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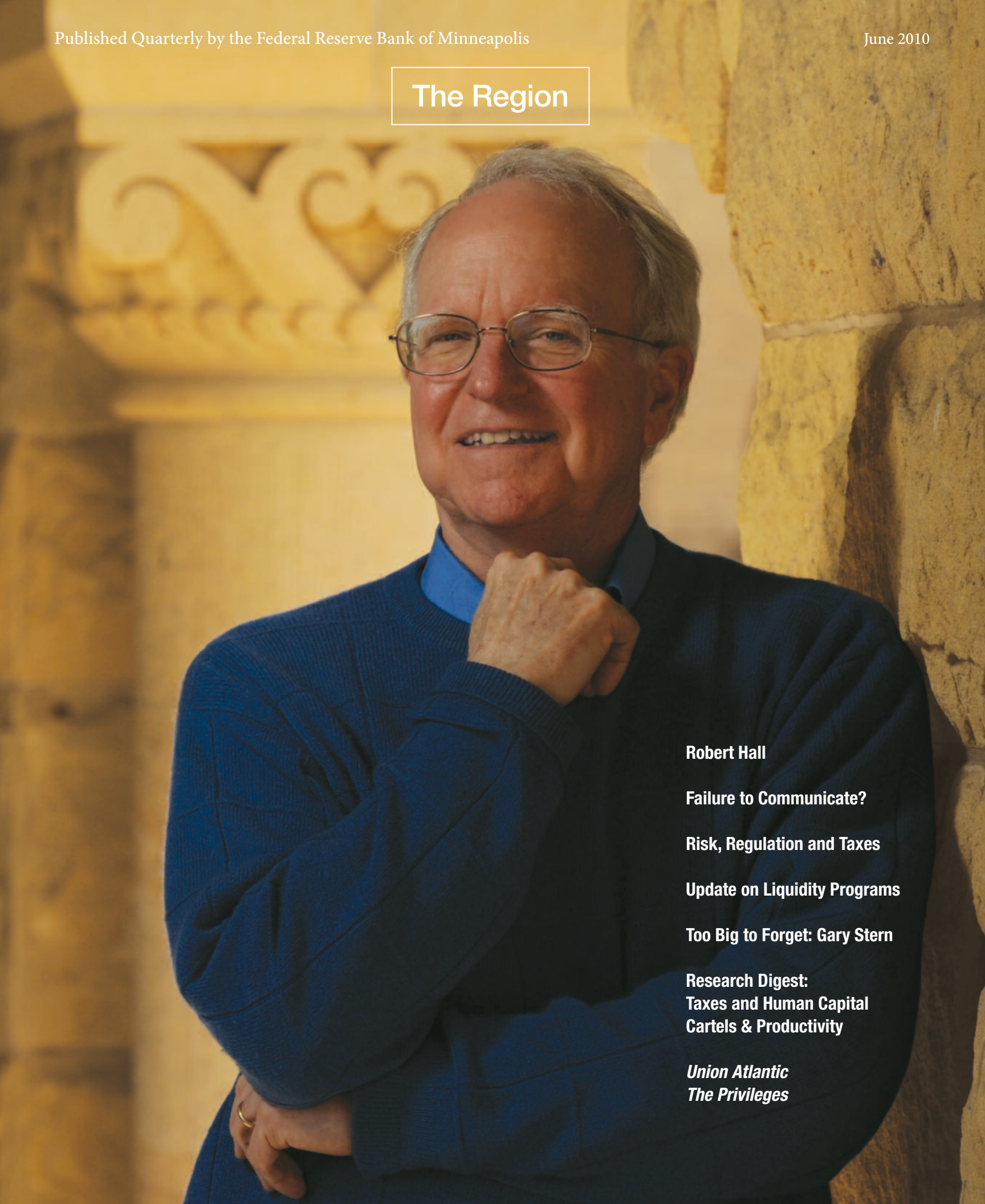

Robert Hall

Failure to Communicate?

Risk, Regulation and Taxes

Update on Liquidity Programs

Too Big to Forget: Gary Stern

Research Digest:
Taxes and Human Capital
Cartels & Productivity

Union Atlantic
The Privileges

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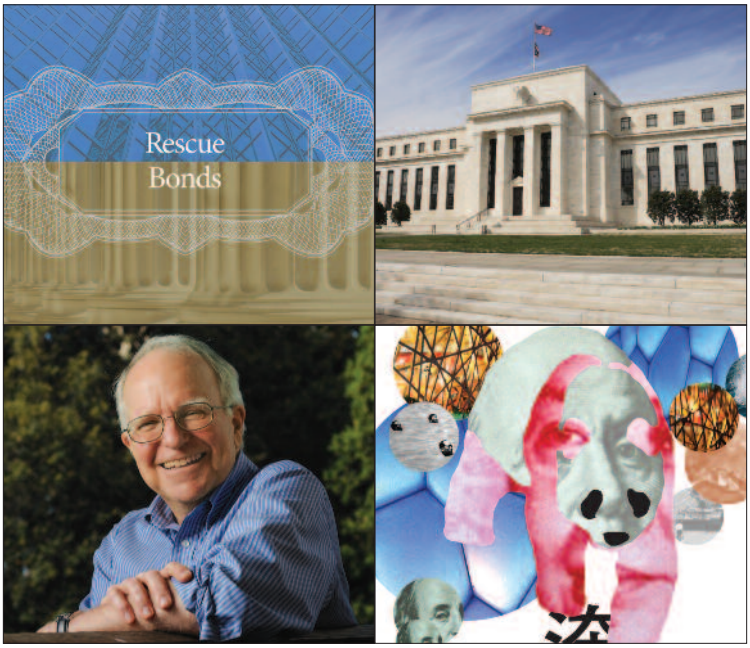

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Failure to Communicate?

Sound economic policy demands superior research and clear communication

Narayana Kocherlakota

President
Federal Reserve Bank of Minneapolis

In my brief tenure as president of the Minneapolis Fed, I have emphasized the importance of policy-based economic research and clear communication about the methods and findings of that research. My first column in *The Region* (December 2009) stressed these points, as did my essay in our 2009 *Annual Report*. At the risk of overselling the message, I'm going to do so again.

That's not to say that some economic research shouldn't be purely theoretical—I've devoted many years to theory and believe that my grasp of policy and economics is stronger because of it. But at the Fed, we also have a duty to produce research that addresses real-world economic issues, and in recent times—as you're well aware—we've had a profusion of those.

I've tried to fulfill that duty in a policy paper that you'll find on the following pages (and on our Web site). The topic is optimal financial regulation through taxation of financial risk; that's a mouthful, I admit, but the idea is fairly straightforward. Basically, I suggest that governments can use taxes to curb risky investing in the same way they use taxes to reduce pollution.

Currently, government debt guarantees (bailouts and deposit insurance, for instance) encourage financial firms to engage in excessively risky investment. How? Like a factory that doesn't have to clean up after itself, financial firms with debt guarantees don't face the full risk of their investment decisions; they know that if their investments fail drastically, the government will be forced to bail them out to avoid broader systemic collapse. It's an unfortunate but inevitable reality that no legislation can truly prevent.

My proposal: a risk tax that, like an emissions tax, would provide firms with accurate price signals to undertake socially optimal investing. I'm not advocating the elimination of risk. However, I do want to ensure that firms pay for the risks borne by taxpayers. Taxes can ensure that they do—just like taxes can ensure that factories pay for the pollution that they generate. My paper explores this analogy at some length because I consider it a very useful way to address the financial and regulatory dilemmas we now face.

Shaping debate and improving policy

Now, while I think this is a great idea, I'm not so idealistic (or immodest) to believe that Washington will adopt my proposal straight away. But I do think it could shape policy discussion in coming months and years—sort of a *medium-term* impact, if you

will—and I hope that a lot of our policy papers and some of my speeches will have that effect: reframing the way people view important economic issues so that subsequent policy debate will be more fruitful.

