In Defense of Much, But Not All, Financial Innovation

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After decades of being celebrated as one of the hallmarks and virtues of American-style capitalism, "financial innovation" has come onto hard times. Soon after the financial crisis began in 2007 and 2008, certain instruments of recent high finance – the collateralized debt obligation (CDO) and the credit default swap (CDS), as leading examples – were blamed by the media, the public, many policymakers, and even by some top economists for nearly bringing the U.S. and global financial systems and their economies to their knees. It didn't take long for financial innovation more broadly to be condemned.

New York Times columnist and Princeton professor Paul Krugman, for example, has asserted that it was "hard to think of any major recent financial innovations that actually aided society, as opposed to being new, improved ways to blow bubbles, evade regulations and implement de facto Ponzi schemes."[2]

Former IMF chief economist and now MIT Professor Simon Johnson, writing with his fellow blogger James Kwak, are less withering, dividing financial innovations into "good" and "bad" ones.[3] Examples of the former, in their view, are the credit card, early forms of securitization, and the Community Reinvestment Act (though the last entry was a piece of legislation "invented" by Congress, rather than by the private sector itself). The CDO, the more complicated and less transparent successor to the plain vanilla mortgage-backed security which I discuss in more detail later, is cited as a "bad" innovation.

Perhaps the most devastating critique of financial innovation comes from one of finance's greatest living giants (both figuratively and literally): Paul Volcker, the widely and deservedly acclaimed former Federal Reserve Board Chairman, who is now Chairman of President Obama's Economic Recovery Board. Volcker has provocatively asked: "How many other [recent] innovations can you tell me that have been as important to the individual as the automatic teller machine, which in fact is more of a mechanical than a financial one?"[4] Volcker's implicit response is that there are none.

Volcker went on to lay out a major challenge to finance practitioners, economists and other analysts when he stated that he has "found very little evidence that vast amounts of innovation in financial markets in recent years have had a visible effect on the productivity of the economy. Maybe you can show that I am wrong. All I know is that the economy was rising very nicely in the 1950s and 1960s without all of these innovations.

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[2] www.nytimes.com/2009/04/27/opinion/27krugman.html.

[3] http://baselinescenario.com/2009/06/17/more-financial-innovation.

[4] Quoted in "Paul Volcker: Think More Broadly," *The Wall Street Journal*, December 14, 2009, p. R7.

Indeed, it was quite good in the 1980s without credit default swaps and without securitization and without CDOs."[5]

In this essay, I take up Volcker's challenge. I do so by highlighting many, perhaps most, of the key truly "financial" (not mechanical) innovations since the 1960s that have changed the way finance carries out its four economic functions: enabling parties to pay each other; mobilizing society's savings; channeling those savings toward productive investments; and allocating financial risks to those most willing and able to bear them. Admittedly, my analysis is more qualitative than quantitative, reflecting the difficulty of putting numbers to the impacts (a follow-on project I hope to undertake). But I nonetheless assert that logic and reason can lead to lead to certain meaningful conclusions.

My ultimate verdict is that like Johnson and Kwak, I find that there is a mix between good and bad financial innovations, although on balance I find more good ones than bad ones. Individually and collectively, these innovations have improved access to credit, made life more convenient, and in some cases probably allowed the economy to grow faster. But some innovations (notably, CDOs and Structured Investment Vehicles, or SIVs) were poorly designed, while others were misused (CDS, adjustable rate mortgages or ARMs, and home equity lines of credit or HELOCs) and contributed to the financial crisis and/or amplified the downturn in the economy when it started.

Along the way, I also address two of the main critiques of financial innovation just cited. The fact that many financial innovations have been and continue to be designed to "get around" financial regulation does not automatically make them bad. Indeed, the opposite is true if the regulations are impeding productive activity. Indeed, I argue that a number of financial innovations of this sort have been socially useful for this reason.

Volcker's observation that because economic times were good in the 1950s and 1960s when none of the modern financial innovations that I will review shortly had even been invented does not prove, by itself, that those innovations, when they came, added no social value. Events or trends in the real world, notably the growth of productivity, typically have many causes. For that reason, one cannot simply compare the performance of productivity or total output in two different time periods – without, and later with, modern financial innovations – and conclude that any difference in those measures can be attributed to the presence (or absence) just of financial innovation. The appropriate question to ask is what productivity or total output, or as I will also argue, other measures of net welfare, would have been "but for" any particular financial innovation or group of innovations. To answer that question requires taking into account, explicitly or implicitly, other causal factors affecting these measures in order to isolate the impact of financial innovations, individually or collectively.

Table 1 summarizes my findings – or the way I would answer this "but for" question – for the post-'60s financial innovations I review here. I classify the innovations

[5] Id.

according to the four functions of finance just outlined. By the nature of these functions, the innovations get generally more complex and less remote from the average consumer as one goes down the table and through the body of the essay – from innovations that are aimed primarily at consumers (payments, savings and consumer-lending innovations) to those innovations serving financial institutions, institutional investors and firms (lending products to help finance investment and innovations facilitating the allocation of risk).

The table illustrates that financial innovations are appropriately measured or "scored" on three dimensions, of which the net impact on productivity or total output is only one. Financial innovations also have distributional impacts – for example, by expanding access to certain products (loans and investments) – and can affect convenience of the users of financial products and services. In the table, and in more detail in the text that follows, I give scores ranging from -- to ++ on what I believe to be the net impacts along each of these three dimensions. I do not pretend that the list of innovations in Table 1 is comprehensive and thus I invite readers to provide additional examples and/or to comment on my assessments here, either in their own published work or by communicating directly to me (rlitan@brookings.edu).

Table 1
Scoring Net Impacts of Recent Financial Innovations: A Summary

	Access	Convenience	Productivity/GDP
Payments			
ATMs	++	++	+
Credit card expansion	++	++	+
Debit cards	++	++	+
Saving			
Money market funds	++	++	0
Indexed mutual funds	++	++	+
Exchange-traded funds	+	+	0/+
Limited partnerships			
Hedge Funds	0	0	0/+
Private Equity	0	0	+
TIPS	++	++	0/+
Investment			
Credit scoring	++	++	0
ARMs	++	N/A+	-/--
Home Equity Lines of Credit	++	++	-

Asset-backed securities	++	++	-/+ (see text)
CDOs*	++	++	--
SIVs*	++	++	--
Rise of Venture Capital	+	+	++ (but future not clear)
Risk-Bearing			
Options/Futures Exchanges And Pricing	+	+	+/++
Interest/Currency Swaps	++	++	+/++
Credit default swaps	+	+	+

*The positive scores here were temporary
Source: Analysis in text.

Why does the proper assessment of and thus attitude toward financial innovation matter? Because the general view that policymakers – informed by academic sifting of the evidence – take about the net impact of financial innovation in general almost certainly will affect the way financial regulation and policy evolves. This is important because by its very nature, innovation of any type (including financial innovation) ultimately has effects – both positive and negative – that cannot be easily foreseen at the outset. It is frequently the case, for example, that drugs developed to cure one disease are later found to be useful treating other ailments. Likewise, technologies developed for one purpose frequently find their way into products and services that were never contemplated by the innovator.

If policymakers take a skeptical view of innovation at outset – for example, by making innovators jump through hoops before being allowed to introduce them to the marketplace – then that will inevitably slow innovation. Such skepticism may be warranted where the downside consequences or side-effects may be severe, the best example being the sale of most drugs, which are subject to intensive scrutiny before they can be sold. The alternative approach, one that is followed for most products and services sold in our economy, is to let the innovations proceed and then only regulate their side-effects once they become evident.

In short, I conclude that it matters a great deal how policymakers view innovation in any particular industry or sphere of activity. I conclude here that, with a limited number of exceptions, the best public policy is to treat financial innovation like other innovations that are subject to after-the-fact regulation. As I discuss below in more detail, society would benefit from even more financial innovation in the future that would help cushion individuals or firms from certain financial risks to which they are now exposed but can do little or nothing about. Our policy environment should not discourage such constructive innovation, but rather should encourage it.

At the same, however, policymakers must do a much better job than they have in the past of stopping destructive innovation and the misuse of constructive innovation, either or both of which can lead to future financial bubbles that expose the economy to financial crises. Meeting this challenge should be high on the "to do" list of any new systemic risk monitor that Congress may create, or the President's Working Group on Financial Markets if no new financial monitoring agency is authorized.

Financial Innovation: What Is It and Why Does It Matter?

Before we can talk meaningfully about financial innovation, it is important to begin with finance itself: What is it, and why does it matter?

At its simplest level, finance is about *money* – something that is commonly used in any society as a means of exchange, as a way to measure something's worth, or as a way to store wealth. Many things have been used as money over time, ranging from livestock and foodstuffs, to metals (notably gold and silver), and later to mere paper, which initially and for almost two thousand years represented the right of the holder to get something "harder," like a metal, if they wanted it. Without belaboring the obvious, the use of money rather than barter is an essential feature for many reasons – cost, convenience, and certainty of value, among them – of all modern economies.[6]

It is this representational aspect of paper money – and now increasingly "digital" money, representing the right to receive paper money if one wants it – that is vital to understanding much of what we today mean by "finance." To oversimplify, the history of finance, and thus of "financial innovation," is marked by increasing kinds of financial *instruments* – pieces of paper (also now digitized) representing contractual rights of the holder to receive money in certain (or uncertain) amounts on certain conditions – issued by an expanding array of both non-financial and financial *institutions*.

The simplest example of a financial instrument is a bank deposit, which gives its holder the right to receive from the "bank" the stated amount in question, with interest, on certain dates (maturities), or immediately at any time (if the account is a "demand deposit" or a "checking account"). A loan, likewise, gives the lender the right to receive regular interest payments from the borrower, and ultimately the total amount loaned in return on a set date. This example highlights the fact that "banks" probably were the first kind of financial institution – entities that take deposits from some and loan some portion of those monies to others.

The first banks, originating in Italy in the 15th century, financed trade, using goods as collateral. Soon bankers discovered governments (or vice versa) as worthy borrowers, especially to raise funds for war. Only in more recent times have banks been major providers of funds for those who want to buy and develop real estate, for commercial or residential uses.

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[6] For a more extensive historical discussion of money and its various forms, especially the most recent ones, see Robert E. Litan and Martin Baily, eds., *Moving Money* (Brookings Institution Press, 2009), chapter 1.

Another important theme in the history of finance is the *standardization* of financial instruments – essentially contracts – that has permitted them to be *traded*, and thus more types of them to be invented. Like holders of paper money who want the option to get something "harder" (like gold) if they want it, holders of financial instruments, being one step removed from money, also want the ability to turn the instrument back into money if there is a need to do so. But buyers are unlikely to surface for these instruments unless they know that they too can sell them to someone else. Such trading will not occur, therefore, until and unless the instruments themselves are standardized (like money itself) and thus capable of being readily sold to someone else.

Early examples of traded instruments are bonds and stocks, which came well after bank deposits and loans. Bonds essentially are nothing more than standardized loans, and were initially issued by governments seeking to raise money on a grander scale than any single bank (even the Rothschilds) could provide. Shares of stock came to be traded after limited liability companies were chartered in the 19th century in both the United Kingdom and the United States. So-called "investment banks" developed in the 19th century to help primarily non-financial companies issue these shares to investors (by "underwriting," or buying and then selling, those shares to a wider public). Interestingly, given the concern today about "financial derivatives" as being some sort of recent and dangerous innovation, the first such instruments – "futures contracts" on rice – were first developed and traded in the 18th century in Japan**.**

Along the way, other kinds of financial instruments and institutions came into being. The first insurance companies, actually syndicates (or partnerships), arose in the 18th century in Britain as a result of growing maritime commerce to insure ships against weather or piracy-related catastrophes (though one of the earliest records of insurance as a concept and practice comes from the 18th century BC in the Code of Hammurabi and used by Mediterranean merchant ships). Eventually, other kinds of insurance, and insurers, formed to help insulate individuals and business against risks to their buildings and property, and even their persons (first their lives and later their health).

Before turning to a discussion of more modern financial instruments and institutions, it is vital to recognize a key lesson from this very brief historical overview of finance: that from the beginning finance was never static. New instruments, institutions and eventually trading and investment strategies were constantly evolving to meet the differing needs of different people, and later on the needs of firms engaged in non-financial activities – making and trading things, or providing services for other people and firms. Moreover, as economic activity became more complicated, finance followed suit. This change will become evident in the descriptions of the recent innovations in subsequent sections.

But to give that discussion some structure, it is important to distinguish the four key functions of finance, already briefly highlighted in the Introduction and elaborated in further detail below. Moreover, since Paul Volcker has raised the question of whether financial innovations since the 1960s or early 1970s, other than the ATM machine, have

been socially useful, it is important to understand in broad terms how the U.S. financial system of that era carried out each of those key functions. This will provide a benchmark against which to assess our modern financial system of today.

Payments: As already noted, the first function of finance is to provide means of payment. Beyond paper money, coins and checking accounts, general purpose credit cards (first introduced each by American Express and Bank of America in 1958) were beginning to come into their own in the 1960s, for both consumer and business use. Much larger wholesale payments were effected between companies by automated clearinghouses introduced in the early 1970s and the Fedwire system operated by the Federal Reserve (which also played the central role in clearing checks written on commercial banks). Major banks in the United States and other developed economies settled large payments with one another on a daily basis through the Clearinghouse for Interbank Payments System (CHIPS) formed in 1970.

Saving: The second key function performed by financial instruments and institutions is that by offering methods for earning interest, dividends and capital gains on monies invested in them, they encourage saving, both by individuals and organizations. Saving is socially important because it funds investments in physical and human capital that in turn generate higher incomes in the future. By the 1960s, most of the major institutions that exist today for facilitating saving were already in place: banks (and savings and loans, or specialized banks placing deposits in residential mortgages), insurance companies, mutual funds (but not yet money market funds or the increasingly popular index funds, each discussed below), and corporate pension plans (although these predominately guaranteed a level of benefits at retirement and did not give workers rights to specific amounts in their retirement accounts for them to invest). In addition, investors who had the time and the means could buy various financial instruments directly: government or corporate bonds and corporate stocks.

