points on a new auction of Treasury securities. If the auction was for $12 billion in 30-year bonds, then the mere 3 basis points would raise the cost of borrowing to the government by $3.6 million a year or $43.2 million over the life of the security. If it were paid by the government on all outstanding Treasury securities held by the public, then it would cost the Treasury and hence us as taxpayers $1.1 billion annually.

Other problems arise when the information is not equally available to all. Privately collected information tends to be hoarded or narrowly distributed.

THE COSTLINESS OF INFORMATION

Another market imperfection, and another that violates an assumption of perfect financial markets, is the cost of information.

The existing economics literature on the cost of information focuses on moral hazard and adverse selection. Its concern is that insurers might end up over-insuring because the insurers did not know how much existing insurance the insured had already and or might take-out in the future. In short, the problem is asymmetric information. More recently, this thinking raised the concern

about transparency. By contrast, the concern with moral hazard in the context of financial market regulation is not based on the cost of information but rather the fact that it is widely expected that investors will be bailed out in the event of a crisis. Stiglitz and Weiss (1981) show that costly information results in credit rationing in competitive equilibrium and that government regulation, such as usury laws, can actually be Pareto improving. Also, information costs explain why bank deposit insurance, combined with a bank supervisor, is efficient.

The efficient financial market, the Pareto Optimal market outcome, depends on the market participants possessing perfect information or all relevant information about the market. The validity of this assumption is then made all the more reasonable as the price of information declines.[8]

Pareto efficiency assumes that everyone in the market has perfectly complete knowledge of market information. In financial markets, asymmetric or unevenly distributed information is a problem. In order for a market to function efficiently, all market participants have all relevant information about that market. However it is economically unreasonable for all customers of financial institutions to have the time to explore, collect and analyze the information necessary to evaluate all the potentially available banks, brokers, mutual funds, insurance companies and pension funds.

Information is important to the efficient functioning of markets for several reasons. Market participants need to know prices, quantities bought and sold at that price and "quality" issues such transaction terms. Information is also important that it be public and not asymmetric or "insider" information. One problem is with the use of equity swaps by corporate executives to reduce their price exposure on stocks issued as compensation and to manipulate their disclose requirements and tax reporting on those options.[9]

In that context, one of the useful roles of the government in the financial markets is to provide regulatory supervision in order to attest that the financial institution meets the minimum standards for safety and soundness set for that type of financial firm. It does not guarantee against any one firm's difficulties or bankruptcy, but it provides useful information that the firm is well managed, that it is meeting its regulatory requirements, its books are properly audited, and that its earnings are properly reported.

ASSYMETRIC INFORMATION

Another related market imperfection is the problem of asymmetric information. This can lead to credit rationing on the part of lenders who cannot obtain sufficient information to prevent adverse selection and cannot restrict (and more to the point enforce restrictions) on all needed constraints on borrowers' behavior to maximize repayment. (Stiglitz and Weiss. 1981)

INTEREST RATE SWAPS AND THE U.S. BENCHMARK

The Treasury yield curve serves through financial markets, and the economy at large, as a benchmark for interest rates. Credit markets have historically looked towards the Treasury market when trying to price the yields on corporate bonds, government agency bonds, mortgage-

[8]) Here the price is presumed to include the total (money and time) cost of locating, purchasing, delivering and absorbing the information.

[9]) Bolster, Paul, Don Chance and Don Rich. 1995. "Equity Swaps and Corporate Insider Holdings: Now You See It – Now You Don't." Working Paper 95-6, Department of Finance, Virginia Tech.

backed securities (MBSs), interest rate swaps and commercial paper. This process of using the market benchmark to price other related products is known as price basing.

In sum, the price discovery process in the Treasury securities markets is being used for price basing in other financial markets. In this way the Treasury market exerts a force in the economy that extends far beyond those buying and selling the securities.

The demise of the Treasury securities market, either from the complete extension of Treasury securities or the withering away of the volume of trading, would leave financial markets without its traditional interest rate benchmark. As a result, these markets are also moving towards adapting the OTC derivatives markets in interest rate swaps as the market benchmark.

The migration in the volume in credit market trading and the rise of a new benchmark will depend on liquidity and that in turn hinges upon dependable market supplies, the homogeneity of the product, creditworthiness and the distribution of product along the yield curve. The Treasury market clearly dominates in each of these categories, but what is the next best? This point was made by US Treasury Undersecretary Gensler, "As our share of the market declines, markets will over time adjust, whether it's by re-poing non-Treasury securities or hedging with non-Treasury securities."[10]

The most likely candidate is the swaps market. They are homogeneous, investment grade (and this will rise to AAA once a clearing house is adopted in the US), trading volume is high and bid-ask spreads are low. In addition, there are many liquid maturities along the yield curve. Moreover, there are ready amounts of short-interest – investors do not have to combine reverse repos and cash market sales in order to create short positions.[11]

There are already several indications that the swaps market is the ultimate destination for the market's interest rate benchmark. One, the swaps rates are now quoted as all in rates and not as a spread above the Treasury rate. Two, the swaps rates are regularly quoted on Bloomberg, Reuters, and Prebon broker screens, and the Federal Reserve Board now includes swaps rates in their regular market interest rate releases. Three, when there is a sharp decline in the swaps market volume, traders in the corporate and mortgage markets are widely quoted as saying that they are having trouble pricing their instruments.