That will only be true, however, if we make our points clearly; that means we need to communicate well, often and in a manner appropriate to each intended audience. I try to do this in my speeches, and I know that our publications and Web site do so as well. Our economic staff reports, ag credit fact sheets and community affairs papers, to name just a few, all seek to communicate clearly to their respective constituents, and we constantly strive to improve each of those efforts.

And if we're successful, I also believe that in some cases our research—and our communication—can and will have a more *immediate* impact. An obvious recent example is a talk I gave in early March about the importance of maintaining the supervisory role of Federal Reserve regional banks. Proposals in Congress at that time would have stripped away that authority. I felt that doing so would seriously undermine the nation's financial stability by depriving regulators of essential on-the-ground information and expertise about small banks throughout the country. Many others, including several of my fellow presidents, expressed similar concerns about the desirability of such a change in public policy. I believe that our ideas played an important role in persuading the Senate to vote instead for an amendment introduced by Sens. Kay Bailey Hutchison of Texas and Amy Klobuchar of Minnesota that allowed for sustained supervisory authority for the Federal Reserve and its district banks over small banks and bank holding companies. The Hutchison-Klobuchar amendment was adopted overwhelmingly by the Senate on May 12.

Communication and research

Other Minneapolis Fed research—and communication about it—will, I expect, have less dramatic but perhaps ultimately more profound *long-term* effects. This will take time; good research often does. But I strongly believe that the results will justify the effort.

Let me give you an example. Economists like our own Art Rolnick, director of the Minneapolis Fed's Research department since 1985, has long been engaged in research on the short- and long-term impact of early childhood education. As Sen. Klobuchar testified in her floor speech regarding the value of the Fed's regional banks: "He has put out studies straight from the Federal Reserve because he had that information on the ground to show the kind of return on investment you get when you invest in kids early on. I do not think we would see that coming out of the Federal Reserve in Washington."

The payoff to Art's research has been enormous. From Massachusetts to Oregon to the Obama administration, policymakers are beginning to design and fund effective early childhood development programs, in part because of research like Art's that shows the public benefits of doing so are large. So research can shape policy, and policy can change our future. An essential link in that process has been good communication—and Art is one of the best communicators I know—among policymakers, economists and the public.

With that in mind, I truly hope you'll enjoy the June 2010 issue of *The Region*—not just my paper on risk and taxes, but also a great conversation with Stanford University economist Robert Hall, an expert in labor markets and recession dating, among other areas; an update on the Fed's liquidity programs; an article about China's economic transformation; and write-ups on the impact of taxes on human capital, and the interplay of cartels and productivity. You'll also find reviews of two novels about financial crises; and finally, news of a recent conference honoring my predecessor in this chair, Gary Stern—an economic model for us all. R

Taxing Risk and the Optimal Regulation of Financial Institutions[1]

Narayana Kocherlakota
President
Federal Reserve Bank of Minneapolis

In the mid-2000s, we—as investors, home buyers and bank lenders—collectively bet that house prices would not fall by 30 percent in most major metropolitan areas in three years. We were wrong. This mismatch between our expectations and our realizations was the ultimate source of the financial crisis of 2007-09.

The Congress of the United States is currently considering legislation to restructure financial regulation. However, no matter how well-written or how well-intentioned the legislation may be, no law can completely eliminate the kinds of collective investor and regulator mistakes that lead to financial crises. These mistakes have taken place periodically for centuries. They will certainly do so again. And once these crises happen, there are strong economic forces that lead policymakers—for the best of reasons—to bail out financial firms. In other words, no legislation can completely eliminate bailouts. Any new financial regulatory structure must keep this reality in mind.

In this paper, I describe an approach to financial regulation that takes as given the inevitability of bailouts. The basis of the approach is that the magnitude of bailouts can be limited by taxes on financial institutions. I arrive at this conclusion about the usefulness of taxes by thinking through an analogy that I'll develop at some length. I will argue that, knowing bailouts are inevitable, financial institutions fail to internalize all the risks that their investment decisions impose on society. Economists would say that bailouts thereby create a risk "externality." There is nearly a century of economic thought about how to deal with externalities of various sorts—and the usual answer is through taxation. I will suggest that the logic that argues for taxation to deal with other externalities is exactly applicable in this case as well. The views expressed here are mine, and not necessarily those of others in the Federal Reserve System.

The size of the optimal tax for any given financial institution may depend on a host of risk-relat-

Economic Policy Papers *are based on policy-oriented research by Minneapolis Fed economists, officers and other staff. The papers are an occasional series of publications written for a general audience.*

ABSTRACT

Knowing that bailouts are inevitable because governments will rescue firms whose collapse may cause systemic failure, financial institutions fail to internalize risks their investments impose on society, thereby creating a "risk externality." This paper proposes that just as taxes are imposed to deal with pollution externalities, taxes can also address risk externalities.

The size of the optimal tax depends on risk-related attributes and may be difficult for supervisors to calculate and implement. A market-based method can estimate its appropriate magnitude. For a particular financial institution, the government should sell "rescue bonds" paying a variable coupon linked to the size of the bailouts or other government assistance received by the institution or its owners. Coupon prices will reflect the market's judgment of an institution's risk profile and can therefore be used to set the tax.

A well-designed tax system can entirely eliminate the risk externality generated by inevitable government bailouts.


Rescue
Bonds

ed attributes, and so may be difficult for supervisors to calculate and implement. I suggest a possible alternative: a market-based method to compute the appropriate magnitude of the tax. Roughly speaking, for a particular institution, the government should sell bonds that pay a variable coupon linked to the size of the transfers (that is, bailouts or other government assistance) received by the institution or its owners. The prices of these coupons will reflect the market's judgment of that institution's risk profile and can therefore be used to set the size of the tax that should be imposed.

It is important to distinguish my notion of a risk externality from two other types of externalities that are mentioned in discussions of bank regulation. One of these is a *systemic* externality. The failure of a given Bank X may affect the profitability of many other firms in the economy even though Bank X has no direct contracts with those firms. In this sense, any decision by Bank X that increases its probability of failure has a systemic implication, because it also increases the expected losses by the entire financial—and indeed economic—system.[2]

My notion of a risk externality is also distinct from what might be termed a *fire sale* externality. During financial crises, many financial institutions may have to sell assets or collateral at the same time. These simultaneous sales will put downward pressures on the assets' prices. A given financial institution will not internalize the impact of its sales on the price of other institutions' assets.[3]

I downplay these two externalities because governments typically eliminate their effects through targeted interventions during financial crises. Governments can correct a systemic externality by preventing the failures of financial firms through bailouts.[4] Governments can stop fire sales of assets by purchasing the assets or being willing to treat them as collateral in loans to the relevant firms. Indeed, in the recent financial crisis, the United States government and the Federal Reserve System intervened precisely to address externalities of these kinds (although admittedly not in the case of Lehman Brothers).[5]

The inevitability of bailouts

In the crisis of 2007-09, governments made large transfers to claimants of financial institutions. Some onlookers have argued that future legislation should seek to eliminate these payments. In my view, many such payments are unavoidable in the context of a financial crisis. These payments assure depositors and debt holders that their financial interests in the relevant financial institutions will be backed by the government. Why does government provide such assurance? There are several reasons, but I believe that the most important concerns the prevention of "runs."

Imagine that Bank X needs $100 billion of one-day loans to survive. This means that for a given lender to be willing to make a $1 billion, one-day loan to Bank X, that lender has to believe that Bank X will get another $99 billion in one-day loans. In this situation, Bank X could fail simply because every possible lender believes correctly that no other lenders are willing to lend to Bank X. Such a crisis of confidence can occur regardless of the true condition of Bank X.