Investment: The third critical financial function is to channel savings, whether by domestic or foreign residents, into productive investments. Well before the 1960s, it was commonplace for companies wanting to build new buildings or to purchase new capital equipment, to borrow the funds from banks or insurers (whose primary functions as "financial intermediaries" are to direct the funds placed with them into private and public sector investments), or to issue new bonds or even to sell additional stock (almost always then was and now is a last resort). The federal government was instrumental in facilitating investment in residential housing by aiding the mortgage market. In the 1930s, the government established the Federal Housing Administration to insure mortgages taken out by low- and moderate-income households and the Federal Home Loan Bank System to provide a secondary market for most mortgages. Likewise, the government facilitated investment in education, or "human capital," by guaranteeing loans for post-secondary education. And, of course, the U.S. government funded some of its own investment activities – such as the construction of the interstate highway system and the support of much scientific research – in part by issuing bonds (when tax revenues were not sufficient to pay for all this). With the exception of a few small "venture capital" limited partnerships, the U.S. financial system had yet to develop by the end of

1960s a reliable way to fund the inherently risky process of firm formation and initial growth. This innovation was to come into its own shortly, but was hardly part of the financial landscape of the era celebrated by Volcker as implicitly having all the financial innovation it really needed.

Risk-Bearing: A final, and sometimes overlooked, essential function of finance is to allocate risks to those who are most willing and able to bear them. This function is sometimes confused with the belief that finance *reduces* overall risk. Clearly it does not, and cannot. Instead, the best that finance can do is to shift risk to those who most efficiently can bear it and to spread it out so that it is unduly concentrated among a handful of parties. (One of the most important lessons from the financial crisis is that the kinds of "securitization" that made subprime lending possible did not end up de-concentrating risks of default of the underlying mortgages, as so many market participants and other analysts, including former Fed Chairman Alan Greenspan, argued or expected).

As of the 1960s, insurance companies dominated the risk-bearing/allocation function of finance by underwriting various personal (auto, house, life, and health) and commercial (primarily property-related) risks. But insurance for *financial* risks was limited. Insurers were willing to bear the risk of default of municipal and state bonds and certain other financial instruments, but generally no other financial risks. Future contracts for various commodities, which had long been present, were available on futures exchanges, but there were no widely used mechanisms yet for insuring against other kinds of financial risks – due to fluctuations in interest rates, currencies (there was no need for this as exchange rates between currencies were fixed under the post-war Bretton Woods agreement), or stock prices (of individual companies or indexes).

In the sections that follow, I identify, document the growth of, and grade the most significant financial innovations since the 1960s that have served one or more of the above four functions.[7] As noted in the Introduction, the grades (ranging from -- to ++) represent my largely qualitative assessments of the *net impacts* of the innovations along three dimensions: contribution of the innovation toward distributional welfare (enhanced access), convenience of users, and impact on productivity or GDP. I invite readers to decide whether the grades are consistent with their own intuitions and understanding.

Market success is a necessary but clearly not sufficient condition for net positive impact. By definition, markets do not take adequate account of externalities. As the 2007-08 financial crisis has so clearly demonstrated, some recent and for a time highly successful financial innovations measured by market growth (for example, CDOs) also have had serious negative impacts on the financial sector generally and the economy as a whole that were not reflected in market prices or adequately taken into account by market participants at the time.

[7] I draw on multiple sources for the information summarized below, including specialized websites and *wikipedia.org.*

Before listing and assessing the innovations, several general observations are in order. First, there is an extensive literature on most, if not all, of the innovations described below -- so much so that a whole book could be written on each one. Clearly, that is not my purpose here, which instead is to provide something like a "Cliff's Notes" guide to financial innovation, with only a few footnotes. Readers thus hopefully will understand and excuse the brevity.

Second, as we will soon see, despite the impression one might get from the popular media, *not all financial innovation comes from Wall Street.* Many financial institutions and instruments have been developed and grown outside of New York.

Third, it is necessary to distinguish between innovation itself and how it can and may be used or misused. Everyone would agree, for example, that the automobile is an important, socially valuable innovation, even though driver misuse accounts for more than 40,000 auto-related fatalities a year. To reduce misuse, government regulates the use of automobiles, by requiring driver's licenses and punishing people who drive negligently (or after drinking too much alcohol). Likewise, just because financial instruments can be and have been misused – notably, the failure of AIG to set aside sufficient reserves to honor the credit default swap commitments it made – does not mean that the *instrument itself* has no or even negative social value. The critical question to ask is whether *the design of the instrument itself* makes it flawed. No one seriously suggests, for example, that we should ban all banks because some of them, even very large ones, fail. Instead, society is constantly seeking ways to regulate (not ban) such institutions (and/or to harness better market discipline) so that failure is much less frequent and costly.

Fourth, as briefly noted in the Introduction, a number of financial innovations are developed to get around current regulations. By itself, this does not make them bad or good. It depends on the regulation, as well as on the innovation itself. The development of the money market mutual fund, which I applaud below, happened because until the 1980s, bank deposit interest rates were capped. At the other extreme, the "Structured Investment Vehicles" created by large banks earlier this decade to avoid bank capital rules but yet strictly complied with prevailing accounting rules turned out to be a socially destructive innovation.

In any event, what has been called the "regulatory dialectic" in finance – new rules aimed at preventing old abuses being circumvented by yet new innovations, and yes sometimes, by new abuses – is as old as finance itself. It is hopeless to try to stop it. The only feasible course, as I conclude at the end of this essay, is for policymakers to continue doing their best to channel financial innovation in a socially useful direction, and to change the rules when abuses warrant.

Finally, it is important to address briefly the topic of "financial engineering," which too easily tends to be equated with (and then to stop the conversation about) financial innovation.

By "financial engineering" I mean the application of advanced mathematical and statistical techniques (such as the famous Black-Scholes-Merton options pricing formula) to the trading of financial instruments by a seemingly ever-growing army of "quants" – in hedge funds, the former investment banks, and now perhaps controversially, at the "proprietary trading desks" of large commercial banks. Financial engineering has become essential knowledge at any trading operation, and indeed has become a respected and much studied subject in finance, and even has its own specialized advanced degrees (Masters and Ph.D.).

I recognize that a broader definition of financial engineering would also include the creation of new financial instruments – such as the complex mortgage securities backed by subprime mortgages that have been justifiably heavily criticized, or credit default swaps (essentially insurance on those securities and other debt obligations) – but because I later discuss these specific instruments themselves, I do not cover here these non-trading aspects of the term. Nonetheless, even the narrower definition of financial engineering – mathematically driven trading – has had no shortage of critics. Here is a sample paraphrasing of some of the attacks:

–Financial engineering is nothing more than gambling dressed up in higher mathematics.

–Traders are paid too much and in the wrong way: as a share of their most recent profits, which discourages long-term thinking by the companies whose trades, bonds or options they trade.

–Like a Greek siren song, the lucre in trading has attracted too many of the nation's best minds – those that otherwise would work on scientific advances that benefit mankind – into essentially what is little different than a casino.

Finally, in his now famous critique of innovation, Volcker reports that when he asked a well-known (but unidentified) finance theorist and practitioner whether this increasingly fancy finance had contributed anything positive to the economy, he responded that, according to Volcker, "it does nothing … it [financial engineering] moves rents in the financial system – and besides, it's a lot of intellectual fun."[8] The expert was essentially restating the view that from society's vantage point, trading is a zero-sum game. The financial engineers may find clever ways to make money, but in doing so they are merely taking it away from someone else.[9]

These and possibly other critiques are largely the basis for the Administration's proposal to prohibit commercial banks that accept insured deposits, and even bank holding companies, from engaging in "proprietary trading" (notwithstanding the absence

[8] Volcker, at R7.

[9] For another thorough critique of financial engineering, as well as a fascinating and highly accessible tour of the history of economic thought, see Justin Fox, *The Myth of the Rational Market* (Harper Collins, 2009).

of evidence that proprietary trading by commercial and/or investment banks contributed to the financial crisis in any meaningful way).[10]

Any fair assessment of mathematically driven trading strategies, regardless of whether banks will be permitted to pursue them, should at least take account of possible counter benefits. For one thing, to the extent that financial engineering has led to more trading than would otherwise occur, it has enhanced liquidity in at least those markets where traders are active. Enhanced liquidity reduces trading spreads and makes it easier for non-full time traders to exit and enter positions at less cost. In addition, more frequent and intense trading more rapidly eliminates any pricing inefficiencies that may exist for any number of reasons in capital markets.

I have seen no credible empirical analysis that definitively settles the debate whether these possible benefits outweigh the alleged social costs of financial engineering as I have used the term here. Fortunately, for the purpose of this essay, this question need not be resolved (though it could certainly benefit from more research). All I claim is that wherever one comes out on the net benefits/costs of financial engineering, *there is much more to financial innovation than mathematically driven trading*. The rest of this essay will hopefully convince readers of this proposition.

Financial Innovation in Payments

If finance is not static, then the way we pay for things is living proof. Forty years ago, the typical individual probably carried a lot more cash (as a fraction of his/her income) around than is done today. And when individuals wanted cash, they typically went to the bank and waited in a teller line to get it.

That time is long gone, and there are many reasons why. Let's count the ways and assess them as we go along.[11]

ATMs

Let's begin where Paul Volcker starts and ends – with ATM machines, the one innovation he clearly likes (though he notes the obvious, it is not purely a *financial*

[10]The so-called "Volcker rule" will be more difficult to implement than is commonly assumed because there is no clear definition of "proprietary trading" and efforts to do so and then to ban it for commercial banks can have unfortunate unintended consequences. For example, prohibiting banks from making markets in thinly financial instruments that their clients want to buy or sell not only will fail to serve their clients' interests, but also reduces liquidity in those markets. Likewise, will the proposed ban cover hedging activities that banks may undertake to reduce their exposures to credit or interest rate risk? If so, such a prohibition could make banks less safe, hardly the outcome that is desired. For a more thorough discussion of concerns about the Administration's proprietary trading proposal, see my colleague Doug Elliott's paper, "Restricting Bank Activities," February 3, 2010, at http://www.brookings.edu/opinions/2010/0121_restricting_banks_elliott.aspx

[11] In reading this section, readers should be aware that I have consulted at various points over the past two decades for the American Bankers Association on ATM fees, and for American Express, Visa, and MasterCard on various credit card fee issues.

innovation, since a lot of hard technology, embodied in the machines themselves and the communications networks that link them to computers, is required to make them work).

Actually, the ATM machine has been around a lot longer than many people think: the first machine to mechanically dispense cash was developed in 1939 by Luther George Simjan and the City Bank of New York. That machine was only operational for six months, however, because of a lack of customer acceptance. It would be nearly 30 years later, in 1967, when Barclays Bank in London installed the first modern electronic ATM.

While the invention of the machine itself was certainly revolutionary, it was the advent of the *networked* ATM, introduced in Dallas, Texas in 1968, more than the machine itself that proved to be most useful for consumers. Once ATMs were networked, bank customers were free from not only having to wait in line at a bank branch (and then only when it was open), but since networking allowed ATMs to be placed anywhere – and over time, they were – consumers now were free from the bank branch itself and could get money any time across a wide geographical area.

The use and proliferation of ATMs has been rapid. By 2007, or roughly four decades after they were introduced, there were over 3 million ATMs in use around the world, about 400,000 of these in the United States, accounting for almost 10 billion transactions per year. The growth of ATM usage and deployment has slowed, however, with the rising use of debit cards (discussed shortly) and online banking.

Clearly, ATMs have broadened access to financial services and been a major source of convenience for consumer. I give this innovation a ++ score on both these measures. Moreover, by eliminating the need for tellers to dispense cash or take deposits, ATMs also have clearly improved productivity in the banking sector by saving time for both the banks and the individuals who use the machines, although even assuming generously a value of $1 per transaction in time saved would translate to just $10 billion worldwide, a big number in absolute terms, but small relative to worldwide GDP of roughly $50 trillion. I therefore give ATMs a + productivity score.

Credit Card Expansion

As already noted, general purpose credit cards (those not tied to a specific retail establishment) were part of the financial landscape in the 1960s, having been introduced to the world by American Express and Bank of America in 1958. And while the cards have multiple purposes – they have become a means of payment (although with subsequent bank settlement) as well as a source of credit and even a means of verifying identity – I am treating them here primarily as a payments innovation.[12]

I single out here the *expansion* of credit cards since the 1960s as a major innovation, since the cards are now far more ubiquitous and important than they were then. In 2008, credit card charge volume was approximately $2 trillion, up twenty-fold

[12] To the extent credit cards also help finance start-up businesses, as I argue shortly in this section, they are a vehicle for financing investment and thus could be discussed in that category of innovations as well.

from the $100 billion annual volume in 1983. Roughly half of credit card charges are for convenience use (in which the cardholder pays off the full balance when due) and the other half as a means of borrowing money.

Although the credit feature of credit cards has certainly contributed to their growth, the introduction of frequent flyer points (and other loyalty programs) for card usage in the 1980s probably was the major marketing innovation that more than anything else legitimated and fueled the growth in charge card volume. Thereafter, credit cards came to be commonly used in grocery check-out lines as well as at major retail establishments. More recently, credit cards (along with newer forms of payment, such as PayPal, which are nonetheless linked to credit cards) have found another use as an important form of payment for on-line purchases.

Despite their huge popularity and near ubiquity in the United States, credit cards nonetheless remain controversial. Primarily their fees and fee structures are continuing objects of media and consumer group criticism and litigation, despite the extensive disclosure and even fee-related regulation of cards by the Federal Reserve under federal law (under both the Truth in Lending Act, and more recently by the Credit Card Accountability Responsibility and Disclosure Act of 2009, or "Credit Card Act").[13] Indeed, it is this regulation that is most responsible for the length and complexity of credit card contracts, whose fine print consumers rarely read or understand.[14] A new consumer financial product regulatory agency, which would be created by the financial services bill enacted by the House but whose prospects are cloudy in the Senate, could (and should) streamline such rules, among other things.[15]

Scoring the net benefits of credit cards is a more complex exercise than doing so for ATM cards. That is primarily because credit cards, as the adjective implies, permit consumers both to pay and to borrow at the same time, not just in the period between time of purchase and due date on monthly card bills, but thereafter if the card user wants.