There are several salient problems with the rise of the interest rate swap market as the benchmark for US financial markets. One problem is that the market will not only be liquid. One reason is that the market is not free of credit risk like the US Treasury securities market, and as a result it will react, i.e. reduce trading volume or completely freeze-up, in response to credit problems at key dealer or market participant. Another reason is that, also unlike that US Treasury securities market, there are no requirements placed on dealers to make a market. OTC swap dealers are under no mandate or obligation to remain in the market and post and honor bid/ask quotes. They profit from their position as dealers, but they are no obligation to act as a dealer. For these two reasons, the swaps market is not as liquid as the Treasury market.

One well known but less well understood example of this occurred during the failure of Long Term Capital Management. It was a major player in the market, and its $900 billion of swaps

[10]) Remarks on August 11, 1999. See Appendix 3 below.
[11]) See Michael Fleming. 2000. The Benchmark U.S. Treasury Market: Recent Performance and Possible Alternatives. New York Federal Reserve Bank Economic Policy Review, Vol. 6, No. 1.

was 9% as large as the $10,000 billion by Chase, the largest US bank swaps dealer. When LTCM faced bankruptcy, the swaps market froze up and as a result the markets for mortgages, mortgage and asset backed securities and corporate bonds was disrupted by the inability to price those instruments against a benchmark.

IV. POLICY RECOMMENDATIONS AND CONCLUSION

While the vulnerabilities described above cannot be completely eliminated or prevented in a modern financial system, they can be substantially reduced. Just as banking supervision and the regulation of securities markets does not completely prevent bank failures or securities fraud and price manipulation, they do go a long way towards those goals. Outside the period in the late 1980s, when bank and thrifts failed in droves following major bank deregulation laws in 1980 and 1982, there have been few failures and certainly none that threatened the overall economy since the 1936 bank act. Similarly, there have been few failures of securities broker-dealers since the 1933 and 1934 securities acts even though the regulatory enforcement against securities fraud remains a major focus of the resources of the Securities and Exchange Commission. The collapse of hi-tech stock prices in 2000 was more the result of bad investment decisions than fraud.

The round of corporate scandals starting with the failure of Enron brought to light loopholes in accounting rules – especially those pertaining to the use of derivatives – and regulatory lacunae in energy derivatives markets. Some of the scandals – especially that dealing with mutual funds – have been the result of outright criminal behavior that cannot be entirely prevented by legal prohibitions. By comparison, strict criminal statutes against grand larceny have not prevented all acts of bank robbery, but that does not mean that the statutes are flawed.

With these provisos in mind, the remainder of this section argues that carefully designed prudential regulatory measures can substantially improve the safety and soundness – in addition to the efficiency – of financial markets. There are three pillars of such prudential regulation, and they apply in their own way to derivatives markets as well as banking, securities and insurance.[12]

Registration and Reporting Requirements. The first pillar relates to reporting and registration requirements for OTC derivatives dealers and the use of derivatives. These are designed to improve the transparency – and thus the pricing efficiency – in the markets.

Under current US law, banks and other depository institutions are required to obtain a state or federal bank or other relevant charter. Similarly, securities brokers and dealers are required to register with the Securities and Exchange Commission. Brokers for exchange traded futures and options are required to register with the Commodity Futures Trading Commission. In addition, the individuals responsible for customer accounts are also required to pass competency standards (such as the Series 7 exams for securities brokers) in order to register. This process helps establish minimum initial capital requirements for financial institutions, and it allows for a background check on individuals for criminal conviction for fraud. Those convicted are usually given life-time ban from the securities markets. Registration is thus a principal step to rule enforcement in financial markets.

[12]) See Dodd (2004), "Virtues of Prudential Regulation" forthcoming in volume of essays by the Initiative for Policy Dialogue.

Reporting requirements enable the government, and other market surveillance authorities such as exchanges and self-regulatory organizations, to better detect and deter fraud and manipulation by observing large positions and large changes of positions in the market. The dissemination of non-proprietary data, obtained from collecting all data through reporting requirements, makes market participants as well as those economically linked to the derivatives markets better informed as to the price, trading volume and open interest in those markets.

The goal of market transparency is a widely supported objective. However, in order to achieve it, reporting requirements are needed to compel market participants to disgorge information that they would otherwise hoard. The proper collection and dissemination of information will make markets not only more fully informed but informed on a more level playing field. This will help sharpen competition so as to increase liquidity and drive down bid-ask spreads in the market.