This story is hardly a new one. It's exactly why we have deposit insurance: to prevent runs by reassuring bank depositors that their money is safe. But the story has huge consequences for how governments operate. In a financial crisis, there is a tremendous sense of uncertainty. There are some truly insolvent financial firms out there—but no one knows for sure which they are. And during a crisis, the panic in the air means that any institution—even one with solid fundamentals—may be subjected to a run if its investors lose confidence in its solvency.

In such an atmosphere, contagion effects become extremely powerful. Even a slight loss by one short-term creditor can lead all short-term lenders to rush to the safety of Treasury bills. Such flight would endanger the survival of key financial institutions, even if they are fundamentally sound. Governments cannot risk such systemic collapse, and so during times of crisis, they end up providing debt guarantees for financial institutions. Thus, policymakers inevitably resort to bailouts even when they have explicitly resolved, in the strongest possible terms, to let firms fail.[6]

Many observers of the events of September 2008 have emphasized the need for better resolution mechanisms. Different people mean different things by this, but most want to impose losses on debt holders. I'm not opposed to faster resolutions of bankruptcies. But I do not believe that better resolution mechanisms will end bailouts. No matter

what mechanisms we legislate now to impose losses on creditors, Congress, or some agency acting on Congress' behalf, will block them when we next face a financial crisis. And Congress will do so for a very good reason: to forestall a run on the key players in the financial system.[7]

Debt guarantees result in excessively risky, inefficient investment

I have argued above that government concerns about runs make debt guarantees (that is to say, bailouts) inevitable at least in severe financial crises. Here, I argue that these guarantees lead to inefficient investments by financial institutions.

Imagine for a moment that we live in a world without bailouts, so that the government does not provide debt guarantees or deposit insurance. If a financial institution decided to increase the risk level of its investment portfolio, its debt holders and depositors would face a greater risk of loss. By way of compensation for that greater risk, they'd demand a higher yield. As a result, in the absence of government guarantees, financial institutions would find it more costly to obtain debt financing for highly risky investments than for less risky ones. This effect, on the margin, would curb a firm's appetite for risk. It would have an especially powerful effect on highly leveraged financial institutions, because high debt-to-asset levels mean higher risk of being unable to fulfill debt obligations.

But now return to the real world, with deposit insurance and debt guarantees, and the inevitability of government bailouts. Even if they only kick in during financial crises, these guarantees change this natural market relationship between risk and cost. The depositors and debt holders are now partially insulated from increases in investment risk, and so they do not demand a sufficiently high yield from riskier firms. Financial institutions are no longer as deterred from undertaking risky ventures by the high costs of debt finance. And this missing deterrence is especially relevant for firms that are highly leveraged, because they should be paying out especially high yields on their debts.

Note that the problem here is created by the expectations of depositors and debt holders, not the expectations of the financial institution itself. Because the depositors and debt holders sometimes expect to receive a bailout, they accept a lower yield on their investments. The financial institution is then able to finance high-risk, high-return investments at low cost. The institution itself does not care *why* the funds are so cheap.

In this way, the expectation of bailouts leads to too much capital being allocated toward overly risky ventures. These misallocations of capital don't create the collective mistakes in predictions that generate financial crises. But the misallocations do mean that society loses a lot from those mistakes—far more than is efficient.

An externality analogy

The problem I've just described of bailout inevitability and the relationship between debt guarantees and inefficient investment is well-known. Less understood, perhaps, is how closely related it is to a standard policy issue in economics: pollution.[8]

Think about a firm with a factory. The firm has to make a decision about how much output to produce at the factory. In doing so, it trades off the revenue gain associated with expanding production against the costs of producing that extra output. Unless required by law, it does not take into account the environmental cost associated with any pollution generated by the factory.

The pollution is an externality: It is a cost borne by society that is *external* to the purely market considerations that shape the firm's decision. The presence of this externality means that the firm will choose to overproduce according to society's standards because the firm's costs are lower than the full societal costs.

Now return to the decision problem of a financial institution that is financed in part with guaranteed debt. As we have seen, the debt guarantee implies that taxpayers absorb some risk of the financial institution's investments, allowing the institution to ignore that risk when choosing among investments. Hence, it is ignoring some portion of the costs of its decisions, and will therefore choose to overproduce high-risk investments.

Notice the analogy between the financial institution and the polluting firm. The firm increases production because it can ignore some costs that are borne by society. Similarly, the financial institution increases the risk level of its investments because the government guarantee allows it to ignore some costs

(in the form of risk) that are borne by society. Debt guarantees create a *risk externality*. This connection is a useful one, because economists know a lot about how to design policies to address externalities like pollution. We can apply those lessons to great effect when thinking about optimal financial regulation.

The externality analogy and a tax solution

In this section, I use the externality analogy to develop an appropriate regulatory response to the risk externality created by government guarantees. Again, consider a firm with a factory that generates pollution. It is reasonable to presume that the firm can influence the pollution level in many different ways, including the following:

1. The amount of time that the firm runs the factory during the workweek.
2. The kinds of antipollution technology used at the factory.
3. The kind of energy used by the firm to run the factory.

Potentially, the government could regulate the firm's pollution levels by controlling any or all of these choices. However, to do so, the government has to choose how to trade off these three (and other) factors against one another. Among other considerations, the government's decision will be influenced by cost. If antipollution technology is cheap, the government may simply require the firm to invest in that. If antipollution technology is expensive, the government may require the firm to switch to using natural gas instead of coal. These trade-offs require the government to acquire a tremendous amount of firm-specific information and perform cost-minimization exercises for each and every factory. Such a task is clearly infeasible for any government to perform on a national level for all relevant industries.

The solution to this difficulty is to regulate the *amount* of pollution produced by the firm, not *how* the firm produces that pollution. The problem is that pollution has a social cost that the firm does not internalize when choosing its level of production. However, the firm *will* choose the efficient level of pollution if it is required to pay for its full social cost. More concretely, suppose that the firm is told, before choosing its level of production, that the government will

1. Measure the amount of pollution that the firm generates.
2. Charge the firm a tax that is exactly equal to the social cost of that quantity of pollution.

This policy generates a tax schedule that translates the amount of pollution generated into an amount paid by the firm. If the firm knows that it faces this tax schedule, its costs of production will include the social cost of pollution. In this way, what was external to the firm becomes internal. As a result, the firm will choose the socially efficient level of production. Just as importantly, it will automatically choose to produce that pollution—and its other outputs—in a cost-minimizing fashion.

This (well-known) solution to the pollution problem has an exact analog in the risk externality problem generated by debt guarantees. Currently, regulators are trying to combat the risk externality by having distinct regulations for financial institution capital, liquidity and incentive compensation.[9] All of these measures are likely to mitigate the inefficiencies created by risk externalities. Again, though, the optimal trade-off between these various measures is likely to depend on a host of firm-specific information that will be hard to acquire.

For example, regulators are considering requiring financial firms to defer payments of incentive compensation. Such deferrals would make the compensation plans less attractive to employees. Firms will therefore have to increase their average wage bill to retain employees, by amounts that depend on subtle characteristics of both firms and workers.

The pollution analogy suggests how regulators can sidestep these difficult choices. Instead of regulating all of the financial institution's decisions, the government should tax the financial institution for the amount of extra risk that it produces. In this scenario, the financial institution is told that *after* it chooses its investments, the government will

1. Estimate the expected present value[10] of the net payments made by government—the cost of "pollution," if you will—to the financial institution or its stakeholders.
2. Charge the financial institution a tax that is exactly equal to the above estimate.

This policy generates a tax schedule that translates the financial institution's choices into an amount paid by the firm. This amount equals the extra cost borne by the taxpayers, appropriately adjusted for risk and the time value of money. If the financial institution knows that it faces this tax schedule, its private costs of financing an investment are now equalized to the social costs of doing so. Its investment choices will be efficient—as will its choices of capital, liquidity and incentive compensation, factors that current reform proposals address in a less precise manner.