Clearly, like ATMs, credit cards (whose features, including debit and ATM, are now typically combined on a single card) enable many people to have another way of paying for purchases. Credit cards also have both widened the availability of and reduced the cost of consumer credit, compared to the previous world in which banks rarely extended personal loans, especially on an unsecured basis, which is the standard feature of credit card debt. Given these benefits, I give credit cards a ++ on *access* (despite the

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[13] Among other things, the Credit Card Act of 2009 and new rules implementing it prohibit card issuers from increasing the interest rate during the first year of an account and on existing balances on the card; requires creditors to obtain a consumer's consent before charging fees for transactions exceeding the credit limit; and prohibits issuers from allocating payments in ways that maximize interest charges.

[14] U.S. Government Accountability Office, *Credit Cards: Increased Complexity in Rates and Fees Heightens the Need for More Effective Disclosures to Consumers* (2006), available at www.gao.govnew.items/do6929.pdf.

[15] I believe, however, that the rules established by such a new federal agency should preempt state rules, although I support giving the relevant state officials (such as the Attorney General) the ability to enforce the federal rules in the federal courts (along with the officials from the federal agency, of course).

clear need for simplified disclosures and the recession-induced cutback in credit lines on many credit cards).

I also give credit cards an unambiguous ++ grade on *convenience.* Credit cards (along with debit cards) enable consumers to pay without cash, and thus to reduce trips to the bank and/or ATMs. Also, because by law consumers are liable for only $50 for the fraudulent use of credit cards, these cards offer a safer way to pay for things than money (which can be stolen, often with violence).

Finally, what about the contribution of credit cards to GDP? Here, there are multiple cross-currents. To the extent credit cards encourage more spending (less saving) in the short run, they boost aggregate demand and therefore add to GDP. But this effect cannot be permanent, since at some point (the Great Recession being a great example), credit card borrowing is voluntarily or involuntarily cut back, and thus the short run contribution to GDP becomes negative. So, over the cycle, from a demand standpoint, credit cards are growth-neutral, although for reasons just described, they may also add to the amplitude of the cycle (on both the up and down sides).

Over the longer run, if credit cards contributed to a decline in saving, they would also reduce investment and thus growth (since foreign borrowing is not a perfect substitute for domestic savings). But there is no hard statistical evidence that credit cards have contributed to the decline in the personal savings rate over the past four decades. In part, this may because of other credit innovations, in particular the rise of the home equity line of credit (HELOC) discussed below, whose interest is tax-deductible, whereas credit card interest is not. Indeed, the Federal Reserve's ongoing "Survey of Consumer Finance" shows that between 1989 and 2007 credit card debt as a share of total household debt has remained roughly constant, fluctuating in a narrow band from 2.8% to 3.9%.[16]

There is one way, however, in which credit cards almost certainly *enhance* long-run growth. Credit card lines are an important source of start-up capital – in amounts and at costs that otherwise likely would not be available – for many entrepreneurs.[17] In turn,

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[16] There is an ample literature on whether and to what extent credit card borrowing has contributed to the secular rising trend in personal bankruptcies. A primary issue is separating cause and effect. Clearly, individuals who file for personal bankruptcy tend to have heavy credit card debt, but the weight of the evidence suggests this is largely due to credit card borrowing by individuals or households who have suffered some unfortunate event in their lives – such as involuntary unemployment, a sudden illness, or divorce – which then leads them to use credit cards as a way of providing cash to pay ongoing bills. This narrative suggests that excessive card borrowing is more often a result of some other exogenous event, which is the true cause of bankruptcy, not the borrowing itself. See, e.g. Elizabeth Warren and Amelia Warren Tyagi, *The Two-Income Trap: Why Middle-Class Mothers & Fathers Are Going* Broke (Basic Books, 2003); Todd Zywicki, "An Economic Analysis of the Consumer Bankruptcy Crisis," *Northwestern University Law Review*, Vol. 99, No. 4, 2005; and David B. Gross and Nicholas S. Souleles, "An Empirical Analysis of Personal Bankruptcy and Delinquency," *Review of Financial Studies*, Vol. 15, 2002.

[17] See Alicia Robb and David Robinson, "The Capital Structure Decisions of New Firms," 2008 and Robert H. Scott, "The Use of Credit Card Debt by New Firms," 2009, both available, at www.kauffman.org. These and other financing studies of new firms are based on the Kauffman Firm Survey, the largest longitudinal survey of new firms in the United States (of roughly 5,000 firms launched in 2004).

young companies have accounted for virtually all net new jobs created over the past three decades.[18] By implication, therefore, *personal* credit cards used for business creation therefore must be contributing to long-run output growth. I therefore give a grade of + to expanded credit card use with respect to its long-run impact on GDP.

Debit Cards

Debit cards – which automatically deduct a customer's payment at a retail establishment from his or her bank account – are a natural outgrowth of both ATMs and credit cards. They appear to have been first introduced in the United States by the First National Bank of Seattle in 1978.

Because they do not give a customer the "float" that accompanies credit card use (borrowed money until payment is due), debit cards understandably took longer to gain market acceptance than credit cards. However, as the debit feature was added to ATM cards and as more merchants accepted debit transactions, debit cards grew in popularity. By 2009, there were 34 billion debit transactions annually completed in the United States, accounting for approximately 35% of payment card transactions.

On both access and convenience, debit cards have the same advantages as ATM and credit features, and thus deserve a ++ grade. Although they are less expensive than credit transactions – in part because there is much less fraud because of PIN requirements to use – debit cards are still a close substitute for both credit and ATM features. For this reason, debit features probably do not add much to GDP incrementally, and therefore in my view deserve a + grade on their GDP contribution.

Financial Innovations And Saving

Both financial intermediaries and financial instruments offer more convenient, safer and potentially rewarding ways of saving than simply holding (or hiding) some form of money. The history of financial innovation is therefore marked by a series of new ways that individuals and firms can save, and thereby help finance useful social investments (a third aspect of finance which I discuss in the next category of innovation).

As discussed in the Introduction, through the era of the 1960s, there were a few basic savings vehicles: savings or time deposit accounts at banks, bonds, equities and mutual funds. Over the last four decades, however, there has been a proliferation of new ways to save. I concentrate on three of them here.[19]

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[18] See John Haltiwanger, Ron Jarmin and Javier Miranda, "Jobs Created from Business Startups in the United States," Kauffman Foundation, January, 2009 and Dane Stangler and Robert E. Litan, "Where Will The Jobs Come From?" Kauffman Foundation, November 2009. Both these studies also can be found at www.kauffman.org.

[19] Sources for the information in this section include the SEC website, Wikipedia.com, the website of the Investment Company Institute (ici.org) and a number of other specialized websites. For index funds and ETFs, I have drawn on Peter J. Wallison and Robert E. Litan, *Competitive Equity: A Better Way to Organize Mutual Funds* (American Enterprise Institute, 2007).

Money market funds

It may surprise U.S. readers that the first money market fund (MMF) – a specialized mutual fund that invests in short-term safe assets – actually was introduced first *outside the United States*, in Brazil in 1968. Like the U.S. equivalent that was to follow in 1971 when Bruce Bent introduced the "Reserve Fund," the Brazilian *Conta Garatia* enabled investors to redeem shares in the fund "at par" like a bank account, but it paid more interest than one could earn at a bank. The same all along has been true here, although after MMFs proved to be highly popular, banks were later permitted by their regulators to offer a rough equivalent, the "money market deposit account" (MMDA).

MMF shares have not been covered by federal deposit insurance until very recently and then only temporarily, ironically because the Treasury Department wanted to stop a run on MMFs following losses by, yes, the same Reserve Fund on commercial paper issued by the failed Lehman Brothers.[20] Nonetheless, at first smaller investors, and later institutional investors (who wanted a short-term safe asset in amounts over the deposit insurance ceiling at their bank), quickly were attracted to MMFs because they invest only in "safe assets" – Treasury bills or highly-rated short-term bonds (commercial paper).

The numbers document how highly popular MMFs have become over the past four decades since their introduction. At year-end 2008, roughly 800 MMFs were in business, holding assets of almost $4 trillion.

MMFs were and still are an important positive financial innovation primarily because they gave ordinary people access to interest-bearing short-term assets that even had transaction-like features (one could write a check on them). In contrast, banks were prohibited by law from paying interest on checking accounts, and only offered interest-bearing "certificates of deposit" in larger amounts, such as $50,000 or $100,000. Furthermore, Treasury bills could only be bought in denominations of $10,000, which kept the typical small investor out of the market. MMFs ingeniously avoided these restrictions and limitations by buying large batches of Treasury bills and corporate commercial paper, and then sold shares to investors who could buy in with as little as $1,000. In short, MMFs gave their investors the same opportunities as the "big boys" and for this reason alone, earn a ++ grade on my access measure. For similar reasons, because of their transaction features, MMFs also deserve a ++ grade on convenience.

Have MMFs contributed to GDP growth? Perhaps, but I conclude that any effect has been small, and thus I assign it a 0 on net. There are two broad channels to consider.

First, it is doubtful that the ability to earn more on what is, after all, a quasi-transactions account is unlikely to have spurred much consumer savings, holding other factors constant (the latter is important to do, because of the long-term secular decline in

[20] The Treasury Department's guarantee was extended in September, 2008 through September, 2009.

the personal savings rate since the 1960s).[21] There is little evidence that interest rates matter much to saving, and the interest rate advantage offered by MMFs (especially relative to bank-offered MMDAs) is not that great.

The second possible way in which MMFs could affect GDP is by increasing the demand for highly-rated commercial paper issued by corporations, thereby lowering their cost of funds relative to what they might have paid had they continued to borrow from banks. With a modestly lower cost of funds, larger corporations have thus been able to grow more rapidly than would otherwise be the case, but it is not clear that this benefited *the economy* as a result if this has come at the expense of new firm formation and growth (which, as noted earlier, have been the real engines of job growth in recent decades). Moreover, because the growth of the commercial paper market has meant a decline in bank borrowing by the largest and most credit-worthy companies, the largest banks that used to supply this kind of credit have gone into riskier activities, such as commercial real estate lending, leveraged buy-outs, and of course subprime residential mortgages (through complex mortgage-backed securities, to be discussed later below). As recent events have underscored, this outcome has not been a positive one.

In sum, therefore, when all is said and done, MMFs have probably not contributed much to GDP.

Some may be tempted to dismiss the value of MMFs because they so clearly were the product of "regulatory arbitrage." As already noted, MMFs came into being because of regulatory restrictions. As I have argued, from an access and convenience perspective, this is clearly not a bad thing, but a good outcome. MMFs are thus a prime example of a financial innovation circumventing a bad regulation, underscoring how regulatory arbitrage does not always deserve the pejorative connotation that some may want to give it.

Indexed Mutual Funds

Although mutual funds were a well-recognized and important part of the financial landscape of the 1960s, an inconvenient truth was guiding the industry – that only a small percentage of funds generated better returns for investors, adjusted for risk, than either one of the few "indexes" of stocks at the time (there are now many more) or even an assemblage of randomly chosen stocks picked by the proverbial dart thrower (or monkey, as some put it). The discovery of this "truth" has many fathers, but the one who had the greatest impact on the industry and was thus most responsible for the commercial innovation now described, was John Bogle, the founder of the Vanguard Group of Funds. Drawing on his college thesis research at Princeton, as well as the later popular work of Princeton finance professor, Burton Malkiel (of *Random Walk Down Wall Street* fame), Bogle and Vanguard launched the first "indexed" mutual fund for individual investors in

[21] Indeed, some broader measures of the money supply include MMFs precisely because of their transactions (check-writing) feature. However, for most account holders, MMFs are a place to park their funds for significant time periods, and for this reason, I treat them as primarily a savings vehicle and innovation here.

1975.[22] Dubbed the "500 Index Fund," this first index fund sought to replicate (with a smaller basket of stocks) the performance of one of the most famous, broader stock indices at the time, the S&P 500 Index.

The original Vanguard 500 fund began with only $11 million in assets; today it has over $90 billion. By 2009, the Vanguard Group was the largest mutual fund company in the world.

Indexing, meanwhile, has become an ever more popular way for investors to put money not only into equities, but also fixed income securities. Between 1993 and 2008, for example, total assets invested in index funds of all types grew from $27 billion to over $600 billion, while the number of such funds has expanded from 70 to roughly 370.

As a lower cost and generally more rewarding way to access the capital markets, index funds score a ++ on access and convenience. Although there is considerable variation in expense ratios for S&P 500 index funds (an anomaly suggesting that competition in mutual fund advisory services is still well short of ideal), the management fees for these funds cluster around 20 basis points as a percent of fund assets. By comparison, the management expense ratios at actively managed funds range as low as 50 basis points to well over 300 basis points.[23] This difference in fees can add up. Suppose, for the sake of argument, the average management expense ratio at actively managed funds is 150 basis points, and the average expense ratio for index funds of all types is 50 basis points (I believe these to be reasonable assumptions). This would imply that for every $1 billion in actively managed funds that is switched to indexing, investors would save $10 million in fees; for every trillion, the savings would be $10 billion.

The expense savings afforded by indexed funds also is indicative of a productivity gain (delivering portfolio diversification more cheaply than active management) totally apart from any improvement in investment performance. At the same time, however, there are potential economic costs to indexing, which is why it would not be good for all mutual fund assets to be indexed, even the vast majority of actively managed funds that fail to consistently out-perform the indexes (and even if substantially more fund assets were invested in a broader index, such as the Wilshire 5000, which avoids biasing capital toward a narrow base of firms, such as those belonging to just S&P 500 or 100, or to the Dow Jones 30 industrials). Indexing removes incentives for shareholders to monitor companies as intensively as they would if they owned shares in the companies directly. On the other hand, because there is some stock market premium associated with membership in the more exclusive indexes, the strong demand for indexed funds provides incentives for firms to grow. On net, therefore, I would give indexed funds a + on their contribution to productivity and GDP growth.