Capital and Collateral Requirements. The second pillar of prudential regulatory measures involves capital and collateral requirements. Capital requirements function to provide both a buffer against the vicissitudes of the market and a governor on the tendency of market competition to drive participants out along the "capital market line" where they seek higher yields by taking on greater risks.[13] Capital requirements govern risk taking by requiring financial institutions to a minimum amount of certain types of capital in proportion to the credit risk exposure on their balance sheet and off-balance sheet positions. In the case of derivatives, the Tables 1 and 3 above show that the notional amount of outstanding derivatives is much greater than the gross market value, and after adjusting for legally enforceable netting agreements the gross market value is higher than credit exposure. Gross market value is the amount by which contracts are currently "in the money" when marked to market or assessed at fair value (when no market value exists). It is how the much the firm would lose, before netting, if all its winning positions were to fail due to counterparty default. This figure for credit exposure does not take into account the degree to which firms have required that collateral to posted against this open exposure. It is the credit exposure that is subject to capital requirements, and the amount of credit exposure can be further reduced through the use of collateral.

In this way, capital requirements apply to financial institutions for the credit risk that they face on all their combined assets after adjusting for netting and collateral.

In US financial markets, there are capital requirements for bank, securities brokers and dealers and for futures commission merchants that broker exchange-traded futures and options. However there are no capital requirements for firms that often act line financial institutions but are not otherwise registered or chartered as such. For example, Enron Corporation was subject to no capital requirements even though – with over $800 billion in derivatives on its book – it was a major dealers in the energy derivatives markets. Other major players in financial markets such as GE Capital and GMAC are subject to no capital requirements.

Where capital requirements apply – if they apply – to financial institutions, collateral requirements should apply to transactions.

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[13]) John Eatwell has raised some serious concerns about the ability of capital held to meet capital requirements to successfully function as a buffer against such changes. See Eatwell, John. 2001. "The Challenges Facing International Financial Regulation." presented to the Western Economic Association in July, 2001.

Collateral (also known as margin) requirements have basically the same effect, although collateral requirements apply directly to transactions as opposed to institutions. Thus non-financial institutions that would not otherwise be subject to capital requirements would be subject to collateral requirements on their derivatives transactions. This would affect end-users of derivatives such as speculators as well as hedgers. End-users qualifying as hedgers could be offered lower collateral requirements since the derivatives would represent a reduction in their overall risk exposure as opposed to an increase.

The current market practice for managing collateral, in so far there is one, is dangerous and poses one of the most serious sources of vulnerability to the financial system. It allows derivatives users to re-hypothecate collateral – meaning that collateral party A is scheduled to receive (but has not actually been delivered) from party B can be posted as collateral against party C. This is one reason why derivatives can fairly be described as creating "daisy chain risk."[14] Another dangerous industry practice is to charge low levels of collateral at first but then designate firms as "super-margined" if their credit rating were to drop substantially and especially if it were to drop below investment grade. Being *super-margined* amounts to demanding large amounts of fresh capital from firms just at the time they are experiencing problems with inadequate capital. This market practice creates a *crisis accelerator*, and the timing of Enron's bankruptcy can be attributed to this triggering mechanism.

Yet another dangerous industry practice is allow inferior assets to be used as collateral. The best forms of collateral are cash and US Treasury securities (especially bills and on-the-run coupons). The advantages of these assets are their liquidity, their widely known market values (which reduces the likelihood of disputes) and their ability to be transferred readily between counterparties. In contrast to these ready assets, derivatives counterparties sometimes use corporate bonds and equities and even more volatile and less liquid assets as collateral. In the wake of Enron's bankruptcy it came to light that one of the largest US derivatives dealer at the time, Chase Manhattan Bank, arranged for a group of insurance companies to write surety bonds to collateralize prepaid natural gas swaps with an Enron special purpose entity.

The prudential alternative to this practice is to require derivatives counterparties to post adequate amounts of appropriate collateral up front. The OTC derivatives market should look to the stock market and that for exchange-traded futures and options for prudential lessons. In both those cases collateral (called margin) must be posted up from and adjusted promptly each day – an even intraday in the event of exceptionally large price movements – in order to hold positions open.

Orderly Market Rules. The third pillar of prudential market regulation is a collection of market regulatory measures that has proven to be effective in reducing vulnerability to financial distortions and disruptions while increasing efficiency. The list below is not complete, but is illustrative of the types of measures that improve both market stability and efficiency.

- Detect and deter manipulation and fraud in order to protect the integrity of the information embedded in market prices

The fact that prices play an important role in markets outside that in which they are established means that there is an externality to the information embodied in such prices. This basic insight is reflected in the laws written to regulate futures markets in the United States. Section 3 of the

[14]) Term used by Warren Buffett in letter to Berkshire-Hathaway shareholders.

Commodity Exchanges Act, entitled "The Necessity of Regulation," states that futures are "affected with a national public interest." "The prices in such transactions are generally quoted and disseminated throughout the United States... for determining the prices to producer and consumer of commodities and the products and by-products thereof and to facilitate the movements thereof in interstate commerce."[15]

- Require OTC derivatives dealers to act as market-makers by maintaining bid-ask quotes throughout trading day. This obligation compares with the privileges of being a dealer, and is similar to requirements for dealers in the over-the-counter US Treasury securities markets.