Using markets to compute the right tax

Calculating the appropriate tax for a polluting firm requires measuring the quantity of emissions and then pricing those emissions for the costs they impose on society. The former is beyond my ken, but certainly within the expertise of environmental engineers. The latter can be (and in some cases, is being) accomplished via market mechanisms (such as carbon taxes or "cap and trade" emissions markets).

Similarly, computing the appropriate tax for a financial institution with debt guarantees requires measuring the quantity of taxpayer risk and then *pricing* that risk. The latter can be accomplished through options markets, which are designed specifically to price risk accurately. But how should the government go about measuring the *quantity* of risk? There are at least two possible methods, one that relies on regulatory monitoring and another that depends on markets.

Quantifying by government

If the government can observe the payoffs of the financial institution's asset portfolio, then this problem is (at least conceptually) straightforward.[11] Good information about how well a financial institution's investments actually do over time, or are likely to do, provides a clear picture of risk levels inherent in the firm's investment decisions.

But good information may not be readily available. Put more technically, the probability distribution of the financial institution's asset portfolio's payoffs may be *private* information, known only to the institution (or its employees), not to government supervisors. In this situation, many different attributes of the financial institution may inform the supervisor about its assets' payoff probability distribution. The supervisory authority should use all of these financial institution attributes to arrive at an estimate of the quantity of risk.

There is a useful analogy in private insurance markets. Consider the pricing of homeowners' insurance. The insurer would like to link the insurance premium to how well the homeowner takes care of the home. But this is impossible without constant monitoring of homeowner behavior, an infeasible task. The pricing of insurance therefore ends up depending on various clues that have proven reliable guides to how homeowners treat their homes. Thus, the insurance price will be based partly on whether the home has a fire extinguisher. More subtly, the premium may also depend on the homeowner's driving record, since good drivers also tend to be good homeowners.

This same logic applies to the regulation of financial institutions. Suppose two financial institutions both use incentive compensation plans for their investment managers. However, one institution defers managerial bonuses and the other does not. It is natural, then, for the government supervisor to presume that managers of the latter institution will choose investment projects with more extreme risk. That presumption should be reflected in the supervisor's judgment about the quantity of taxpayer risk and, ultimately, in the tax paid by the financial institution.[12]

A market-based approach to quantifying risk

This kind of analysis seems daunting however, because it is likely to require monitoring an enormous number of financial institution attributes. For this reason, I believe that a market-based approach is at least complementary and possibly superior.[13]

Here's what I have in mind. Suppose that, for every relevant financial institution, the government issues a "rescue bond." The rescue bond pays a variable coupon equal to 1/1,000 of the transfers actually made from the taxpayer to the financial institution or its stakeholders. (I pick 1/1,000 out of the air; any fixed fraction will do.) Much of the time, this coupon will be zero. However, just like the financial institution's stakeholders, the owners of the rescue bond will occasionally receive a large payment. In theory, or in a perfectly functioning market, the price of this bond is exactly equal to

the 1/1,000 of the expected discounted value of the transfers to the financial institution's stakeholders. Thus, the government should charge the financial institution a tax equal to 1,000 times the price of the bond.

Notice that this approach could be used for a wide variety of financial institutions, including nonbanks. In principle, the government need not figure out in advance which institutions are systemically important and which are not. Instead, the market would provide this information through the pricing of rescue bonds.

Markets for rescue bonds may prove to be thin and illiquid. In these circumstances, it would be inappropriate to rely only on market measures to compute the appropriate taxes. However, even when they are imperfect, market measures would contain valuable information that should be an input into the supervisory process.[14]

Conclusion

In this note, I've argued that to prevent runs, governments provide debt guarantees to firms in the financial sector. These guarantees create a risk externality, as those firms do not bear the full costs of their investment choices. Regulation should control and, if possible, eliminate that externality, because it leads to inefficiently risky investment.

There are numerous proposals for financial regulatory reform in the wake of the events of 2007-09. Several proposals, such as leverage caps, capital requirements and controls on incentive compensation, can help mitigate the risk externality problem. However, it may well be difficult for a government to figure out the optimal trade-off among these proposals on a firm-by-firm basis. Instead, a well-designed tax system can entirely eliminate the risk externality generated by debt guarantees to financial institutions. Figuring out the right tax may be complicated, but the task can be eased using appropriate information from financial markets. R

Endnotes

[1] This policy paper is an elaboration of "Taxing Risk," a speech given in Minneapolis, Minn., on May 10, 2010 (Kocherlakota, 2010). The author thanks Andrew Atkeson, V. V. Chari, Harold Cole, Ron Feldman, Chris Phelan and especially Doug Clement for many helpful comments.

[2] See Haldane (2010) for a discussion of this kind of externality.

[3] See Brunnermeier and Sannikov (2009), Chari and Kehoe (2009), Jeanne (2008) and Jeanne and Korinek (2010) for discussion of this kind of externality and its impact.

[4] Many observers besides Haldane (2010) discuss the importance of systemic externalities, although his treatment is especially powerful. Nonetheless, I remain skeptical of the very existence of systemic externalities. They seem to be predicated on the failure of two or more parties in a private market to engage in a mutually beneficial transaction. Suppose Firm A's failure will lead Firm B to fail. It would be in B's interest to provide A with extra financial incentives to avoid failure. Indeed, B could simply acquire A. Note that even with these kinds of efficient contracts in place, there may be shocks that would cause both A and B to fail simultaneously.

[5] It is true that the bailouts needed to undo fire sale externalities and systemic externalities do generate risk externalities of the kind emphasized in this paper.

[6] There is no way to eliminate bailouts completely. However, it is both possible and worthwhile to consider mechanisms that will reduce the incentives for government interventions in a financial crisis. Feldman (2010) and Stern and Feldman (2004) discuss some alternatives along these lines.

[7] As mentioned in footnote 5, systemic externalities and fire sale externalities may also lead governments to engage in bailouts.

[8] Flannery (2010), Haldane (2010) and Jeanne (2008) also make this direct connection between pollution and risk externalities.

[9] There are also many proposals to restrict bank size with taxes, asset caps or otherwise. In my view, these will not reduce the risk externality problem. Suppose there is a given financial institution with $300 billion in assets, and we split the financial institution exactly in half to form two new institutions. Each half gets an equal share of every asset and an equal share of every liability. Collectively, these two new entities have the same amount of short-term debt and deposits as the original financial institution. They are networked in exactly the same fashion with the financial system. Therefore, even though each financial institution is half as big as the original, the government has the same incentives to guarantee their combined debts. Size, in and of itself, does not change the government's motivation to intervene. Consequently, restricting the size of financial institutions

would not eliminate forces that lead them to undertake excessively risky investment. (In fact, I would go further: Breaking up a financial institution may make it harder to track the interconnections among them and increase the magnitude of the systemic externality mentioned earlier.)

[10] The term "expected present value" raises the important question of the appropriate discount rate. Financial institutions are likely to receive transfers from the government when the stock market is performing poorly. In the language of traditional asset pricing models, these transfers have a negative "beta," and so should be discounted at a lower rate than the risk-free rate. Indeed, the appropriate discount rate may actually be much lower, given the rather extreme outcomes that lead to bailouts. This consideration underscores the importance of using market information to compute the right tax, as I propose in the next section of this paper.

[11] The government may end up making transfers to the financial institution that benefit other stakeholders besides debt holders or depositors. Ideally, the option-pricing approach should also account for this possibility.

[12] See Clement and Phelan (2009) and Phelan (2009) for a more detailed discussion.

[13] See Hart and Zingales (2009), Phelan (2009) and Wall (1997) for other ideas about how to use market-based information in conjunction with the supervision and regulation of financial institutions. Hart and Zingales propose using credit default swaps on the underlying institution as a source of market information. Such swaps can provide useful information about the probability of a government bailout. However, in contrast to the "rescue bonds" proposed in this paper, credit default swaps are typically silent about the size of the bailout.

[14] See appendix on page 12 for discussion of possible concerns with the market-based approach.