Exchange-traded funds

[22] A few years before, in 1971, William Foust and John McQuown at Wells Fargo Bank created an index fund only for institutional clients.
[23] These data are drawn from Wallison and Litan, *Competitive Equity*.

Exchange traded funds, or ETFs, are a relatively recent innovation, having been first introduced to investors in 1989, and in their modern form not until 1993.[24] Until recently, all ETFs have been essentially like a closed-end mutual fund, in that the shares in the ETF represent a fixed basket of stocks or other financial instruments – typically those making up or tracking a well-known index. Accordingly, the price of the ETF tracks the aggregate value of the financial instruments on which it is based (although initially ETFs tracked indexes and thus were "passively managed," in 2008, the SEC authorized actively managed ETFs).

Like mutual funds, ETFs come in two forms: unit investment trusts (UITs), which really are like closed-end mutual funds in that they have a fixed number of shares; and open-ended ETFs, which issue new shares as more investors want to invest in them. The shares of both kinds of ETFs are bought and sold in the markets, just like stocks, and are not purchased through a fund company.

From about the year 2000, ETFs, especially of the open-ended variety, have soared in popularity. By year end 2008, there were over 700 ETFs on the market, with total net assets exceeding $530 billion. This figure is still relatively small compared to the nearly $7 trillion in all mutual funds (other than in money market funds), but ETFs are steadily gaining on the latter.

There are several reasons for ETFs' growing popularity, despite a few drawbacks compared to mutual funds: [25]

–Perhaps most important, ETF investors control the timing of their capital gains tax liabilities because they pay capital gains taxes only when they sell their ETF shares. In contrast, mutual fund investors cede control over the timing of their capital gains or losses to the manager of their mutual fund, whose transactions and the tax liabilities for them pass through *pro rata* to investors.

–ETFs are cheaper to operate than mutual funds because there is no need for ETFs to manage investor relationships or even keep track of them. Yet given the already low cost of managing index funds, the ETF cost advantage is probably only a few basis points.

–Unlike mutual funds, which spread the transactions costs of new investors across the base of existing investors, buyers of ETFs pay the incremental costs they impose on the market maker and thereafter do not pay for the costs of subsequent purchasers.

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[24] Actually, it was in that year that the precursor to the modern ETF, "Index Participation Shares" were created and traded as a proxy for the S&P 500 on the American Stock Exchange and the Philadelphia Stock Exchange. That particular product, however, spent little time on the market, since the Chicago Mercantile Exchange successfully sued to halt all sales. Eventually, U.S. issuers found a way around then existing SEC regulations to develop legal indexed products, the first being the S&P Depository Receipt, or the SPDR, introduced in 1993. Barclays was especially innovative and aggressive in this field.

[25] This discussion draws on Wallison and Litan, pp. 56-57.

–Since ETFs are traded on an exchange, investors can buy them any time the exchange is open rather than being able to buy them only at the close of the market each day, as is the case with mutual funds.

There are three main drawbacks of ETFs relative to mutual funds, however. First, because ETFs are like stocks, investors must pay brokerage fees to purchase them, in contrast with the popular no-load mutual funds which impose no sales charge (with the emergence of discount and on-line brokers, however, the brokerage fees for ETFs are small). Second, again because they are like stocks, ETFs must be purchased in a fixed number of shares, and are typically bought in round lots of 100 to minimize transactions costs; in contrast, mutual funds can be purchased in fractional shares with any dollar amount. A third drawback is that investors in ETFs with few assets can find these instruments traded in illiquid markets and at relatively high spreads (although because smaller mutual funds are unable to fully exploit economies of scale, small ETFs may not be at a disadvantage relative to small mutual funds).[26]

The rapid growth of ETFs is a market-tested indication that investors find them useful as a way of obtaining the benefits of diversification at even lower cost than afforded by indexed mutual funds. Thus, *relative to index funds*, I give ETFs a + on both access and convenience. Given the small relative cost advantage of ETFs compared to index mutual funds, I would give ETFs somewhere to a 0 to + ranking on their contribution to GDP or productivity.

Finally, it is noteworthy that ETFs emerged as a way of circumventing prior SEC regulations that prevented such instruments, but only with the SEC's explicit blessing via a special exemption from provisions from the Investment Company Act. Thus, to the extent that ETFs represent a positive development – and for the reasons given in this section I believe this to be the case – they are then another example of socially beneficial regulatory arbitrage.

Financial limited partnerships

Another important category of investments where there has been significant innovation over the past several decades include various kinds of financial limited partnerships: venture capital funds, hedge funds, and private equity funds. The first of these, venture funds, represent a new financial intermediary – one that channels savings to a particular kind of investment (equity in start-up or new companies) – and is therefore discussed in the following section dealing with investment-related innovations. Each of the other two types of funds are essentially a different type of "mutual fund for the wealthy or for institutional investors" and thus are discussed here as savings vehicles.

There are certain features that are common to all of these fund variations, however. First, as a legal matter, they each tend to be structured as limited partnerships, with the fund manager as the general partner, and the investors as limited partners.

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[26] See a warning of this danger by Eleanor Laise, "Risks Lurk for ETF Investors," *The Wall Street Journal*, February 1, 2010, p. R1.

Limited partners, by law, are shielded from liability or responsibility for actions of the general partner, or the organizer of the fund. Second, unlike the typical investment vehicle or financial instrument, which calls for the investor to pay all of the purchase immediately, the typical financial limited partnership obligates the investor to meet "capital calls" over an extended period (such as ten years) as investment opportunities identified by the general partner are identified and negotiated. (Hedge funds are an exception to this pattern; they typically require purchasers to post their money up front.) Third, financial limited partnership interests are typically very difficult to trade, and in the case of hedge funds in particular, limited investors are typically unable to get their funds back until after some "lock-up" period is over.

Hedge Funds: In perhaps one of the great misnomers in the financial world, "hedge funds" are typically anything but investment vehicles designed to hedge against certain market outcomes. To the contrary, hedge funds – of which there many varieties – are akin to mutual funds on steroids: many, if not most, of them use investors' money to borrow still more money, and to make leveraged bets of various kinds, all in an effort to achieve for the investors a superior return adjusted for risk ("alpha") relative to what they could obtain from investments in an indexed instrument.[27]

Hedge funds differ from mutual funds, in that in order to be exempt from registration with the SEC under the Investment Company Act, hedge funds must take funds only from "sophisticated investors" – wealthy individuals or institutions (pension funds or endowments). Hedge funds are like mutual funds, however, in that they place investors' funds in markets for liquid financial instruments (stocks, bonds, derivatives), and indeed many trade these instruments far more frequently than mutual funds. The liquid nature of their investments distinguishes hedge funds from "private equity" funds, discussed next, which tend to buy large or controlling interests in companies, and to hold these positions for sale after several years.

Although the first hedge fund is generally believed to have been introduced into the market in 1949, this particular investment vehicle began to become popular only in the 1980s. One particular hedge fund, Long-Term Capital Management (LTCM) gave the whole asset class or industry a bad name for a while, when it had to be bailed out by its largest counterparties at the behest of the Federal Reserve in 1998 (for fear that the fund's failure would trigger a much larger financial meltdown). LTCM was excessively leveraged, over 100-to-1, and thus was highly exposed to market fluctuations, even though it largely engaged in arbitrage that at the time seemed to be safe bets. This proved to be wrong in the highly volatile market environment that followed the default by the Russian government on its ruble-denominated bonds in August 1998.

Because they are not required to register with any arm of the government – yet – there are no hard data about the number of hedge funds or their total assets under management. A best guess, however, is that there is roughly $2 trillion invested in hedge funds of all types, making these funds significantly more important as a collective

[27] In fact, many hedge funds do what their name implies and attempt to reduce risk for investors, but over time, the term has been applied to funds that use leverage as well.

investment vehicle than ETFs (which many hedge funds invest in), but still considerably less important than mutual funds.

Hedge funds are another example of regulatory arbitrage, but are they a net positive or negative? They certainly are controversial, and have been the target of critics for some time for socially harmful speculation – either pushing stock or commodity prices down unjustifiably through their short selling, or doing the opposite by buying options and futures (in oil in particular) and creating or contributing to asset price bubbles.

Given their limited appeal (by law) to wealthy and large institutions, I give hedge funds a 0 score on both access and convenience (they might help just these investors, but they are not like money market funds, for example, which expanded interest-bearing accounts to the masses). As to economy-wide productivity, the case for their positive impact rests primarily on the liquidity that hedge funds add to the markets in which they participate. Greater liquidity benefits all other investors, and thus probably reduces the cost of capital by some small amount. The case for their negative impact turns on the systemic risks they are alleged to pose. No one really knows how much their risks are concentrated because hedge funds are under no reporting obligations. It is possible that, taken together, hedge funds contributed to the demand for complex mortgage securities (CDOs, in particular, to be discussed shortly), and thus facilitated the extension of subprime mortgages. But then some funds – one in particular – profited hugely by betting against securities backed by subprime mortgages, and so these funds can hardly be blamed for the crisis.[28]

Meanwhile, even if hedge funds as a group earned superior returns for investors (had positive "alphas" using the term of the trade), that outcome would not represent a positive contribution to GDP or productivity for several reasons. For one thing, any such higher return may have been largely or entirely due to leverage, or borrowed funds. More fundamentally, trading is a zero-sum game (apart from the liquidity benefits) for society as a whole: if hedge funds made money, others lost it. And finally, given the absence of reliable data, it is impossible really to know the net performance of hedge funds as a group, especially when one has to subtract out the negative returns of the funds that disappear or close down (meaning that any reported returns for hedge funds as a group almost certainly suffer from what statisticians call "survivorship bias").

On balance, therefore, I give hedge funds a 0 to + score on contribution to GDP, with any plus (assuming it exists) being a small one. Meanwhile, if a financial services reform bill is enacted this year, it is likely to require some form of reporting by hedge funds in the future. If this happens, analysts, investors and policymakers all may know somewhat more about the net social benefits or costs of hedge funds than they do now.

Private Equity Funds: Unlike hedge funds, private equity (PE) funds have a much longer-term investment horizon, with investments often taking the form of

[28] For one revealing popular account, see Gregory Zuckerman, *The Greatest Trade Ever* (New York: Broadway Business, 2009) (about the fortune made by John Paulson and the hedge fund he manages).

controlling interests in companies, especially "turnaround" situations. Today's typical PE firm evolved from the leveraged buyout (LBO) partnerships that were all the rage in the 1980s, and is still typically financed heavily with debt, some of it secured (and often bought by institutional investors, including hedge funds), and the rest unsecured.

Annual funds committed to PE firms have increased enormously over time, from just $200 million in 1980 to over $200 billion 2007. I have no comparable data since the recession began, but even assuming new commitments to be down, there is little question that PE limited partnerships have become an important investment vehicle. [29]

Because private equity firms appeal to the same investor class – wealthy individuals and institutional investors – as hedge funds, they earn, in my view, the same score on access and convenience, namely 0.

The more interesting question is whether PE firms contribute or detract from GDP or productivity. One knock against them on this score is that at least through the middle of the last decade, and thus even before the Great Recession, PE investors on average seem to have earned *less*, net of fees, than the S&P 500 index.[30]

Nonetheless, the most recent thorough study of PE firms contradicts the popular view of PE firms (especially held in Europe) as being overly short-term oriented – buying up distressed companies, laying off lots of workers, and then buffing up the firms for a quick resale.[31] This study, led by Harvard Business School Professor Josh Lerner for the World Economic Forum, finds that in fact that PE firms hold most of their investments (almost 60%) longer than five years, and that the holding period has been lengthening. In addition, although on average jobs fall at PE-controlled firms during the first two years after they are acquired, employment growth resumes thereafter, and by the fourth and fifth year after the PE transaction, employment at PE-controlled firms is no different than at firms in a control group. This study confirms that the findings of other academic studies that PE partnerships are thus good at controlling costs of firms that need it, and then find a way to build them back up over time – a finding that seems consistent with the view that PE partnerships thus contribute positively to productivity and to GDP. On net, I give them a + on this measure.[32]

TIPS

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[29] Data are from Steven N. Kaplan and Per Stromberg, "Leveraged Buyouts and Private Equity," *Journal of Economic Perspectives*, Vol. 23, No. 1, Winter 2009, pp. 121-46. This article also provides an excellent overview of the PE industry.

[30] Steven N. Kaplan and Antoinette Schoar, "Private Equity Returns: Persistence and Capital Flows," *Journal of Finance*, Vol, 60, No. 4, 2005, pp. 1791-1823.

[31] "The Global Economic Impact of Private Equity" (World Economic Forum, January 2008).

[32] To the extent that PE firms have an effect on the allocation of domestic savings toward new investment, then they perform an "intermediation" role and thus also should be considered as an important innovation affecting the translation of savings into investment, along with other notable innovations in this category, discussed below.

One of the more important financial innovations in the last two decades is the introduction of government bonds whose principal amounts are indexed to inflation. Such bonds were first sold by the British government in the 1980s, and later adopted by the United States in 1997 as "Treasury Inflation-Protected Securities." TIPS have since gained steadily in popularity, topping $600 billion in early 2010, though still accounting for less than 10% of all Treasury debt outstanding.

When rated on access and convenience, TIPS score a ++ in my view. Until TIPS were offered by the U.S. government, investors had no safe instrument that offered a close to perfect hedge against inflation. They could buy commodities, such as gold, whose prices more or less increased with the general price level, but at many times, this correlation was less than perfect or even absent. Given large current projected budget deficits, as well as the recent unprecedented loosening of monetary policy during this recession, many investors now are especially worried about future inflation, and so demand for TIPS has been strong.