Markets work better when they are liquid, but liquidity is often reduced during financial crises and even lesser disruptions. In order to better ensure the orderliness of the market, derivatives dealers should face the responsibilities of market making just as they capture the benefits of that market position.

- "Know thy customer" provisions should be extended to all entities engaging in derivatives transactions. It holds derivatives dealers or other sellers responsible for engaging in transactions that are inappropriate and potentially destructive to their counterparties.

This provision will discourage sharp trading and sales practices that sometimes lead to the "blowing-up" of customers. For example, the PERLs served no positive purpose for East Asian investors and were primarily a stealth vehicle for financial institutions in developed countries to acquire long-dated short positions in developing country currencies.[16] This provision already exists in US securities markets and a comparable measure exists for US banking markets. It should be extended to derivatives markets where there is even greater concern with the implications of large differences in the degree of financial sophistication between market participants.

- Price limits and stand-still provisions should be available to maintain or restore order in the market place.

Price limits have already demonstrated their effectiveness on securities markets and for futures and options trading on exchanges. Similar measures should be available to regulatory authorities in the OTC derivatives market. Stand-still provisions are useful in order to facilitate the rescheduling and reorganization of debt as well as derivatives obligations.

Conclusion. The tremendous growth of the derivatives markets in recent years has a new and major source of vulnerability in the US financial system and economy as a whole. The growth has shown no signs of easing even during the recent stock market downturn and the economic recession. Moreover they are likely to be showing up in more and more as hybrid instruments in retail securities and banking transactions in the near future. Yet the regulatory system in the US has failed to keep up with this very important market development. This chapter is designed to help identify the source and nature of this major new economic risk as well as to offer a positive intellectual framework for conceptualizing these risks and market imperfections. The three pillars of prudential regulation, however brief, can serve as a beginning for putting the US financial system back on a stable foundation.

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[15]) This passage was amended in the deregulatory Commodity Futures Modernization Act of 2000, but it still retains the basic message.

[16]) For descriptions of these structured securities and how they are transacted, see Frank Parnoy's F.I.A.S.C.O. and Randall Dodd. 2002. "The Role of Derivatives in the East Asian Financial Crisis." In Lance Taylor and John Eatwell (editors), International Capital Markets: Systems in Transition. Oxford University Press.

Sources

Bator, Francis M. 1958. “The Anatomy of Market Failure.” *Quarterly Journal of Economics*, Volume 72 (August), pp.351-79.

Baumol, W.J. 1964. “External Economies and Second-Order Conditions.” *American Economic Review*, Volume 54 (June), pp. 358-72.

Bolster, Paul, Don Chance and Don Rich. 1995. “Equity Swaps and Corporate Insider Holdings: Now You See It – Now You Don’t.” Working Paper 95-6, Department of Finance, Virginia Tech.

Chancellor, Edward. 1999. *Devil Take the Hindmost – A History of Financial Speculation.* A Plume Book published by the Penguin Group. London, England.

Dodd, Randall. 2002. "The Structure of OTC Derivatives Markets." *The Financier*, Vol. 9, No.s 1-4.

Dodd, Randall. 2002. “The Role of Derivatives in the East Asian Financial Crisis.” in John Eatwell and Lance Taylor (editors), International Capital Markets: Systems in Transition. Oxford University Press (2002).

Fleming, Michael. 2000. "The Benchmark U.S. Treasury Market: Recent Performance and Possible Alternatives." *New York Federal Reserve Bank Economic Policy Review*, Vol. 6, No. 1.

Futures Industry Association. 1984. *An Introduction to the Futures Markets 2.*

Grossman, Sanford J. 1977. "The Existence of Futures Markets, Noisy Rational Expectations and Informational Externalities." *Review of Economic Studies,* Volume 64 (Oct.), pp. 431-49.

Markham, Jerry W. 1994. "'*Confederate bonds,' 'General Custer,' and the Regulationof Derivative Financial Instruments.*" Seton Hall Law Review.

Markham, Jerry W. 1987. *The History of Commodity Futures Trading and Its Regulation.* Praeger Press, New York.

Partnoy, Frank. 1999. *F.I.A.S.C.O.: The Inside Story of a Wall Street Trader.* Penguin. New York, NY.

Samuelson, Paul. 1954. “The Pure Theory of Public Expenditure.” *Review of Economics and Statistics,* Volume 36 (November), pp. 387-89.

Samuelson, Paul. 1955. “Diagrammatic Exposition Of A Theory Of Public Expenditures.” *Review of Economics and Statistics,* Volume 37 (November), pp. 350-356.

Stiglitz, Joseph E. and Andrew Weiss. 1981. “Credit Rationing in Markets with Imperfect Information.” *American Economic Review*, Volume 71 (June), pp. 393-410.

Swan, Edward J. 1993. *The Development of the Law of Financial Services.* Kluwer Law International. London, United Kingdom. Swan, Edward J. 2000. *Building the Global Market: A 4000 Year History of Derivatives.* Kluwer Law International. London, United Kingdom.

Swan, Edward J. (editor). 1993. *The Development of the Law of Financial Services.* London, Cavendish Publishing, Ltd.