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Appendix: **Three Possible Concerns with the Market-Based Approach**

In this appendix, I discuss three possible concerns with the market-based approach.

- Suppose a government makes a transfer to a financial institution, but that transfer is then paid to a given lender to fulfill an obligation. Should that transfer be credited to the lender's rescue bond or to the financial institution's rescue bond?
- How would the market-based approach account for financial institution assets that are transferred to government in exchange for bailout transfers?
- How would the market-based approach deal with the issue of financial institution decisions made over time, rather than the static analysis offered above?

Borrower/lender ambiguity

Suppose Bank A borrows from Bank B, and the government guarantees that B will receive its payments. During a crisis, this guarantee could be implemented in one of two ways: The government could pay A and then A pays B, or the government could simply pay B directly. Under my proposed market-based approach, the different choices would manifest in different outcomes for the owners of rescue bonds. If B is paid indirectly through a government payment to A, then the owners of A's rescue bond receive a coupon payment. If the government pays B directly, then the owners of B's rescue bond receive a coupon payment.

Fortunately, how the government resolves this ambiguity does not affect the efficacy of the rescue bonds. The loan from Bank B to Bank A is a transaction that offers benefits to both banks. The expected transfer from the government—regardless of whether it's made to A or B—is distorting because it increases the joint benefits of the loan transaction. To eliminate the distortion, the government needs to levy a tax that cancels out those joint benefits—and that tax can fall on A, B or both of them. Indeed, in principle, there would be no efficiency losses if the government were to levy the tax on a wholly distinct third party C. The presence of the tax would still undo the distorting effects of the subsidy by providing an incentive for C to pay A and B not to undertake the loan.

Assets in exchange

When governments make transfers to debt holders or depositors, they often receive some of the financial institution's assets in exchange. Rescue bonds should be based on the *net* transfer to debt holders, taking account of those exchanged assets, not the *gross* transfer. However, valuing the assets received by governments in exchange may well be difficult, especially during the heart of the crisis.

This problem can be addressed by keeping track of the payments received from the assets exchanged. Thus, suppose the government receives a bundle of mortgages from a struggling bank. It ends up holding those mortgages for a year before selling them. During the year, it receives payments from the homeowners, and at the end of the year, it receives a final payment. The financial institution's rescue bond should reflect these payments by paying a *negative* coupon equal to 1/1,000 of these payments.

Of course, bonds with negative coupons do create difficulties. (How should the government collect from bondholders?) To deal with this issue, the government can require the rescue bond to pay a relatively large positive fixed coupon C (instead of a zero coupon) when no transfers are made to or received from the financial institution. The coupon goes up by 1/1,000 of any transfer made to the financial institution or down by 1/1,000 of any transfer received from it. The appropriate tax is then 1,000 times the difference in price between the rescue bond and a bond with fixed coupon C.

Sequential choices

In the earlier discussion, I described how to compute the tax in a static context, in which the financial institution is making a single investment

choice. How should the tax be adjusted in light of new investment choices or in light of information about past choices?

Here, forward markets can play a useful role. Suppose a rescue bond is issued in 2010, and there is a forward market for 2011 delivery of the bond. When 2011 arrives, the spot price of the rescue bond may be higher or lower than the forward price set in 2010. If the spot price is higher, we can conclude that there has been an unexpected increase in the value of the transfers to be received by the financial institution. If the spot price is lower, there has been an unexpected decrease.

These changes in prices can be used to align the financial institution's private incentives with social ones. Specifically, in 2011, the financial institution should be charged a tax equal to 1,000 times the difference between the 2011 spot price of its rescue bond and the price set in 2010 for 2011 delivery of the rescue bond. This tax will ensure that the financial institution internalizes the impact of new information about its choices and actions on future government transfers.

Note that, as time unfolds, the annual tax may well be negative. In this case, market participants have received information that the financial institution is less exposed to the risk of failure than had been anticipated earlier. The government is implicitly subsidizing the financial institution for reducing its risk profile.

—N. Kocherlakota

Federal Reserve Liquidity Programs: An Update

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The financial system in the United States experienced extreme stress and dysfunction from 2007 until the beginning of 2009, contributing to a major global economic downturn. The episode is generally believed to have been the worst economic and financial crisis since the Great Depression.

Narayana Kocherlakota, president of the Federal Reserve Bank of Minneapolis, recently described it as follows: "This was a time of tremendous uncertainty, and uncertainty … can strangle an economy. At that time, almost all believed that a horrific economic collapse—already named Depression 2.0—was possible. Indeed many believed that it was inevitable."[1] The deepest points of the crisis have passed, and although many segments of the economy are still under strain, the United States is now in the process of slow recovery.

Broad-based governmental and central bank action on various fronts was a key part of the response to the crisis. Fed Chairman Ben Bernanke summarized the Federal Reserve's overall strategy as follows:

> *The Federal Reserve, like other economic policymakers, has been challenged by the unprecedented events of the past few years. We have been bold or deliberate as circumstances demanded, but our objective remains constant: to restore a more stable economic and financial environment in which opportunity can again flourish, and in which Americans' hard work and creativity can receive their proper rewards.*[2]

The numerous new programs devised and quickly implemented by the Federal Reserve System were specifically designed to stem the crisis by improving the functioning of various credit and funding markets, building confidence and creating extraordinary levels of liquidity. These Federal Reserve programs were described by Niel Willardson in the December 2008 *Region*.[3] Now that the financial crisis has subsided, this article reviews those programs, describing their magnitude and current status. It also describes the significant impact they have had on the Federal Reserve System's balance sheet.

I. Liquidity programs created to stem the crisis

The financial crisis was accelerated in large part by a liquidity shortfall in nearly all major financial markets as well as the corresponding loss of confidence in illiquid market participants. In normal times, the Federal Reserve uses two primary methods to inject liquidity into markets: open market operations and discount window lending. In the extraordinary circumstances of the financial crisis, however, these tools alone were insufficient, in both reach and magnitude, to create the liquidity and confidence needed to stabilize markets.

Therefore, the Federal Reserve created many new programs—in some cases under statutory authority that can only be invoked in "unusual and exigent circumstances"—to provide the liquidity needed to slow the crisis and prevent financial meltdown. While certain aspects of their effects may be subject to debate, it is generally believed that these programs were instrumental in averting crisis. As Kocherlakota observed: "It is clear to me that these policies worked as intended: They kept illiquid but solvent firms alive during the course of the financial crisis, while letting truly insolvent firms fail. In so doing, these policies eliminated the *possibility* of Depression 2.0."[4]

Another measure of the success of the Federal Reserve's slate of programs was that their timing and magnitude were carefully tailored. They were designed as temporary efforts to meet immediate, but short-term, needs. Indeed, nearly all of the programs have already ceased operation because they are no longer necessary; private markets are now meeting liquidity requirements.[5]

What follows is a description of the major liquidity programs implemented by the Federal Reserve, their magnitude, impact and current status.

A. Programs supporting banks

The crisis began when financial firms started becoming concerned about the financial condition of other financial firms—it was essentially a modern-day, broad-based "run." This was due, in part, to the burst of the housing bubble, which created worries about the quality of mortgage loans that banks and other firms had made, as well as mortgage-backed securities they owned or were selling. Starting in the fall of 2007, rates of interbank loans with maturity terms of one month or longer rose to very high levels.

LIBOR, an interest rate at which banks lend to one another, is a market-based rate that nicely summarizes the sentiments of financial institutions' comfort with their fellow firms; comparing it against a risk-free rate such as that on U.S. Treasury bills gives a helpful measure over time of perceived risk in lending markets. As noted in Chart A, the "TED spread"—the difference between the 3-month LIBOR and comparable U.S. Treasuries—rose from a normal level of around 50 basis points (a basis point is one-hundredth of a percentage point) to about 150 basis points and then in October 2008 to nearly 450 basis points. This 400-basis-point jump was largely due to the sharp increase in liquidity risk as well as the credit risk perceived by market participants.[6] Charts A through C include key dates from the crisis period.