Any connection between TIPS and GDP growth or productivity is more difficult to make. One possible link, at least in theory, is that because TIPS cause the federal government to pay out more if inflation rises, the government should be less inclined than it otherwise would be to run deficits. Other things being equal, this means less crowding out of private investment, and thus faster GDP growth over the long run. Although theoretically plausible, there is little evidence in the current environment of this possible effect. Federal deficits are at record highs, both in absolute terms and relative to GDP. To a large extent, this is both because of the recession and the stimulus measures that have been taken to help the economy get and stay out of the downturn, factors which should be temporary. Nonetheless, it still seems difficult to detect any such positive impact of TIPS on GDP growth. Perhaps such a positive impact will become more evident with the passage of time, both because it will be easier to detect through time-series regression techniques, and also as the share of total Treasury debt accounted for by TIPS increases.

Second, as has been widely observed, with TIPS in the market federal policymakers – the Federal Reserve in particular – have a much better market-based measure of expected future inflation than they had before. Prior to TIPS, policymakers would have to find ways to tease out the expected inflation component of interest rates on long-term Treasury bonds from other factors influencing those rates. Now they can look to the *difference* between the market rate on TIPS of a given maturity (say 10 years) and the market rate on a standard Treasury bond of that same maturity as a good estimate of how much inflation investors in the Treasury market expect over that time horizon. The Fed can use this information to improve its forecasting of future inflation, which should improve the performance of monetary policy over time – reflected in a smoother path of GDP growth than would otherwise occur. This may be more than a temporary effect, since if private actors expect the economy to be more stable, they should be inclined to invest more than they otherwise would, which should translate into higher long-term growth. Here, too, however, the financial crisis and subsequent recession make it difficult to detect whether there is any basis to this second channel through which TIPS might

affect GDP, but such an effect might be found in the future for the same reasons as asserted for the first possible TIPS-GDP linkage.

In sum, given the plausible theoretical connection between TIPS and increased GDP growth, but the absence of hard empirical evidence so far, I give TIPS a 0-+ score on their GDP/productivity impact.

Overall Assessment

After reviewing the various innovations in savings vehicles since the purported "Golden Age" of 1960s, one natural question to ask is: why then, with all this innovation, have personal savings rates steadily fallen, from roughly 8 percent of disposable income then, to essentially 0 in the years preceding the Great Recession? Many explanations for the precipitous drop in the savings rate have been advanced, but the one I find most convincing is that rising prices of homes and equities over this period (with the exception of the 1970s) until the financial crisis hit made households feel wealthier and thus less inclined to save. The fact that the personal saving rate has jumped up to the 5% range since the crisis – and thus after the significant drop in equities values (even taking into account the partial recovery in stock prices since March 2009) and, perhaps more importantly, since the bursting of the housing bubble – lends credence to this view.

Assuming this to be right, then one cannot draw a simple inference from the secular decline in the personal savings rate that the savings innovations just described have had no – or even a negative – impact on savings. As I have asserted, various innovations have made widened access to more ways of saving and have made saving more convenient. *Holding all other factors constant, therefore, there is a presumptive case, at least in my view, that financial innovation has increased total personal saving relative to what it otherwise would be.*

Financial Innovations Affecting the Translation of Savings into Investment

The flip side of financial innovations that facilitate and ideally augment saving are innovations that improve the process by which saving is translated into productive investment. In the Volker-defined "Golden Age" of finance of the 1960s, banks (and to a lesser extent insurers and pension funds) engaged in this translational process by lending out customers' funds to credit-worthy companies. Banks and specialized thrift institutions also served the credit needs of consumers, mostly (at that time) for "personal investments:" houses or long-lived consumer durables, such as appliances. Except for the residential mortgages that Fannie Mae and the Federal Home Loan Banks purchased from thrifts, the loans originated by banks generally were held on their balance sheets rather than sold – until the loans matured, were rolled over, or paid off early by the borrowers.

Financial intermediation was far less developed in this golden age for equity investments. With the exception of a handful of "venture capital" funds, which are discussed shortly, there were no intermediaries for financing entrepreneurial start-up ventures with equity. The large investment banks underwrote securities for the most

successful start-ups that had matured to the point where they could sell shares to the public, but the banks themselves did not supply the seed capital or subsequent rounds of financing for these companies prior to their wanting to go public. Instead, entrepreneurs who needed equity financing – because they had insufficient collateral or income to obtain a loan – had to get it from their own bank accounts, or friends and family (or people we now would call "angel investors").

The debt and equity intermediation functions have experienced major innovations over the past three or four decades, admittedly in light of the financial crisis -- not all of it positive. I now describe and assess what I believe some of the key innovations that have affected the translation of savings into investment, both in housing and in productive assets (equipment, buildings, and research and development) purchased and used by the good-producing and service sectors of the economy.

Credit Scoring

Until recent decades, banks generally did not link the interest rates they charged on loans to the perceived risk of their borrowers, especially consumers. If a borrower were deemed credit-worthy (often a subjective exercise of the lender, who might also have looked to the borrower's race, age and sex) they would get the loan they applied for, and if not, they wouldn't; the credit decision had a "zero-one" character. In short, in such a system, credit inevitably was rationed – by quantity, not by price.

One of the modern revolutions in finance over the past several decades – affecting residential mortgage lending in particular – has been the development and widespread use of "credit scoring." As readers of this essay will know by now (but may not have been aware of several years ago), individuals' creditworthiness is tracked regularly by three major credit agencies: Experian, TRW and TransUnion. All of them use scoring techniques developed by Fair Isaac, which introduced its FICO score in 1958, but did not have success until the 1970s.

Credit scoring since has become essential for lenders extending various forms of personal credit and increasingly for credit extended to small businesses. Credit scores have improved lenders' ability to predict risk, which in turn has enabled lenders to *price* risk by reflecting it in the interest rate charged on loans. As a result, lenders can now and do extend credit to many individuals they heretofore would never lend to at all. For this reason, credit scoring thus clearly deserves a ++ in helping to expand access to credit.

Not only has credit scoring helped to "democratize credit" (and so has securitization, the financial innovation discussed next, which depended heavily on credit scoring), it also has surely reduced (though not eliminated) racial discrimination in lending because credit scores are based on objective criteria, largely the payment history of the individuals being rated regardless of the color of their skin.[33] In the process, credit

[33] Individuals, disproportionately minorities, who may live at the margins of the mainstream economy because they pay in cash, may not have a credit score and thus may not be able to obtain a loan, but this would have been true before credit scoring came along.

scoring has also helped banks meet their obligations under the Community Reinvestment Act (CRA), which requires banks to serve the credit needs of all those in the institution's service area. Because the Act is silent as to price, an innovation like credit scoring that reduced rationing by quantity has been an ideal handmaiden to the Act. It is even conceivable (though I have seen nothing in the literature about this possible effect) that the enactment of the CRA in 1977 could have been one of the driving forces behind the wider use of credit scoring by all depository lenders.

If credit scoring deserves a ++ on access, it also deserves the same score on convenience. It is credit scoring that helped make possible the software-based underwriting that lenders now routinely use to qualify borrowers and price their loans or lines of credit. In a world without credit scoring, the underwriting process – being far more subjective – would and did take much longer.

While it is clear that credit scoring has changed the allocation of credit, its impact on economy-wide GDP is less evident. To the extent that it has enabled people who were previously shut out of the credit markets to obtain credit from conventional lenders, credit scoring almost certainly has allowed if not encouraged more spending on consumer durables and homes than would otherwise be the case, at least during economic expansions. In downturns, lenders tighten their lending and return to more quantity rationing because they are both more risk averse and concerned about intensified oversight by their examiners (if they are regulated depositories).

This "asymmetric" behavior – more spending in good times, no effect in bad times – implies that over the long run, therefore, credit scoring probably has contributed to the decline in the personal savings rate. The events leading up to and following the financial crisis reinforce this conclusion. To the extent that credit scoring facilitated the extension of credit to "subprime borrowers" – a class of borrowers who, by definition, would not exist without credit scoring – then this innovation indirectly (though by how much is not clear) helped fuel the housing bubble, which even if it had not popped, was almost certainly a factor in lowering the savings rates of homeowners. The richer they felt, the less many believed they needed to save out of current income. If, therefore, these were only economy-wide impacts of credit scoring, I would feel compelled to conclude that it has had a negative long-run impact on GDP.

However, an opposite positive impact may also be present. By enhancing the purchases of consumer durables, most of which these days have embedded within them some combination of computer chips, credit scoring indirectly (again) helped the firms producing these products and the chips inside them "run down the cost or learning curve" and thus achieve efficiencies more rapidly than would otherwise have been the case. Balancing this possible (though small) positive effect on productivity and thus GDP against the foregoing negative (though also likely small) effect credit scoring has had on GDP by reducing overall saving, I conclude that the net impact on GDP has not been detectable, and thus I assign it a 0.

Adjustable Rate Mortgages (ARMs)

For decades after the Depression, homeowners could only borrow money at a fixed rate of interest to finance their houses. If rates rose, this was a good deal. But if rates dropped, they had to refinance, assuming they could qualify, incurring a variety of expenses in the process (prepayment penalties, up-front points on a new mortgage, closing costs, title and legal fees) that often added up to several percentage points of the new mortgage amount.

Fixed rate mortgages not only can be problematic for some homeowners, but for lenders. America's thrift industry initially ran into trouble in the late 1970s and early 1980s when market interest rates soared, forcing down the value of the long-term fixed-rate mortgages they held on their balance sheets, while creating a cash flow crisis for the institutions that were then subject to "Regulation Q" ceilings on the rates they could pay their depositors. After Congress lifted Regulation Q in 1980, the thrifts had a new problem: the double digit market-based interest rates they were then paying on new deposits far exceeded the single digit interest rates they were stuck earning on their fixed-rate mortgages. Most thrift institutions thus were essentially insolvent, but not forced out of business by the federal government (which eventually spent what at the time was an unprecedented sum, roughly $150 billion, making good on the thrifts' insured deposits) until the next decade. By this time, many of the thrifts that were already broke had lost even more money "gambling for resurrection" by extending various kinds of risky loans.

But before all that happened, Congress tried one thing to prevent the inevitable by permitting thrifts to do something they should have been allowed to do long before: extend adjustable-rate mortgages – mortgages whose interest rates moved with an index of market interest rates (such as the Treasury bond rate or the London Interbank Borrowing Rate or LIBOR) – so that they could better match the interest they received on these mortgages with the interest they paid their depositors. The mortgage market in the United States has never been the same since. At times, depending on the prospects for future interest rates, ARMs have accounted for substantial fractions, even a majority, of total mortgages originated.

Because the typical initial rate on an ARM always has been lower than the rate on fixed-rate mortgages of the same maturity, ARMs offered an easier way for some homeowners to qualify for mortgages. Although ARMs shifted the risk of future interest rate movements to the borrower,[34] in periods of declining interest rates, such as much of the 1980s, and portions of the following two decades, many borrowers were better off having taken out an ARM than the traditional 15 or 30 year fixed rate mortgage. For these borrowers, then, ARMs clearly deserve a ++ on expanding access, though I find it difficult to know how to score this particular innovation on convenience (an application for an ARM mortgage being no different, in principle, than an application for a fixed-rate mortgage).

[34] The rate changes, however, were typically subject to a cap, both on an annual and lifetime-of-the-mortgage basis.

With respect to GDP impact, it is important to distinguish the original ARM from its later, destructive mutations. In its original design, the ARM enhanced home purchases, thereby promoting residential investment, which added to aggregate demand and thus GDP in the short run. Over a longer period, it is likely that the initial ARMs added to the increase in overall household debt (both in absolute terms and relative to GDP),[35] especially for individuals who could not otherwise qualify for a loan. In this way, ARMs made the household sector in general somewhat more susceptible to the negative impacts of recessions, while contributing to the decline in the personal savings rate. I therefore give the initial, even well-designed, ARM a single - on its contribution to GDP.

The evolution of the ARMs in the years preceding the financial crisis was much more damaging. This period was marked by a substantial deterioration in underwriting standards and the emergence of loan products that, in retrospect, simply made no sense, either for the lender or the borrower. I have in mind here the proliferation of ARMs with low "teaser rates" that reset after some period to a substantially higher market-based interest rate, as well as "option ARMs" or "cash flow ARMs" which allowed borrowers to pick the kind of monthly payment they wanted to make. Among the options was a minimum payment that did not even cover accrued interest so that the unpaid portion of the monthly interest due was added to the mortgage balance ("negative amortization"). Many borrowers using either of these exotic ARMs found themselves unable to service their mortgages when home prices quit rising and the economy began sinking. The Federal Reserve has since effectively eliminated these destructive ARMs by requiring borrowers to qualify at the higher reset interest rates rather than at any low initial interest rate.

While they were being granted, the exotic ARMs temporarily helped fuel the housing boom and thus for a short while boosted GDP. But because these mortgages, among other developments, contributed to the subprime mortgage crisis and subsequent recession – when GDP dropped by a far larger amount than any previous short-run gain that the exotic ARMs may have generated – the ARM mutations deserve a double -- score on their impact on GDP.

Home Equity Lines of Credit (HELOCs)

An even more recent, mortgage-related innovation is the development of the Home Equity Line of Credit (HELOC). Just as many businesses have lines of credit which they can draw down when money is needed, the HELOC allows consumers to establish and draw against a line of credit, using the equity built up in one's home as collateral. The HELOC appears to have been introduced in the late 1980s, for that is when the amounts outstanding on bank balance sheets begin to show up in the Federal Reserve's statistics on the banking system.

[35] The median "debt service ratio" (total annual debt service payments relative to personal) among all households rose from 5 percent in 1983 to 13 percent in 2007. Karen E. Dynan, "Changing Household Financial Opportunities and Economic Security," *Journal of Economic Perspectives*, Fall 2009.