Appendix I

Primer on Derivatives Instruments

A **derivative** is a transaction that is designed to create price exposure, and thereby transfer risk, by having its value determined – or derived – from the value of an underlying commodity, security, index, rate or event. Unlike stocks, bonds and bank loans, derivatives generally do not involve the transfer of a title or principle, and thus can be thought of as creating pure price exposure, by linking their value to a *notional* amount or principle of the underlying item.[17]

Forward contract. The simplest and perhaps oldest form of a derivative is the forward contract. It is the obligation to buy or borrow (sell or lend) a specified quantity of a specified item at a specified price or rate at a specified time in the future. Derivatives contracts always include precise terms for fulfilling the obligation; these terms include the specifications for quantity (the actual or notional principal for pricing the contract), the underlying price (of the commodity, asset or index), location (if delivery is involved), time (final delivery or settlement date) and price. For instance, a forward contract on foreign currency might involve party A buying (and party B selling) 1,000,000 Euros for U.S. dollars at $0.8605 on December 1, 2002. A forward rate agreement on interest rates might involve party A borrowing (party B lending) $1,000,000 for three months (91 days) at a 2.85% annual rate beginning December 1, 2002.

Consider the case of the farmer entering into a forward contract to sell corn upon harvest. The farmer needs to plant corn in the spring, when the spot price is $3 per bushel, in order to harvest in October when the spot price is unknown. In order to avoid the risk of a price decrease, the farmer could enter into a forward contract to sell 50,000 bushels of corn to the local grain dealer or grain elevator between October 5th and 15th, at a price of $3.15 bushel (the quality, such as No. 1 yellow corn, would also be specified). The farmer would thus be *long* corn in the field and *short* corn in the forward market; the grain dealer would be long corn in the forward market. The farmer would thereby hedge his price risk by shifting his long corn price exposure to the grain dealer through the forward contract. The grain dealer could either hold the long price exposure as a speculator or hedge the risk away by entering another forward contract – this time as a seller – with either a speculator or another hedger such as a food processor that wants to hedge its price exposure to possible future price increases.

Although the grain dealer is likely to have similar contracts with many of the farmers in his local market, and is likely to a have a standard template for each such forward contract, the contracts are deemed to be unique, bilaterally negotiated contracts, and their price is not reported to the market, the press, the government's data collection agency or any government regulator. The forward contract may be collateralized by the title to the crops. The contract would be settled by the farmer delivering the quantity and quality of corn to the specified location on the specified date in exchange for the dealer making a payment to the account of the farmer.

This is an example of a typical commodity forward contract, but its economics are not unlike forward contracts for securities, loans or other items. Delivery terms will likely vary according to the nature of the underlying cash or spot markets. There may be "MAC" clauses for major adverse conditions or "acts of god" clauses that allow for the early termination or abrogation of the contract.

Foreign exchange forward. A foreign exchange forward is a contract in which counterparties agree to exchange specified amounts of foreign currencies at some specified exchange rate on a specified future date. The forward exchange rate is the price at which the

[17]) The exceptions to this are foreign exchange forwards and foreign exchange swaps which usually involve the exchange of principal. Non-deliverable foreign exchange forwards are consistent with this distinction.

counterparties will exchange currency on the future date. The forward rate is usually negotiated so that the present value of the forward contract at the time it is traded is zero; this is referred to by describing the contract as trading at par or "at the market." As a result, no money need be paid at the commencement of the contract because the market value of a par contract is zero; although a contract is at the market, counterparties sometimes agree to post collateral in order to insure each other's fulfillment of the terms of the contract.

Futures. Futures contracts are like forwards, but they are highly standardized, publicly traded and cleared through a clearing house. The futures contracts traded on organized exchanges in the United States are so standardized that they are fungible – meaning that they are substitutable one for another. This fungibility facilitates trading and results in greater trading volume and greater market liquidity. Liquidity, in turn, improves the way in which all the relevant market information becomes accurately reflected in market prices. This process of establishing efficient market prices is known as the *price discovery* process.

Futures are traded on organized exchanges. In contrast to of negotiations in the OTC market, the trading on exchange "pits" or their electronic quote matching platforms are very public and multilateral. Trading in the pits involves the very public statement (most likely in the form of a yell or shout) of bid and offer prices known as "open outcry." Open outcry is not only public, but also multilateral because all market participants can *hit* a bid, *lift* an offer, or raise or lower the quote. In this environment, all market participants can observe the bid, offer and execution prices and thereby know whether the prices they are agreeing to are the best prevailing market prices. This knowledge is more difficult to ascertain and the information is more likely to be incompletely disseminated in a non-transparent, OTC trading environment.

Clearing houses are used to clear exchange-traded futures contracts. Trades from the exchange floor are reported to the clearing house, and the contracts are written anew, or *novated*, so that the clearing house becomes the counterparty to every contract. In this manner, the clearing house assumes the credit risk of every contract traded on the exchange.