To respond to pressures in the interbank funding market, the Federal Reserve created the **Term Auction Facility (TAF) (December 2007–March 2010)**, which allowed any depository institution eligible to borrow under the primary credit program to bid for a loan at an interest rate determined in an auction process. This facility was introduced on the heels of the introduction of term lending by the Federal Reserve, which first allowed 30-day and later 90-day loans from the discount window. The Federal Reserve has long engaged in short-term backup lending to depository institutions through its discount window. Pricing above market-based terms for lending and other factors led the window to be a contingency, rather than primary, source of funding for banks.

However, the fact that the interbank funding market was responding to negative perceptions of creditworthiness made institutions very reluctant to borrow from the Federal Reserve for fear that this would be perceived as a signal of their poor financial condition. Such a signal could further strain liquidity at these firms. Largely in response to this "stigma," the Federal Reserve created the TAF in December of 2007 as a primary source of liquidity. Due to the perceived difference between auction bidding for discount window credit versus going directly to the discount window to get a loan, the TAF eliminated the stigma of borrowing from the

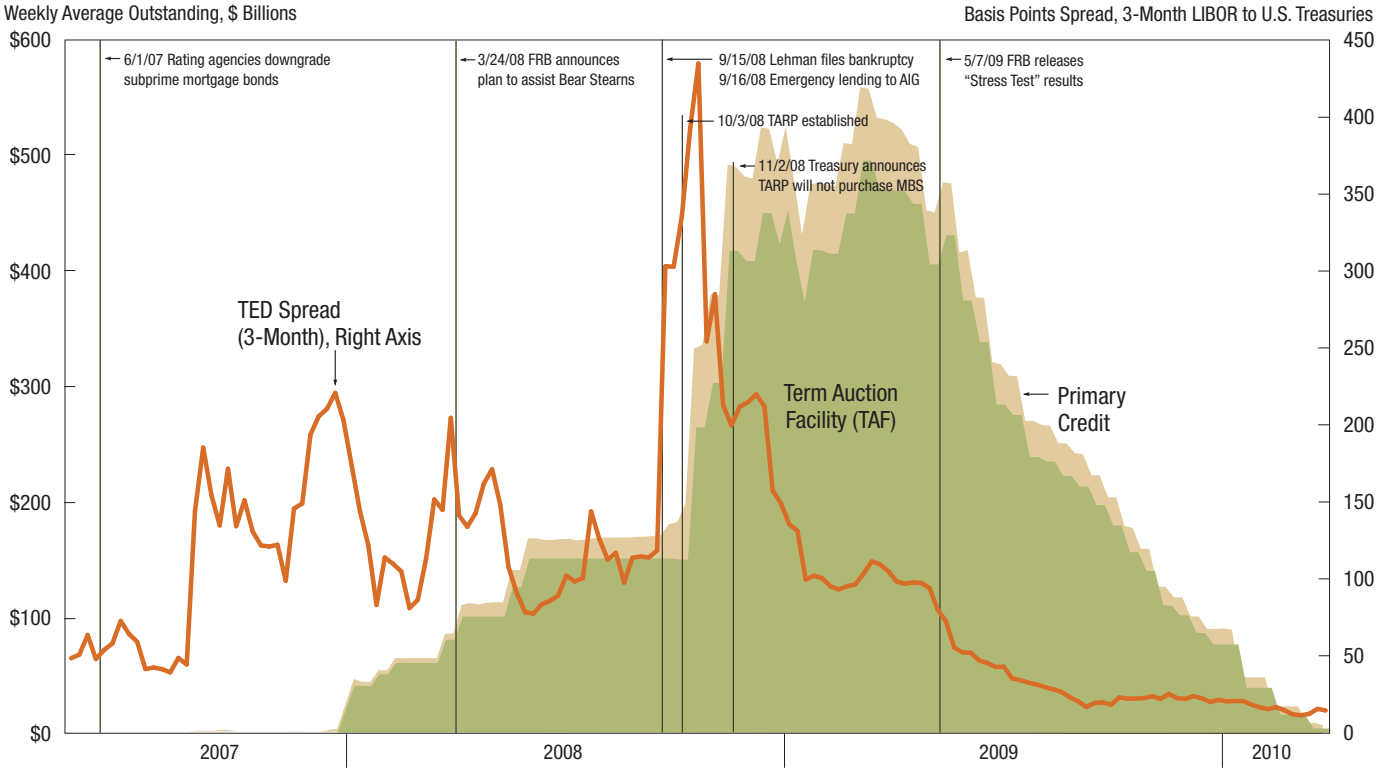
Federal Reserve.

Of the numerous programs created by the Federal Reserve in response to the crisis, the TAF is considered one of the most successful. Depository institutions welcomed it, and early auctions were fully subscribed. While economic experts differ in reasoning, the consensus was that the TAF helped ease broader interbank money market liquidity concerns primarily by relieving *individual* financial institutions' liquidity issues and related perceptions.[7] One study showed that the TAF relieved strains in interbank money markets—a cumulative spread reduction of more than 50 basis points is associated with the TAF announcements and operations.[8] Further, at extreme moments during the crisis, such as the period around the Lehman Brothers bankruptcy, the TAF served as an important liquidity backstop when the interbank market was stalled. Chart A shows the total amounts borrowed by financial institutions under the TAF and primary credit programs. As noted on this chart, TAF borrowing increased as the spread between U.S. Treasuries and 3-month LIBOR spiked and reached a peak of approximately $500 billion shortly after the Lehman Brothers and American International Group (AIG) events of September 2008. This chart also shows use of the Federal Reserve's primary credit programs, which operated normally during the crisis, though with more attractive pricing and longer terms.

The TAF was adjusted as necessary during the crisis, with longer maturities and higher amounts being auctioned. As markets improved, the amounts bid at TAF auctions began falling short of the total offered; in mid-2009, the Federal Reserve began reducing the total funds auctioned. The final TAF auction was held on March 8, 2010.

The remainder of the special liquidity programs noted below were developed and operated under the authority of Section 13(3) of the Federal Reserve Act, a very rarely used authority that allows the Federal Reserve to make loans to all types of businesses, but only under "unusual and exigent circumstances."

Chart A **Lending to Depository Institutions**



B. Programs supporting primary dealers

In March 2008, liquidity conditions in certain markets, particularly the repurchase agreements ("repos") market, grew very strained. Repos are a form of financing in which an owner of a security sells it under an agreement to repurchase it on a future date at a fixed price; essentially, they function as loans collateralized by securities. At that time, primary dealers, which use repos and similar instruments as a major source of short-term financing, were becoming concerned with the creditworthiness of counterparties as well as the risk of the securities pledged as collateral in these transactions.[9] As a result, "haircuts" (the difference between the market value of collateral and the amount that a lender will lend against it) increased significantly even for borrowers with high credit ratings and for extremely safe collateral such as Treasury securities.[10]

Due to this rapid jump in haircuts, some dealers had to turn to other funding sources. The situation that arose was this: If dealers could not borrow in those markets and did not have capital to fund their inventories, they would be forced to sell off holdings.[11] In turn, if such sales could not be made because markets were illiquid, the dealers would likely become insolvent, which would force them into bankruptcy.[12] Bear Stearns essentially faced this problem on March 13, 2008, and would have had to declare bankruptcy the next day had the Federal Reserve not extended it credit through JPMorgan Chase.[13]

At the height of the Bear Stearns situation, the Federal Reserve created the **Primary Dealer Credit Facility (PDCF) (March 2008–February 2010)** as an alternative source of liquidity. The Federal Reserve created the PDCF because it believed that the financial markets in which primary dealers traditionally finance themselves were seriously impaired.[14] Thus, the PDCF was deemed necessary to help primary dealers avoid the problem experienced by Bear Stearns as well as to prevent Bear Stearns' financial distress from spilling over to other institutions.