HELOCs became steadily more popular thereafter, for two reasons. The first reason is that unlike the interest on consumer debt – notably credit card debt – that is not deductible for tax purposes, interest on HELOC's is treated as tax-deductible mortgage interest. This tax treatment gave many households incentives to draw down their HELOC lines as a substitute for credit card borrowing. The second reason is that rising home prices in the 1990s and the 2000s (until about 2006) increased many homeowners' equity and so enabled them to qualify for a HELOC. Some homeowners used HELOCs to *add* to their debt levels, thereby increasing overall household indebtedness. As many observers have noted, HELOCs thus enabled too many households to turn their homes into the functional equivalent of an ATM machine. By 2009, banks had over $600 billion in HELOC loans outstanding, a large number in absolute terms, although still relatively small compared to the roughly $14 trillion in mortgage debt then outstanding.[36]

Clearly, HELOCs helped expand credit for many consumers, and thereby deserve a ++ on the access dimension. Likewise, because consumers could easily draw down their HELOCs simply by writing a check – or with the arrival of Internet banking with the push of a button or the click of a mouse – they deserve a ++ score on convenience as well.

However, by adding to household debt, like ARMs, HELOCs have contributed to the amplitude of the economic cycle, while very likely reducing the personal savings rate, thereby lowering investment and the growth of potential GDP. I give them a - rating on GDP impact for this reason.

Securitization/Asset-Backed Securities

Until the financial crisis, the broad social benefits of what has come to be called "securitization" had been unquestioned. By bundling many individual, heretofore illiquid (difficult to sell) loans into packages on which securities could be issued (passing through the loan payments, *pro rata*, to the purchasers of the securities), securitization was thought to considerably expand the supply of funds available for lending beyond the deposits available in the banking system (which in fact it has done). In the process, it was widely believed that securitization helped to distribute more widely the risks of lending throughout the financial system rather than to concentrate them only in banks. By comparison, loans to developing countries and to commercial real estate developers in the late 1970s and 1980s overwhelmingly were then concentrated in banks, which exposed the largest banks in particular to enormous instability and potential insolvency. The recent financial crisis, however, revealed that securitized instruments also came to be held heavily by the largest financial institutions, in the United States and around the world, and thus contributed far less to asset diversification than most experts and participants in financial markets previously believed.

Unlike the innovations that represent regulatory arbitrage – the circumvention of certain rules – securitization actually was very much a product of deliberate federal policy, applied ironically (given the recent crisis) first in the mortgage market. It was

[36] Data are from the Federal Reserve.

there that the three government (or government-sponsored) housing finance entities created to provide liquidity for mortgage lenders – Ginnie Mae, Fannie Mae, and Freddie Mac – designed and issued the first "mortgage-backed securities" (MBS).

MBS had two important features. First, MBS were built around pools of prime quality (or federally insured) mortgages that legally were put into trusts that served as collateral for the securities. This arrangement was truly innovative. Second, to further insure their marketability to investors, MBS were "credit enhanced" through the guarantees these entities provided to investors on their *pro rata* share of principal and interest on the underlying mortgages. Because two of the housing entities (Fannie and Freddie) were creatures of the federal government, even though publicly held, their guarantees were widely viewed by market participants to be implicitly backed by the federal government. This aspect of MBS was not really innovative, although the government's later rescue of Fannie and Freddie validated the market perception of who was really behind them.

Mortgage-backed securities fundamentally changed the mortgage lending business (and ultimately lending more broadly). Whereas once mortgages were originated by lenders who held them until they matured or the houses they financed were sold, securitization ushered in the "originate-to-distribute" (OTD) model of mortgage lending, where lenders originating loans that met the underwriting criteria of the government housing entities sold them to those entities, which packaged the mortgages and issued securities collateralized by them. Once so-called "agency" mortgages had been securitized, the technology spread to other types of loans: mortgages in amounts above the Fannie Mae/Freddie Mac ceilings ("jumbo mortgages" used in "private label securitizations"); home equity loans; commercial mortgages; business loans; auto loans; credit card loans; student loans; and even some exotic income streams (such as royalties on the music of famous artists). As of year end 2008, there were roughly $5 trillion in agency MBS outstanding; $2.5 trillion in non-agency MBS; and roughly $4 trillion in other asset-backed securities (ABS).[37]

By connecting the broader capital markets to the financing needs of consumers and businesses, securitization has made it easier for lenders of all kinds to originate loans, and thereby has surely enhanced access to credit and made it more convenient for borrowers to obtain it. I give it a ++ score on both those counts.

Whether securitization has contributed to GDP growth is a more complicated issue, however. Until the financial crisis, I believe most analysts would have answered this question with an unequivocal positive assessment, either a + or ++ using my scoring conventions, although pinning down an exact benefit estimate is difficult. In theory, by broadening the supply of funds for financing the loans backing the securities, securitization should have brought down the cost of finance. Estimates pre-dating the financial crisis suggest that agency (Fannie/Freddie) securitizations indeed have done that – by anywhere from 7 to 22 basis points – but these studies do not distinguish between

[37] From the Securities Industry and Financial Markets Association (SIFMA) at the organization's website: www.sifma.org/research/statistics/market-sector-statistics.html.

the interest-reducing affect of the implicit government guarantee of these securities and the reduction in interest rates due to the "capital markets effect" (an expanded source of funding) just discussed. Indeed, the studies themselves seem to assume that all of the interest rate reduction is due to the implicit government guarantee.[38]

This is probably incorrect, but I have seen no studies that estimate separately the capital markets effect attributable to securitization, either in the context of agency residential mortgage securities, private label mortgage securities, or other ABS. As a thought experiment to get some idea of the magnitude of the capital markets impact, assume conservatively that, independent of any perceived government guarantee, securitization lowered interest rates on the loans underlying the securities by 3-4 basis points (approximately half of the Passmore estimate for the consumer benefits of agency MBS, or the lowest estimate of such benefits). On a base of roughly $11.5 trillion in total ABS (including all MBS) through 2008, the total consumer benefits – and thus the impact on GDP in the form of an efficiency gain – of securitization thus would be roughly $35-45 billion annually.[39]

This is a not insubstantial figure, and until the financial crisis the estimation of the GDP impact of securitization would have stopped there. But the crisis has revealed at least two significant downsides of securitization, one which may be apparent, and other which may not be well recognized.

The first problem with the OTD model is that because it weakened incentives for mortgage originators to care about the default risk of mortgages after they were sold, it facilitated or at least did not check the relaxation of lending standards that enabled subprime borrowers to purchase homes with little or no money down and without the income to support the mortgages. Had lenders and those who arranged for the issuance of CDOs in particular had at least some "financial skin in the game" then it is conceivable that much of the excess in subprime mortgage lending never would have occurred.

The second, less well appreciated problem with the OTD model relates to what happens when the mortgages underlying the securities become delinquent. When the underlying loans are sold to a trust that backs a securities issue, then any "workouts" short of foreclosure (in the case of loans, such as mortgages, where foreclosure is a potential remedy) are governed by the contractual provisions creating the trust, specifically how much authority these contracts give to the entity that services those

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[38] The higher estimate was made by the Congressional Budget Office in May 2001 in a study entitled "Federal Subsidies and the Housing GSEs." The lower and more recent estimate is from Wayne Passmore, "The GSE Implicit Subsidy and the Value of Government Ambiguity," *Real Estate Economics*, Vol. 33 (2005). Although they differ in their estimates of the consumer benefits of agency MBS, both studies estimate that most of the benefits of the implicit government guarantee up to that date (the failure and subsequent taxpayer bailouts of Fannie Mae and Freddie Mac made that guarantee explicit) flowed through to the shareholders of the housing GSEs.

[39] The typical way of estimating the value of the implicit government guarantee on agency MBS is to measure the interest rate spread between agency MBS and private label MBS (secured by "jumbo mortgages" in amounts above the agency ceilings). This spread does not, however, take account of the "capital markets effect" in lowering the interest rate on *both* agency and private level MBS.

loans (the "servicer") and what kind of majority or super-majority voting is required to approve any loan modifications. In the case of the complex securities backed by subprime loans, to be discussed next, these contractual arrangements inhibited mortgage modifications, which have prompted government officials at both the federal and state levels since to look for other ways, typically entailing taxpayer funds, to achieve modifications short of foreclosure. Although some believe that the difficulty of reaching agreements on workouts is a good thing – because it will encourage loan originators in the future to be more prudent when underwriting mortgages – the consensus among the experts seems to be that by complicating the ability and freedom of servicers to modify the underlying mortgages, existing servicing agreements have contributed to more foreclosures than would otherwise be the case, thus aggravating the downward spiral in housing prices since the crisis began. If this latter view is correct, and I believe it is, then the significant transactions costs of working out delinquent loans underlying ABS represent a major problem with securitization.

Still, securitization or the OTD model of loan origination and distribution has become so entrenched in the financial system that it is difficult to see banks and other lenders returning to the previous "originate and hold" model any time soon, if ever. To the contrary, throughout the crisis the Federal Reserve has creatively used its Term Asset-Backed Lending Facility (the "TALF") to support the ABS market by lending to investors in these securities and protecting them against losses. The Fed would not be doing this if it believed that the financial system could easily or should return to the previous lending model.

The challenge is how to fix securitization so that it continues to provide the consumer benefits of the added funds it brings to lending without having the workout disadvantages just described, and especially without becoming so complex and opaque that it distorts asset markets in the way about to be described below. One obvious solution given the first flaw in the OTD model just discussed is to require both lenders and issuers of ABS to share some of the losses in future defaults or delinquencies (the so-called "skin in the game" requirement). Given what has happened to the ABS market, it is quite likely that the market will impose such discipline on future securitizations even if policymakers do not (a skin in the game requirement is in the financial services bill enacted in the House but it is unclear whether it will be included in any final bill, assuming one is passed).

In addition, debate continues over how, if at all, to provide greater freedom to loan servicers to modify loans of delinquent borrowers so as to lower the transactions costs of such workouts. One positive development in this regard is that the collateral debt obligation (CDO) – with its different payments streams to different classes of investors – is unlikely to return. This particular structure inhibited agreement on loan workouts because of the clashing economic interests of the different classes of investors. As securitized instruments become more transparent and as they return to the pass-through model of the original agency MBS, this particular complication will no longer be present.

Nonetheless, the continuing uncertainties over what the new model of securitization will look like, coupled with the weak economy and general risk aversion of investors, have considerably dampened the issuance of ABS of all types since the crisis began. Especially uncertain is what will happen as the Fed winds down the TALF and ends its program of buying MBS.

One way or another securitization will continue to exist, although in a different form than issuers and investors were accustomed to before the crisis. Putting aside the CDO mutation that I discuss next, the securitization technology has provided and will continue to provide benefits to the economy, provided it is restructured by the market and/or policymakers. On this assumption, I give it + on its contribution to GDP, though recognizing that its GDP contribution the years running up to and immediately following the financial crisis very likely was negative.

CDOs

The main reason that securitization now has a bad name in many circles is not because of the structure that characterized the vast proportion of ABS, but rather because of the financial mutation known as the collateralized debt obligation (CDO).

CDOs cleverly (too cleverly, it turns out) permitted far too many subprime mortgages (and their rough equivalent, so-called "Alt A" mortgages, or those extended to less-than-prime borrowers on terms more lenient than those used for prime mortgages) to be originated and sold to securitizers because of an innovation in the way investors were paid. Rather than pass through the principal and interest payments made on the underlying mortgages directly and on a pro rata basis to all holders of the securities, as was common for MBS, the CDO divided securities purchasers into groups or "tranches" according to their risk appetites. In effect, the CDO structured a "waterfall" of payments that flowed first to those who were most risk-averse, and then in stages, to investors who had higher risk appetites and who received higher interest rates for assuming such risks. To provide additional comfort to investors, especially those in the first tranche, the designers of these securities either took out insurance on the payments from private bond insurers or from a new class of insurers, companies (like AIG) that were willing to sell "credit default swaps" (CDS) that had the same effect (I discuss CDS separately below, in the category of innovations aimed at risk allocation). By structuring the payments in a waterfall-like fashion and layering them with insurance, issuers of CDOs were able to take subprime mortgages that otherwise separately would have received low ratings by the ratings agencies, and to repurpose them into higher-rated securities, whose first tranche even typically received a AAA, a rating equivalent to that of risk-free Treasury debt, but with a significantly higher interest rate.

In brief, the CDO was financial alchemy at its best, and at its worst, taking financial lead and turning into what seemed like financial gold.[40] Until the housing price

[40] From the best I can tell, the first CDO was developed by Drexel Burnham Lambert in 1987. The security was further refined and made more popular by J.P. Morgan in the mid-1990s, where the company's bankers first thought of the idea of credit enhancing CDOs with CDS. The CDO's waterfall payments structure later

bubble popped, the markets believed this. From just $5 billion issued in 1996, new CDOs issued ballooned by more than a hundred-fold to $520 billion in 2006. By 2008, the year of the financial crisis, that figure had dropped to just $60 billion. The CDO market today is essentially dead.

It is not too much of an overstatement to say that the subprime mortgage debacle likely would not have occurred – or if so, would have been much less damaging – had the CDO never been invented. The OTD lending model does not work unless there are buyers at the end of the lending pipeline. The developers of the CDO became the buyers, or actually the intermediate buyers (since the purchasers of the securities were the ultimate buyers) of subprime mortgages. They were aided in this process, as just noted, by bond insurers, issuers of CDS, the ratings agencies, and bank-related structured investment vehicles discussed next. Each of these entities unwisely rushed into the market for subprime mortgage debt, lured by the transactional fees, on the basis of the thinnest of actuarial evidence to judge the default probabilities of the underlying mortgages, coupled with the unrealistic expectation that home prices would continue rising and thus bail all parties out from any mistakes.

Nonetheless, while it worked, the CDO thus was instrumental in expanding access to mortgage financing to a large class of people who previously could not buy a home. We know now, of course, that many of these subprime borrowers never should have been offered these loans, especially with little or no down payment and with little or no documentation of their incomes (or lack thereof). But some portion of those who received subprime or Alt-A mortgage financing – we won't know the exact share until the foreclosure crisis has run its course – clearly benefited from it. Thus, on my access and convenience measure, I am inclined to give the CDO a qualified, temporary ++.

On its contribution to GDP and productivity, however, the CDO clearly deserves a large --. Losses from mortgage-related securities by this date have topped $1 trillion, and the knock-on effects (aggravated by undue leverage in the financial system, a topic discussed next) on economic output in the United States and the rest of the world added trillions of dollars of losses. Given this record, it is difficult to imagine a more destructive financial innovation.