The presence of a clearing house in the center of market trading means that every market participant has a top-ranked (AAA) credit risk as a counterparty. Instead of having to perform a credit evaluation of every actual and potential trading partner, the futures trader has only to evaluate the creditworthiness of the clearing house, and in the case of U.S. futures exchanges, the clearing houses all carry a AAA credit rating.

Clearing houses have top-ranked credit ratings because they are very well capitalized. This makes their ability to perform on or fulfill the terms of futures (and options) contracts all but certain. Their capital includes the paid-in capital plus the callable capital of clearing members of the exchange. In addition, the clearing house maintains an emergency line of credit with an array of banks. Moreover, the clearing house collects, and updates daily and even more frequently if required, the margin accounts of all those who hold positions in exchange-traded contracts.

The front line defense against contract default is the margin accounts. Although futures contracts are highly leveraged, with the maintenance margin rates ranging from 1429:1 for the Eurodollar contract to 17.4:1 for the S&P 500 futures (as of May 2004), the level of margin is generally set so that it would have covered 95% to 98% of the largest daily price movement in the previous six months. The exchange also reserves the right to make intra-day margin calls to protect the integrity of the futures (and options) market in the event of an exceptionally large price swing. If a trader fails to meet margin requirements, the exchange reserves the authority to liquidate the trader's positions.

Another implication of *novation* is that it allows existing positions to be offset or completely liquidated by entering into contracts from the opposite side. For example, party A has bought 10 futures contracts for natural gas in November. This existing long position of 10

contracts can be reduced to 2 contracts – either the next minute or at any time up to the expiration in November – by selling 8 contracts. The short selling of 8 contracts offsets all but 2 of the existing long position of 10 contracts.

How do futures contracts work? Consider the example of a farmer hedging by entering into a futures contract to sell October corn at $3 a bushel. The standard contract size is 5,000 bushels and so the notional value of the contract can be thought of as $15,000. The margin requirement for the position is say $750 in initial margin to open the position, and then $500 for maintenance margin. The first day the price rises by $0.02 so that the value of the short position loses $100 (the two cents times the 5000 bushels specified in the contract). The clearing house debits $100 from the farmer's margin account which now totals $650. The new amount in the account does not fall below the maintenance level, and so no further action is required. If the loss were to reduce the level in the account to below the maintenance level, then the farmer would be required to add resources to the account (cash or Treasury securities) until it reached the higher initial margin level. If the price moves in favor of the farmer, then the clearing house credits the farmer's margin account and the farmer is allowed to withdraw excess funds from the margin account. This process of adjusting the margin account to the daily changes in futures prices is known as marking the position to the market value, or "mark to market" for short.

How does the farmer, who is a short-hedger, benefit from the futures contract. Consider the result of the futures price falling to $2.80 a bushel in October. The farmer closes out the position by buying a corn contract in the days prior to expiration (otherwise the farmer would have to deliver the corn at one of the designated locations in the contract, and this is most likely less convenient than the local elevator). What is left of the farmer's margin account? In the process of marking to market the farmer's short position, the clearing house will have added a *net* amount of $1,000 (5,000 bushels times the $0.20 drop in price) to the farmer's margin account over the holding period of the futures contract. This $1,000 in payments to the farmer should offset the effect of a 20 cent decline in the market price of 5,000 bushels of corn harvested in October. In sum, this daily mark-to-market process will generate a cash flow as funds are added to, or drained from, the margin account. These changes, taken in sum, will adjust the final gain or loss on the position to the initial price for which the contract was traded.

Options. An option contract gives the buyer or holder of the option (known as the long options position) the right to buy (sell) the underlying item at a specific price at a specific time period in the future. In the case of a call option on a stock, which is the type granted as employee stock options, the holder has the right to buy the underlying stock at a specified price – known as the strike or exercise price – at a specified time in the future. If the spot market price of the stock were to exceed the strike price during the time period in which the option could be exercised, then the holder would be able to exercise the option and buy at the lower strike price. The value of exercising the option would be the difference between the higher market price and the lower strike price. If the market price were to remain below the strike price during the period when the call option was exercisable, then the option would not be worth exercising and it would expire worthless.

In the case of a put option, the option holder has the right to sell the underlying item at a specified price at a specified time in the future. Imagine a situation in which a farmer has purchased a put option on the price of corn. If the spot price of corn were to fall below the strike price during the period in which the option was exercisable, then the farmer would be able to exercise the option and sell at the higher strike price. In the way, the put option acts as a form of price insurance that guarantees a floor or minimum price. Like an insurance policy, the price paid for the option is called a *premium*. The value of exercising this put option would be the difference between the higher strike price and the lower market price.

Whereas the holder of the option has the right to exercise the option in order to buy or sell at the more favorable strike price, the writer or seller of the option (known as the short options position) has the obligation to fulfill the contract if it is exercised by the option buyer. The writer of an option is thus exposed to potentially unlimited losses. The write of a call option is exposed to losses from the market price rising above the strike price, and the writer of a put option is exposed to losses if the price of the underlying item were to fall below that of the exercise price.

American style option can be exercised over a specified period which is usually the life of the contract, while European style options can be exercised only on the expiration date.