The PDCF provided overnight discount window loans, fully collateralized by investment-grade securities, to primary dealers. Its structure and function were similar to traditional discount window lending to depository institutions. The facility was designed to promote the orderly functioning of financial markets generally and to improve the ability of primary dealers to provide financing to participants in securitization markets.

As Chart B shows, PDCF usage was high immediately, spiking to $40 billion. It then declined as the financing arrangements with Bear Stearns were concluded. Usage spiked higher yet to $150 billion in September 2008, when Lehman filed for bankruptcy and the Federal Reserve expanded PDCF-eligible collateral in response. This chart also shows the effective fed funds rate spread over comparable Treasuries. Repo market financing often closely tracks fed funds pricing, with overall rates running slightly below the fed funds market. Accordingly, using the more broadly available fed funds spread over Treasuries is a good proxy for what was taking place. Chart B shows the significant jumps in this spread during the crisis period, with noted peaks around the Bear Stearns and Lehman events. As the spread decreased to near zero, lending to primary dealers subsided.

These two spikes in activity immediately following major market disruptions suggest that the PDCF served its purpose of providing an alternate source of funding that prevented disruption from spreading among market participants.[15] As market conditions improved thereafter, PDCF usage declined, reaching zero in May 2009. The PDCF was terminated in March 2010.

In addition to creating the PDCF, which was essentially a primary dealer version of traditional overnight discount window lending, the Federal Reserve created the **Term Securities Lending Facility (TSLF) (March 2008–February 2010)**. The TSLF was a TAF-like program designed for use by primary dealers. Under this program, the Federal Reserve would lend up to $200 billion in Treasury securities to primary dealers for a period of 28 days (rather than the standard overnight borrowing). Like the TAF, the terms of these loans were created through auction-style bidding. TSLF loans were secured by securities, including federal agency debt and residential mortgage-backed securities. While the TSLF was not as fully utilized as the TAF in that the submitted bidding amount was substantially lower than the amount offered, total amounts outstanding under this program were often double the amounts outstanding under the PDCF. Once again,

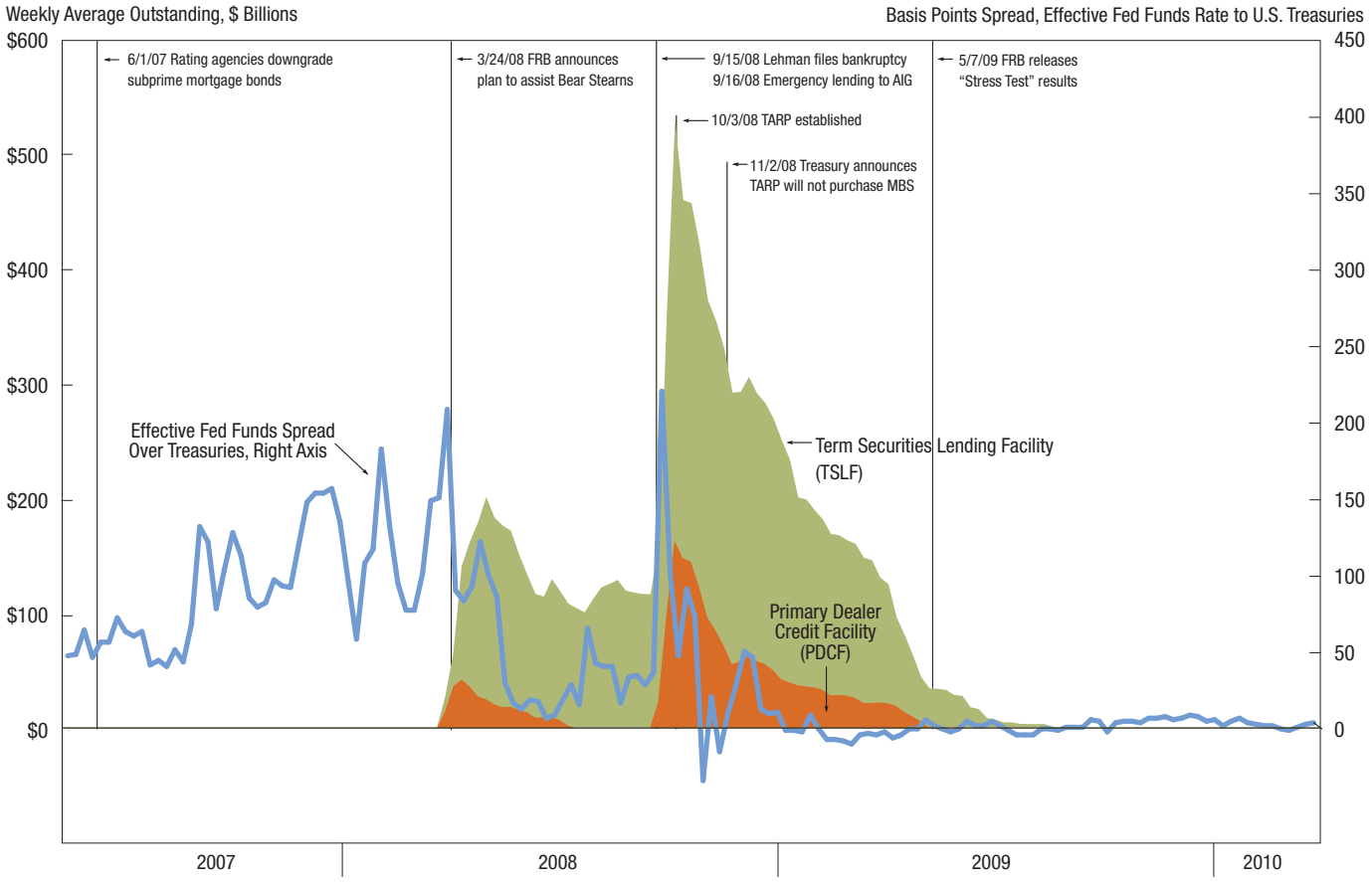
as Chart B indicates, the TSLF was used at the times of disruption in primary dealer markets; the two spikes in TSLF activity correspond with the Bear Stearns event and the Lehman bankruptcy.

C. Programs supporting commercial paper/money markets

As financial conditions worsened and confidence in a wide range of markets declined, investor confidence in securities, particularly asset-backed securities, also declined. Large numbers of investors began redeeming their investments in various types of funds. As a result, strains occurred in short-term debt markets as money market mutual funds struggled to sell assets to satisfy redemption requests and meet portfolio rebalancing needs. Due to these liquidity pressures, money market mutual funds and other investors became reluctant to purchase commercial paper, especially at longer-term maturities, which led to further strains in those markets. The Lehman failure also led to significant disruption.