SIVs

It is unlikely that CDOs could not have been sold in the volumes they were without yet another destructive financial innovation: the structured investment vehicle or "SIV." Invented by Citigroup in 1988 and then later copied by other large banks, a SIV was structured (I use the past tense, since they no longer exist given the financial crisis) to be an off-balance sheet entity related to a bank created for the purposes of holding primarily asset-backed securities until these securities could be sold to investors.[41] Banks

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proved to be ideal for subprime mortgages. For a fascinating description of the history of CDOs, see Gillian Tett, *Fool's Gold* (New York: Free Press, 2009).

[41] The bank typically provided the SIV with backup liquidity in case it needed it, and they all eventually did.

created these "holding tanks" as a way of reducing the amounts of capital they otherwise would need to finance ABS or MBS had these securities been held on the banks' balance sheet directly.

At their peak, bank-related SIVs financed roughly $400 billion in securitized assets. But the SIVs suffered from a severe and ultimately crippling design flaw. Unlike bank deposits that were insured and thus a stable source of financing, SIVs funded themselves primarily with short-term commercial paper, which though typically collateralized by specific collateral (the ABS or MBS on the SIV's balance sheet), nonetheless was potentially unstable. If SIVs could not issue new commercial paper to replace similar instruments that were maturing – that is, "roll over" their short-term debts – they could no longer function. In fact, that is precisely what happened during the summer of 2007 when the panic about the depth of the subprime mortgage problem began to spread. After an aborted government-orchestrated plan to enlist all banks with related SIVs to join together to keep them afloat, the banks took the SIVs back on their balance sheets. The SIVs' debt problems that were thus transferred back to the banks, among other factors, drove the Treasury Department one year later to inject government funds (under the TARP) to help save the nation's large banks from insolvency.

Clearly, given this history, it is impossible to score the SIVs' contribution to GDP as anything but --. Indeed, by helping banks to circumvent their capital adequacy requirements, SIVs enabled the banks to excessively leverage what capital they did have, which greatly magnified the economic impact of subprime mortgage losses after housing prices quit climbing and began to fall.

On a positive note, by adding liquidity to the mortgage securities market, the SIVs temporarily enhanced access to mortgages by subprime borrowers and made it more convenient for them to do so. But even a temporary ++ score on these dimensions cannot come close to making up for the financial damage they helped cause.

The Rise of Venture Capital

There is probably no more iconic financial innovation over the last four decades that has helped improve the allocation of savings toward productive investment than the rise of the venture capital industry, which has fundamentally transformed and indeed effectively invented financial intermediation for equity investment.

Venture capital has been credited with having given birth, or at least contributed to the launching, of a number of America's most famous companies, including Google, eBay, Amazon, and Genentech, among others. Indeed, since the late 1990s, venture-backed companies have accounted for roughly 60% of initial public offerings (IPOs) of stock by rapidly growing companies seeking to sustain their growth.[42] Harvard Business School professors Josh Lerner and Paul Gompers have calculated that by the end of 2000,

[42] This figure and the data on venture returns cited at various points in this section are based on unpublished data compiled by Steve Kaplan and Josh Lerner, made available to the author.

the market value of venture-backed companies had reached $2.7 trillion, or 32 percent of the total value of all public companies at that date.[43]

To be sure, it is not appropriate to attribute all of the growth in market value of venture-backed companies to venture financing at an early stage, but certainly some of the companies in this group would not have gotten started or wouldn't have grown as rapidly had they not had venture support from the beginning. Thus, even taking into account the downsizing of the venture capital industry since the bursting of the Internet stock bubble in 2000 (a subject addressed shortly), the record of VC measured over several decades clearly merits a ++ score on its contributions to GDP and productivity. Likewise, since venture firms also have opened up a new way for investors (albeit just wealthy individuals and institutional investors) to finance early stage companies, I would give venture finance a + on the access and convenience measures as well.

Admittedly, venture capital investing is not entirely new, and certainly existed before the alleged Golden Age of the finance, the 1950s or 1960s. Wealthy individuals or family members, such as the Rockefellers, the Whitneys and the Vanderbilts all were active "venture" investors, backing start-up or early stage entrepreneurs. However, because these investments typically were made in a "one-off" way and outside a formal legal structure, they are more akin to modern "angel investing" than to the venture firms that have formed and grown since the 1970s.

Likewise, even the modern form of the venture firm – namely a limited partnership with a time-limited investment horizon (now typically ten years) – predates the current financial era that is my focus here. Georges Doriot, a professor at the Harvard Business School, is credited with forming the first venture capital firm, the American Research and Development Corporation, in 1946. The federal government helped give venture capital a boost in 1958 with the enactment of the Small Business Investment Act, which licensed SBICs, with government aid, to help finance the creation and growth of entrepreneurial firms.

Nonetheless, venture capital was essentially a financial backwater for several decades, and for this reason, I believe its rapid growth over the last three decades in particular merit its description as an important financial innovation. That growth, in turn, owes much to a policy measure that specifically was designed to produce or accelerate the innovation: an amendment in 1979 to the "prudent man" rule under the Employment Retirement Income Security Act (ERISA), which permitted pension funds to invest in financial limited partnerships. With that statutory legitimacy, university endowments also felt more comfortable investing in venture funds (and, with pension funds, later in PE and hedge funds). Thus, from attracting less than $1 billion annually in new money each year in the 1970s, the venture industry grew rapidly in the 1980s and 1990s, reaching a peak of $100 billion in 2000, the year the Internet stock bubble burst. Venture firm performance, on average, also rose with the level of resources, topping 50% annually (by

[43] Josh Lerner and Paul Gompers, *The Money of Invention: How Venture Capital Creates Wealth* (Harvard Business School Press, 2001), p. 67.

vintage year in which a fund was formed) in the mid-1990s when venture capital was riding especially high.[44]

Much has changed in the venture world since 2000, however. Far fewer dollars are going into venture funds, for one: in the $20-30 billion range annually, considerably down from the 2000 peak. Second, many venture firms have shied away from funding start-ups, and moved into less risky, later round financings. Third, the returns for investors are also down dramatically, to the low single digits.[45] All of these developments raise the inevitable question of whether venture finance is in a cyclical lull or whether we are seeing a secular trend that will fundamentally reshape this mode of financial intermediation. The answer to that question, which should become evident over the next few years, will determine venture's future contribution to productivity and GDP.

Financial Innovations and Risk-Bearing[46]

The fourth key function of finance is to spread or allocate risk to those most willing and able to bear it. Historically, insurance companies and the contracts they write have been the principal means for doing this. Increasingly, however, securities of various types, or financial instruments based on the value of other "underlying" securities ("derivatives"), have been taking on this function. In this section, I describe and assess three of these innovations.

Options and Financial Futures Exchanges

An option is a contract giving the holder a right (or the option) buy (a "call") or sell (a "put") a product or financial instrument at a fixed price (the "strike price") at any time within some time period (typically six months).[47] Such a contract has been in existence for thousands of years. Futures contracts have a more recent origin, tied to agricultural products, and *require* the holder to buy or sell the product or financial instrument at a fixed price at maturity (the "delivery date").

Since both types of derivatives have been available for some time, I don't count them as a major financial innovation *per se*. But in the 1970s there were two key option-related innovations that unleashed a huge growth in the number and kinds of options, as well as the trading volumes in these financial instruments (from 1 million contracts traded in 193 to over 3 billion contracts trading hands in 2008).[48] In addition, there was an important innovation in futures trading that had a similar effect.

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[44] Unpublished data from Kaplan and Lerner.
[45] Ibid.
[46] This section draws on the Wikipedia entries for these topics, as well as other sources noted in relevant places.
[47] This is known as an American style option. A European option gives the holder the right to exercise only on the expiration date.
[48] See generally, the website of the Options Industry Council, www.optionseducation.org and also the website of Optionetics, www.optionetics.com/market/articles/7411.

First, in 1973 the first options exchange in the United States, the Chicago Board Options Exchange, was authorized to do business and opened its doors. Today there are five such exchanges, in which investors can trade puts or calls on individual stocks, stock indexes, bonds, and commodities.

Second, also in 1973, Fischer Black and Myron Scholes published an article outlining a formula for pricing options. Shortly, thereafter, Robert Merton published a different proof of the same formula. All three authors are thus given credit for what is today called the Black-Scholes-Merton (BSM) pricing formula. Although predicated on a number of assumptions, and thus criticized for this reason in some quarters, BSM remains the most widely used method of pricing options in the world today. [49]

Likewise the 1970s saw the authorization of financial futures exchanges as well as those for commodities. Today, trading volumes in financial futures (such as contracts tied to various stock indices) swamp those in agricultural products, where futures trading began.

Like any derivative, options and futures attract the interest of hedgers and speculators. Both derivatives can be relatively low cost ways of locking in the gain or loss on an underlying financial instrument without actually selling it (and realizing the tax consequences of doing so). At the same time, both derivatives represent highly leveraged ways of speculating on the value of the underlying financial instrument. For all the criticism that speculators attract (in any market), it is important to recognize that without them hedgers would have fewer counterparties with whom to trade.

Because of the advantages options and futures afford market participants and traders to both hedge and speculate, I give them a + on both access and convenience.

It is likely that the expansion in the number and trading volume of options and futures have contributed to GDP but by how much is not clear. Putting aside those who merely trade or make markets in these instruments as a business, both derivatives also enable firms producing real things in the economy to hedge risks – for example, to lock in the price they may pay for oil, or the price they may receive for their products, or to hedge against fluctuations in interest rates or currencies – and thereby to reduce various financial risks to their earnings and thus to their businesses. In so doing, companies may make their stocks and/or bonds more attractive to investors, and thereby lower their cost of capital.

Furthermore, it is unlikely the explosive growth of trade and investment flows across borders – the stuff of globalization – would have been as robust as it has been without the parties to these transactions being able to hedge their foreign currency risks in

[49] In brief, the BSM formula showed that on that assumption that stock prices are “normally distributed” (follow a Bell curve pattern), the rational, market price for an option on a non-dividend paying stock depends on the past volatility of the price of that stock, the prevailing interest rate, and period until the option expires.

particular through instruments such as currency futures and options. Although globalization is controversial, it is widely accepted among economists that it has been a major force for good, lowering prices and improving incentives for efficiency throughout the world. So, to the extent that futures and options (along with the use of foreign currency swaps, described next) have facilitated this process, they have positively affected both U.S. and global GDP.

A difficult-to-impossible counter effect is that like other aspects to financial engineering, the proliferation of options and futures has no doubt contributed to the magnet effect that financial careers offer to those who might otherwise pursue innovative careers in the real economy. The lure of having just one "Bill Gates" or "Steve Jobs" equivalent opt for the trading floors of New York or Chicago rather than founding the next Microsoft or Apple would be a significant cost to the economy, but also one that would be difficult to pin specifically on the wider availability of just options or derivatives.

On balance, therefore, my judgment call is to assign somewhere between a + and ++ rating for the contribution of futures/options to GDP.

Interest Rate/Foreign Currency Swaps

A second financial innovation since the 1960s developed and used overwhelmingly as a way of reallocating financial risks is the "swap" arrangement. I focus on two of them here, swaps involving interest rates and currencies.

A swap is a contract that means what it suggests: an exchange of cash flows between two parties. An interest rate swap typically involves the exchange of loan payments with a fixed rate of interest for another payment stream defined by a floating rate of interest. A currency swap involves the exchange of payments in different currencies (where both interest rates could be fixed, both variable, or one fixed and the other variable). The parties may enter in such arrangements because for any number of reasons they would rather reduce or change their risk exposure from the assets (loans or bonds) they currently have on their balance sheets. Swaps enable them to do this without actually having to sell the underlying assets.

Currency swaps were developed first in the 1970s in England to get around then prevailing foreign exchange controls: rather than buy or sell foreign currency assets, the parties simply exchanged payments on them. These swaps represent a form of regulatory arbitrage. In 1981, the World Bank introduced the first cross-currency interest rate swaps.

David Swenson, the famed investment manager for Yale University's endowment but then working for Salomon Brothers, is credited with negotiating the first pure interest rate swap agreement in the early 1980s.

The markets for both kinds of swap arrangements have grown enormously. The "notional value" of interest rate swaps (the total amount of the underlying loans to which

the payments under the swaps are referenced) at year end 2008 worldwide was $385 trillion, down from $458 trillion at mid-year. Foreign currency swaps are also heavily used and traded, at $44 trillion in notional amount worldwide at year end 2008, down from a peak of $63 trillion earlier that year.[50]

For the participants in the markets who use these swaps – largely banks – this innovation has enhanced access to instruments that facilitate risk management. I therefore assign a ++ to swaps on both the access and convenience measures.

As for their contribution to GDP, interest rate and currency swaps reduce the transactions costs of having to sell and buy the underlying loans or bonds. In addition, foreign currency swaps, in particular, facilitate cross-border financial flows, and thus, like futures and options, accelerate globalization and the benefits it brings. My judgment, therefore, is that these arrangements should be scored somewhere between a + and ++ for their contribution to GDP.

Credit Default Swaps

Another bogeyman of the recent financial crisis is the credit default swap (CDS), a swap arrangement that is the functional equivalent of financial insurance. Specifically, the typical CDS pays the purchaser upon some defined event of default on a loan or a bond. Anyone can offer such a product, but as a practical matter, the CDS market has become dominated by a handful of major banks, which use these instruments to hedge against the default of their borrowers, in the process reducing the amount of capital they are required to hold for regulatory purposes.[51] Banks also trade these instruments among one other, for their own account or on behalf of customers who want to hedge against the possibility that their supplier or borrower might default, or speculate on this outcome. In the latter case, the purchaser of the CDS may not have an economic interest in the underlying debt. At year end 2008, the worldwide notional amount of CDS outstanding was $42 trillion, down from a peak of $58 trillion at year end 2007.[52]

By providing another means for parties of all kinds to hedge against the risk of default, CDS contracts clearly have provided something of value. Although linked in the media mostly with insurance for mortgage-related securities, in fact only about 1% of all CDS cover these instruments. Over 90% of CDS are written to cover corporate defaults (or corporate indices).[53] The availability of the "loan insurance" that CDS provide thus surely has expanded access to credit for some customers, and in the process made it more convenient for them to borrow. I therefore give CDS a + rating on both these measures.