The value or price paid to buy an option is known as the premium. What determines the value of an option is the length of time before the option expires, the volatility in the price of the underlying item, the current market price and the strike price. Although the specifics of this relationship are more precisely expressed in closed form equations such as the Black-Scholes formula or options pricing models such as the Binary or lattice models, the basic economic reasoning is the same. The value of an option serves as an insurance policy against a rise (or fall) in the price of the underlying item, and so it follows that insurance against a highly volatile price is worth more than insurance against a very stable price. This is akin to higher auto insurance rates for risky drivers. The value of an option also increases with the length of time to expiration because a greater maturity means there is more time, and hence greater likelihood, for the option to be exercised at a profit. This is akin to paying more for two years of auto insurance than for one year of auto insurance.

In sum, a call gives the option buyer the right to buy at the strike price, and so the option is profitable if the price goes up. A put gives the option holder the right to sell at the strike price, and so it is profitable if the price goes down. Here is a useful memory device: call up – put down. Farmers can hedge by buying puts on corn. If the price falls the farmer is covered, and if the price rises then the farmer receives the benefit of the higher price. The seller of an option, however, is obligated to pay if the price moves past the strike price.

Interest rate options. Interest rate options provide insurance against rate increases (caps), rate decreases (floors), and both hikes and drops (collars). A cap option has an exercise interest rate that creates an interest rate ceiling to protect against a rate hike, while a floor option has an exercise rate that creates a minimum rate to protect against a fall in interest rates.

A costless collar can be constructed by selling a put in order to pay for the cost of buying a call (or vice versa). For example, party A wants to protect itself from short-term interest rates – represented by LIBOR – rising above 6% by buying an option that allows it to borrow at say 6%. In order to pay for this option, party A will write or sell an option that allows the counterparty to lend at say 4%. This obligates party A to borrow at 4% when interest rates fall below that level. The combined effect of the long and short options positions is that party is protected from interest rates rising above 6%, and this protection is paid for by selling protection to someone else that rates will not fall below 4%. By selling the protection, party A gives us the benefits of borrowing at short-term interest rates below 4%.

Swaps. Swap contracts, in comparison to forwards, futures and options, are one of the more recent innovations in derivatives contract design. The first currency swap contract, between the World Bank and IBM, dates to August of 1981.[18]

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[18]) The design of the swap is thought to have originated from the practice of hedging cross-currency interest rates by making back-to-back loans. Smithson, Charles W., Clifford W. Smith, Jr., and D. Sykes Wilford. 1995. *Managing Financial Risk – A Guide to Derivative Products, Financial Engineering, and Value Maximization*. Irwin Publishing, New York.

The basic idea in a swap contract is that the counterparties agree to swap two different types of payments. Each payment is calculated by applying some interest rate, index, exchange rate, or the price of some underlying commodity or asset to a notional principal. The principal is considered notional because the swap generally does not require the transfer or exchange of principal (except for foreign exchange and some foreign currency swaps). Payments are scheduled at regular intervals throughout the tenor or lifetime of the swap. When the payments are to be made in the same currency, then only the net amount of the payments are made.

For example, a "vanilla" interest rate swap is structured so that one series of payments is based on a fixed interest rate and the other series is based on a floating or variable interest rate. A foreign exchange swap is structured so that the opening payment involves buying the foreign currency at a specified exchange rate, and the closing payment involves selling the currency at a specified exchange rate. Thus it is akin to a spot transaction combined with a forward contract. A foreign currency swap is structured so that one series of payments is based on one currency's interest rate and the other series of payments is based on another currency's interest rate. An equity swap has one series of payments based on a long (or short) position in a stock or stock index, and the other series based on an interest rate or a different equity position.

Interest rate swaps are financial instruments used to create future price exposure in interest rates in order to allow hedging and speculation in interest rates. Payments in an interest rate swap contract are designed to match interest rate payments on bonds and loans. For instance, take the situation faced by a corporation that has borrowed through a variable interest rate loan or a floating rate note.[19] That corporation is exposed to the risk that short-term interest rates will rise during the life of the loan or note. In order to hedge against this exposure, the corporation can enter into an interest rate swap of the same maturity so that the floating rate payments are swapped for fixed rate payments.

A foreign exchange swaps differs from an interest rate swap because the principal is exchanged (due to the fact that the payments, which must be in currency, amount to the "principal" in the transaction). A typical foreign exchange swap begins with a start leg that is indistinguishable from a spot transaction in which one currency is exchanged for another at the present spot rate. The second, or close leg, is a forward transaction at the present forward foreign exchange rate. Thus a foreign exchange swap is essentially the combination of a spot and forward foreign exchange transaction.

Foreign exchange swap. A foreign exchange swap is simply the combination of a spot and forward transaction (or possibly two forwards). The start leg of the swap usually consists of a spot foreign exchange transaction at the current spot exchange rate, and the close leg consists of a second foreign exchange transaction at the contracted forward rate. For example, a local investor enters a foreign exchange swap of pesos against dollars in which it buys $100,000 today at an exchange rate of $0.050 per peso (thus paying 2,000,000 pesos), and contracts to sell $100,000 dollars (i.e. buy pesos) at $0.0475 in 180 days. The local investor first receives $100,000 in the start leg, and then upon the swap expiration date pays $100,000 in exchange for receiving 2,105,263 pesos in the closing leg. This 10.8% annual rate of return in pesos is due to the depreciation of the peso against the dollar (or appreciation of the dollar against the peso) and reflects the fact that the peso rate of return from investing in the local currency is higher than the U.S. dollar rate of return.

Foreign exchange forwards and swaps are used by both foreign and domestic investors to hedge foreign exchange risk. Foreign investors from advanced capital markets who purchase securities denominated in local currencies use foreign exchange forwards and swaps to hedge their long

[19]) A floating rate note (FRN) is a two to ten year debt instruments whose interest payments are set each period by a designated short-term interest rate such as LIBOR or the U.S. Treasury bill rate.

local currency exposure. Similarly, foreign direct investments in physical real estate, plant or equipment are exposed to the risk of local currency depreciation. Local developing country investors who borrowed in major currencies in order to invest in local currency assets are also exposed to foreign exchange risk, and they too use foreign exchange forwards and swaps – as well as futures and options where available – to manage their risks.

Of course foreign exchange forwards and swaps were also used for speculation in these local currencies. Derivatives enabled speculators to leverage their capital in order to take larger positions in the value of local currencies. It means that developing country central banks must watch the exchange rate in two markets, the spot and forward, in order to maintain their fixed exchange rates.

Forwards and foreign exchange swaps are not always highly collateralized (measured as a percentage of the principal). Collateral is less likely to be used for trading between the major market dealers, and collateral is lower for less volatile financial instruments such as currency.[20] This enables foreign exchange derivatives users to obtain greater amounts of currency exposure relative to capital, and therefore it can leave foreign exchange derivatives counterparties exposed to greater credit risk. The largest source of credit losses in the derivatives markets in recent years were due to defaults on foreign currency forwards in East Asia and Russia (Swaps Monitor, 1999).

Structured notes. Structured notes contain features of both conventional credit securities and derivatives. The term "note" usually refers to a public or private credit instrument like a bond, and may have a maturity that ranges between two and ten years. The term "structured" refers to attached derivative or other contingent payment schedule. Structured notes are part of a broader class of financial instruments called "hybrid instruments" which contain features of both securities and derivatives. Examples of hybrid instruments include familiar instruments such as callable bonds, convertible bonds and convertible preferred stock. In the 1990s, putable bonds and loans were used to lend to developing countries.

The put option allowed the lender to demand immediate repayment of the loan in the event of a financial crisis or other "credit event" in the developing country. Their role in contributing to the financial crises in developing countries during that decade has made them controversial. The IMF estimated in 1999, using available public databases, that there were $32 billion in debts putable through the end of 2000 for all emerging countries. Of the total $23 billion of this is from East Asian issuers, and $8 billion was from Brazil.[21] Of this $23 billion, $10.6 billion was in the form of bonds issued from East Asian countries.

One well known structured note is called a PERL — principal exchange rate linked note. These instruments are rated as investment grade and denominated in U.S. dollars, but their payments were linked to a long position in the value of a foreign currency. The compensation or premium for holding this exchange rate exposure was a higher than normal yield in comparison to a similarly rated dollar denominated notes. If the foreign currency exchange rate remained fixed, or did not decline too far in value, then the higher yield would be realized. A devaluation or a substantial depreciation, however, could cause the return of the note to fall below the norm and in the event of a major depreciation the structured note might realize a negative return.

[20]) Volatility is less in comparison to local currency securities whose risk is the product of both the foreign exchange risk and the security price risk.

[21]) IMF. 1999. Involving the Private Sector in Forestalling and Resolving Financial Crises. Policy Development and Review Department. Washington, D.C. Note that the disaggregated figures in the tables do not add to $23 billion due to rounding and the exclusion of non-crisis countries such as Vietnam.

Appendix II

Excerpt from Chapter 9, *Politics*, (Benjamin Jowett translation).

It would be well also to collect the scattered stories of the ways in which individuals have succeeded in amassing a fortune; for all this is useful to persons who value the art of getting wealth. There is the anecdote of Thales the Milesian and his financial device, which involves a principle of universal application, but is attributed to him on account of his reputation for wisdom. He was reproached for his poverty, which was supposed to show that philosophy was of no use. According to the story, he knew by his skill in the stars while it was yet winter that there would be a great harvest of olives in the coming year; so, having a little money, he gave deposits for the use of all the olive–presses in Chios and Miletus, which he hired at a low price because no one bid against him. When the harvest–time came, and many were wanted all at once and of a sudden, he let them out at any rate which he pleased, and made a quantity of money. Thus he showed the world that philosophers can easily be rich if they like, but that their ambition is of another sort. He is supposed to have given a striking proof of his wisdom, but, as I was saying, his device for getting wealth is of universal application, and is nothing but the creation of a monopoly.