In assessing the contribution of CDS to GDP it is necessary to distinguish the benefits of the instrument, *as properly used and managed*, from its misuse. As a hedging

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[50] Data are from the BIS Quarterly Review, December 2009, p. A103 (available at www.bis.org).
[51] J.P. Morgan Chase is generally credited with creating the modern CDS in 1997, although similar contracts had been in use in small amounts in the years before. See Tett, *Fool's Gold.*
[52] Ibid.
[53] Based on data reported by the Depository Trust & Clearing Corporation.

device, CDS help reduce risk of the parties who purchase the protection, and thereby facilitate their growth, while reducing their exposure to failure. Even when used for speculation – that is, by purchasers who have no economic interest in the underlying loan or bond to which a CDS refers – CDS have benefits. For one thing, speculators add liquidity to the overall market and provide the other side of the market for hedgers, Furthermore, as recent events in sovereign debt markets are demonstrating, CDS prices also have become the signal of choice – more so than bond interest rates – for investors and the wider public of the credit risk of corporate and sovereign borrowers. (This no doubt is the case because it is cheaper to buy or sell a CDS, which is a derivative, than to buy or sell the underlying bond). The signaling function encourages prompter attention by borrowers to improving their perceived credit risk than might otherwise be the case, in the process improving efficiency and allocation of capital.

There are counter-arguments to the claimed beneficial impacts of CDS. One critique relates to speculators, who some believe contribute to a vicious cycle, especially in difficult times, triggering unwarranted panics. This criticism is analogous to the attacks on short sellers, who some in the financial industry blamed for aggravating the financial crisis during the fall of 2008. My own view, backed I believe by most academic studies, is that the critique of short selling is misplaced: that short sellers, and by analogy CDS purchasers, can be the early messenger of bad news. There is no sense in shooting the messenger for being early to call attention to an underlying credit problem (the one exception being if short sellers and/or CDS purchasers act collusively to manipulate markets, a practice which is not an indictment of the financial instrument but of the behavior surrounding it).

The other critique of CDS is also directed at misuse, such as the negligent expansion of CDS contracts sold by AIG without sufficient reserves to back them up. This company-specific problem, as well as the more general problem posed by the possible cascading of losses from the failure of any major player in the OTC market for CDS, would be addressed by the creation and extensive use of a central clearinghouse for *standardized* CDS (and other OTC derivatives) trades. A central clearinghouse would impose margin and capital requirements on all dealers, which can prevent the kind of unwarranted sale of derivatives without appropriate reserves. [54] Moreover, when CDS parties deal with a clearinghouse rather than each other, their failure need not bring down other counterparties in domino-like fashion as was widely feared would have happened had AIG been allowed to fail (this conclusion presumes that the clearinghouse is adequately capitalized and that its margin requirements are appropriate and are enforced).[55]

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[54] This idea is included in the comprehensive financial services reform bill passed by the House in late 2000 and was proposed earlier by the Obama Administration. In addition, that bill and the Administration's proposal would rightly require dealers of *customized* CDS that are capable of being centrally cleared, to meet separate capital and margin requirements imposed by regulators.

[55] Another asserted kind of misuse of CDS is by purchasers who then have an incentive to encourage the underlying the firm to enter bankruptcy (so that they can collect the full amount of the protection). One way to prevent this kind of behavior is to net against a creditor's position in a bankrupt firm the notional amount

On net, taking into account the benefits of CDS, and assuming the presence of one or more clearinghouses to reduce the systemic risks they may pose,[56] my judgment is that the contribution of CDS to GDP should be scored a +.

Future Socially Useful Financial Innovations

Whatever one may believe about the net merits or drawbacks of the financial innovations I have reviewed here, there clearly is room for and indeed a need for further innovation in the future. You don't need to take my word for it. Look to the substantial body of work pioneered over the past two decades by Yale professor Robert Shiller, one of the economists who foresaw the financial crisis and who was critical – before the crisis happened – of some of the excesses that led to it.

In two important books, Shiller has argued for a range of highly innovative financial products primarily to allow individuals and other actors in the economy to hedge against certain clear risks for which insurance or its equivalent is not yet currently available.[57] Thus, for example, while people can buy various forms of "insurance" on their investment portfolios (through futures and options), or against damage to their house, personal property and for health care expenses, Shiller notes that they have yet to be able to buy protection against the decline in the value of perhaps their most important asset, their home ("home equity insurance"), or against shifting fortunes that may affect their future incomes ("livelihood insurance"). Shiller also has proposed the creation of securities whose value is linked to the performance of entire economies (including the global economy) as well as the creation of loans whose repayments would be linked to the incomes of individuals, companies or governments.[58]

It is a fair question to ask: if these are such good ideas and they so clearly meet needs that individuals want filled, why hasn't the market created such instruments? In the case of income contingent loans, the answer is that the market actually has briefly done that: Yale University used to extend such loans – I know, I had one and paid it off many years ago – but no longer offers them, presumably because of a lack of demand (those who are bullish on their future income prospects are reluctant to borrow if they end up paying, because of the income-contingent feature, substantially more, even with a cap, than if the interest rate on the loan were fixed). Presumably a lack of demand also is main impediment to the introduction and use of securities linked to GDP performance, but that is only my guess.

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of the CDS protection it has bought. This could dramatically reduce the leverage of such creditors in a bankruptcy proceeding and thus discourage the misuse of CDS for this purpose.

[56] Already two clearinghouses for CDS have opened for business in the United States, and a third has been established in Europe.

[57] The first book, largely a theoretical treatment, is *Macromarkets: Creating Institutions for Managing Society's Largest Risks* (Oxford: Clarendon Press, 1993). A later, more popular version is Shiller's *The New Financial Order: Risk in the 21st Century* (Princeton and Oxford: Princeton University Press, 2003).

[58] Shiller has outlined other suggestions for mitigating different kinds of social risks – such as the risk of rising income inequality – but these are directed at changes in government policy rather than at the private sector.

Shiller's home equity insurance proposal stands a better chance of becoming reality, especially now that individuals know that home prices can go down as well as up. Already, one predicate for this market is the creation of the Case-Shiller price index for real estate in major metropolitan areas of the country. It is one short step from having a price index to establishing a futures contract, although market participants will need to find a way to permit homebuyers, investors, and speculators to purchase long-lived futures, since if there is to be any interest in hedging against real estate price declines, it is likely to be only over longer term time horizons.

The development of a livelihood insurance financial product seems more distant, and will depend on both the development and use of widely accepted measures of occupation-specific wages or incomes. Developing these measures may entail definitional challenges since the nature of jobs may be more difficult to characterize in practice than the seemingly straightforward definitions found in government labor statistics. Also, here too, any product is likely to be of interest only if purchasers can hedge or speculate over a long time horizon.

I do not want readers to conclude that only Shiller's ideas hold promise for future successful, socially useful financial innovation. Surely there are other ideas that have been or will be developed, to serve not only the interest of homeowners and consumers, but also entrepreneurs and established businesses. For example, I can imagine, and indeed certainly hope, that more entrepreneur-friendly ways of financing start-up companies will be developed than the current venture capital model (which is high on fees and induces many general partners of venture capital firms to look for quick "exits" rather than to establish companies that will grow rapidly over an extended period). Instead, I have concentrated on Shiller's proposals in particular because he has spent so much time thinking about the subject of financial innovation and because his work helpfully illustrates two important, larger propositions.

First, it would be a wrong lesson to take away from the recent financial crisis that all financial innovation must necessarily be bad, simply because some recent innovations or their misuse deserve condemnation. Shiller's theorizing indicates that real financial needs remain to be filled, and that when they are, the net outcomes are likely to be beneficial.

Second, it is important that the policy environment permit, if not encourage, socially beneficial financial innovation in the future. Another wrong lesson from the recent crisis would be to tighten up regulation so much that innovations of positive value cannot be introduced because regulation makes it too difficult or expensive to do so. That is why I conclude below with a brief discussion of what I believe is an appropriate attitude that financial regulators and policymakers should take toward future financial innovations.

Regulating Financial Innovation: A Concluding Assessment

Given the clear case that future socially beneficial financial innovations await, coupled with the recognition that some if not much past financial innovation also has been useful on balance, it should matter a great deal what view policymakers adopt toward financial innovation in the future. For example, if a skeptical view of financial innovation takes hold – either because the benefits of innovation are perceived to be presumptively small and/or the risks of catastrophic damage are feared to be non-trivial – then policymakers (and even voters) are likely to demand some sort of pre-emptive screening and possibly design mandates before financial innovations are permitted to be sold in the marketplace. This attitude very like would chill the development of financial innovations that would benefit consumers, homeowners and investors.

In some areas of life, of course, it is appropriate for policymakers to take a skeptical approach toward innovation. The concern about possible catastrophic outcomes is the reason Congress established the Food and Drug Administration, requiring among other things, that new drugs be tested extensively, in both animals and humans, before they can be sold to consumers. Analogously, the dangers of a core meltdown of a nuclear reactor, however remote, have driven policymakers from the very beginning of the nuclear age to require the utilities that construct such facilities to comply with specific design and performance standards. The European Commission has gone further by adopting the "precautionary principle" in a number of arenas – environmental policy, for food products, and consumer protection generally. Although this principle has been applied differently in different contexts, it essentially means that where there are plausible grounds for believing that a now (or existing) product or activity poses a risk to human health or the environment, policymakers can regulate it in advance (or even ban it).

With the narrow exceptions of pharmaceuticals and nuclear power, however, U.S. regulatory and social policy has not followed the precautionary principle, and thus has so far taken a very different course from that in Europe. The general rule here has long been that *the market, not government,* screens innovations, including financial ones. Government regulates only once evidence of detrimental side-effects becomes reasonably clear, and then, where the underlying statute permits, only when the benefits of regulating outweigh the costs and the content of the regulation represents the least cost way to achieve those benefits.[59] Indeed, had U.S. policymakers followed the precautionary rather than the "wait and see" approach to regulation, it is conceivable that many of the innovations that make up modern life today would have been introduced much later, or even not at all: the automobile (with side-effects of more than 40,000 auto related deaths a year), the airplane (which has its share, albeit much lower than the car, of fatalities), and even the Internet (which is used by terrorists and criminals, not just ordinary citizens).

I believe that financial innovations in general are much less like drugs and nuclear power, which deserve some kind of preemptive screening or regulation, and much more like virtually all other innovations to which U.S. policy historically has applied a "wait

[59] The balancing of benefits and costs and the least-cost requirement for regulation have been embodied in one fashion or another in Executive Orders since the Ford administration.

and see" regulatory approach. To be sure, given the various events that led up the recent financial crisis, policymakers must be better prepared in the future than they were before the financial crisis to step in – first with disclosure standards and possibly later with more prescriptive rules – when finance looks like it is taking a wrong turn.

The one area where an exception to this general "be prepared" strategy may be appropriate and even necessary relates to long-term contracts entered into by consumers, such as mortgages (when borrowing) or annuities (for retirement). There is a strong and growing literature in behavioral finance indicating that individuals are not always rational in their investment decisions. This tendency is dangerous when even well-informed individuals are making long-term financial commitments, with heavy penalties (in the case of mortgages) or perhaps no exit strategies (in the case of annuities) for changing one's mind later. In these cases, preemptive approval of the *design* of the financial products themselves may be necessary to prevent many consumers from locking themselves into expensive and/or potentially dangerous financial commitments. But this exception should remain that way and not become the rule.

Finally, practitioners and policymakers alike must be alert in the future to the fact that financial innovations – both good and bad – do not come forth or flourish in a vacuum. The policy and regulatory environment plays a critical role in what kinds of financial innovations occur.

Looking back, one of the clear lessons from the recent financial crisis is the havoc that bad policies can wreak by providing perverse incentives for the creation and growth of destructive innovations. The two worst in this regard – the CDO and the SIV – unlikely would have been created, and certainly would not have grown to the dangerous levels they did, without major policy errors. The increase in affordable housing targets for Fannie Mae and Freddie Mac over the past decade clearly increased the demand for subprime mortgages and the securities that made them possible, CDOs. Likewise, the failure of bank regulators to take account of the assets on SIV balance sheets in calculating banks' capital requirements encouraged the use of those vehicles as warehouses for CDOs, which in turn also drove the demand for CDOs. SIVs also greatly magnified the leverage of their bank affiliates and thus exposed the financial system to great danger when subprime mortgages and the securities which they backed began to suffer losses.

To be fair, policymakers cannot always see in advance what the full implications of their current actions will turn out to be. But one thing they can do is spot rapid growth in any particular asset class, for this tends to be a strong sign of potential excess. Clearly, the explosive growth of CDOs and the subprime mortgages that underlay them should have been a warning sign to legislators and regulators that something was amiss, especially when it was well known at the time that many subprime mortgages entailed little or no down payments or required verification of borrowers' incomes.

Likewise, policymakers – perhaps the new systemic risk monitor that Congress is considering or at least the President's Working Group on Financial Markets – can and

must do a better job of reining in abuses of otherwise constructive innovations that can fuel asset bubbles that lead to future financial crisis. For example, had a central clearinghouse for CDS been in place, AIG could never have issued CDS in the quantities it did; properly enforced margin requirements would have prevented it. Belatedly, the Fed has ended the practice of qualifying borrowers at low teaser rates on ARMs. And in the future, higher counter-cyclical capital and leverage requirements would prevent the excessive use of HELOCs.

In sum, there has been more socially useful financial innovation over the past several decades than the ATM machine. If we want more useful innovations in the future – as I believe we should – we should not generally apply the precautionary principle to finance. But we should stand readier to correct abuses when they appear and not let destructive financial innovations wreak the kind of economic havoc we have unfortunately just witnessed.