In September 2008, the Federal Reserve created the **Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) (September 2008–February 2010)** to help ease these strains in markets affected by money market mutual funds. Under this program, the Federal Reserve extended nonrecourse loans (that is, loans on which the lender can recover no more than the collateral pledged) at the primary credit rate to U.S. depository institutions, bank holding companies, and U.S. branches and agencies of foreign banks to finance their purchases of high-quality asset-backed commercial paper (ABCP) from money market mutual funds. This was intended to assist mutual funds holding ABCP in meeting demands for

Chart B **Lending to Primary Dealers**



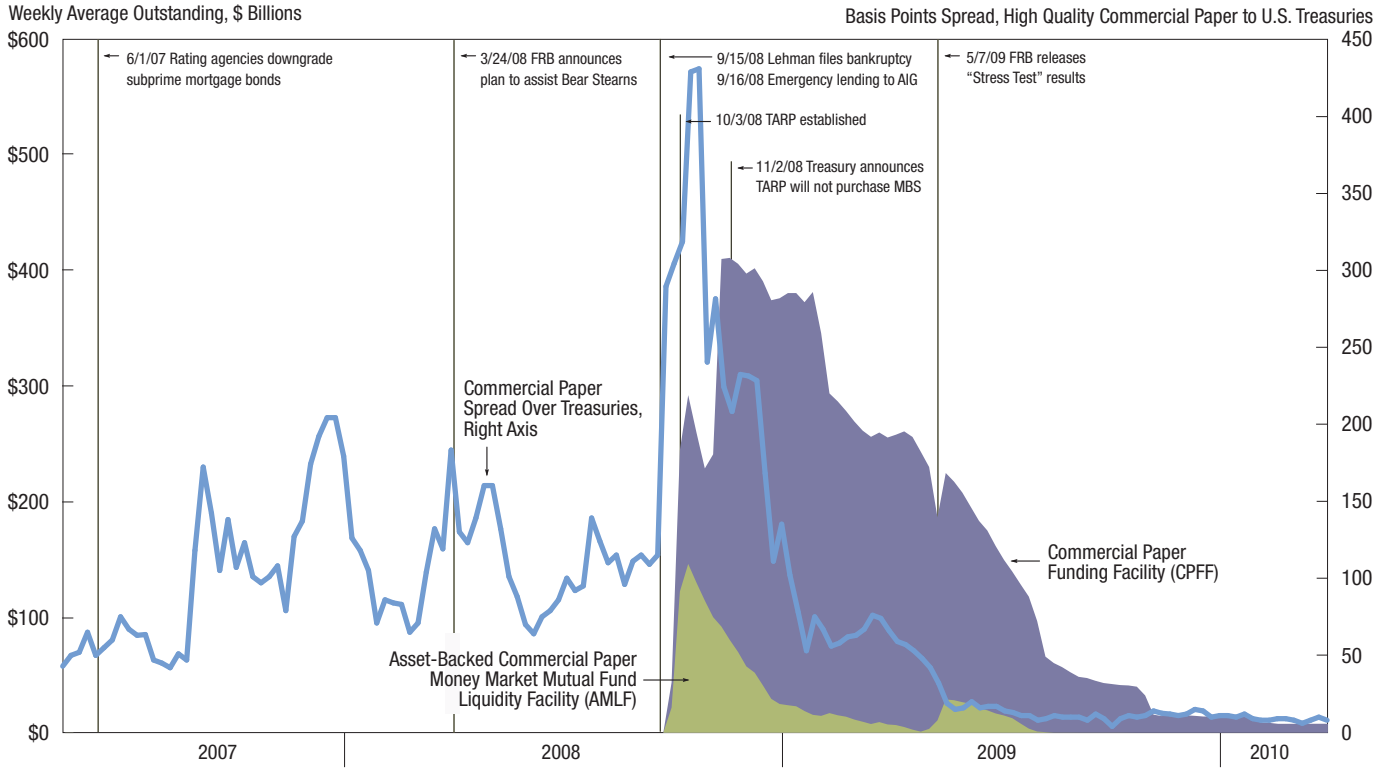
investor redemptions and to foster liquidity in ABCP markets and broader markets.

One month later, two companion programs were created as additional methods of easing strains in short-term debt markets. The **Commercial Paper Funding Facility (CPFF) (October 2008–February 2010)** was created to complement existing liquidity facilities by providing liquidity to term funding markets. The commercial paper market was under considerable strain in September and October 2008 as money market mutual funds—again, largely because of their own liquidity pressures—and other investors became increasingly reluctant to purchase commercial paper, especially at longer-dated maturities. The CPFF had a unique structure since it supported a private sector initiative to provide liquidity to money market investors; it provided financing to a special-purpose vehicle (that is, a corporation established in the private sector for this specific purpose), which used those funds to purchase 3-month commercial paper, both unsecured and asset-backed, directly from issuers.

Similarly, the **Money Market Investor Funding Facility (MMIF) (October 2008–October 2009)** was created to purchase eligible money market instruments. This program was similar to the CPFF in that it was designed to make loans to special-purpose vehicles, which in turn were to use this financing to purchase eligible money market instruments. However, unlike the CPFF and the AMLF, the MMIF was never utilized and was one of the first programs to be terminated.

Chart C shows usage levels for the AMLF and the CPFF. As the chart shows, AMLF and CPFF use was high immediately upon creation and peaked within a matter of months. CPFF use, for example, peaked a mere three months after its inception; AMLF peaked even more quickly, followed by a steep drop-off. Throughout 2009, usage of both programs steadily decreased as markets returned to normal. Again, market information is instructive—spreads between high-quality commercial paper

Chart C **Lending in Support of Commercial Paper/Money Markets**



and comparable Treasuries spiked just prior to operation of these programs, gradually moderated and eventually returned to normal levels.

Interestingly, at its peak, the CPFF's portfolio was primarily composed of financial commercial paper, but during 2009, its composition tilted toward asset-backed paper.[16] This illustrates not only that initial usage was tied to a significant market disruption but also that the markets in asset-backed paper have been slower to recover. Research to date indicates that both programs helped to bring stability to their respective markets. One study found that the CPFF had the intended stabilizing effect; at its peak, it held over 20 percent of all outstanding commercial paper, but by early 2010, it held only 1 percent.[17] Likewise, Fed researchers, using a set of loans extended under the AMLF as well as historical data for commercial paper transactions, were able to conclude that the program stabilized asset outflows from money market funds, restored liquidity to the commercial paper market and drove down credit spreads.[18]

D. Programs assisting market participants more broadly

As mentioned above, the financial crisis began when the housing bubble burst and investors lost confidence in firms holding large quantities of asset-backed securities (ABS), particularly those backed by mortgages. The loss of confidence in these markets became clear in September 2008 with a month-long decline in activity, followed by a near halt in October. At that time, the interest rate spreads on AAA-rated tranches (classes or portions differentiated by risk level) of ABS rose to unprecedented levels, reflecting extreme-risk premiums.

To combat this problem, the Federal Reserve created the **Term Asset-Backed Securities Loan Facility (TALF) (November 2008–June 2010)**. Under the TALF, the Federal Reserve Bank of New York was authorized to lend up to $200 billion on a nonrecourse basis to holders of AAA-rated ABS backed by newly and recently originated consumer and small business loans. The TALF was intended to support the issuance of ABS collateralized by student loans, auto loans, credit card loans and loans guaranteed by the Small Business Administration, which in turn supports economic activity by providing credit to households and small businesses.

The first TALF auction issued $4.7 billion in loans; the second auction only $1.7 billion. The TALF's largest auction occurred less than three months later on June 2, 2009, and resulted in $11.5 billion in loans. Although some thought that initial borrowing levels were not high enough to revive securitization markets, there is strong evidence that the TALF had a positive effect. As TALF operations got under way, most markets, but notably not the commercial mortgage-backed securities (CMBS) market, began to show signs of recovery.[19] By mid-2009, issuance of consumer ABS was gradually rising and spreads on AAA-rated credit card ABS had significantly narrowed.[20] Due to continued strains in the CMBS market, the Federal Reserve expanded the scope of the TALF in May 2009 to make highly-rated CMBS eligible for the program. Shortly thereafter, the risk spread on the AAA-rated CMBS began a fairly steady decline. This, in combination with the fact that lower-rated CMBS (not TALF-eligible) showed little or no improvement, is evidence of the TALF's effectiveness.

All other special Federal Reserve programs were terminated at the end of 2009 or the beginning of 2010, as their respective markets stabilized, but the TALF, initially scheduled to terminate at the end of December 2009, was extended to address continued strains in specific markets. For newly issued ABS and legacy CMBS, the TALF continued through March 31, 2010, and for newly issued CMBS, it is scheduled to continue until June 30, 2010. This extended duration is due, at least in part, to the fact that the TALF supports issuance of ABS, the market that experienced the greatest disruption.

Another program, central bank swaps, was aimed at improving global bank liquidity by bringing down interbank rates worldwide. Through this program, the Federal Reserve made dollars available to other central banks, which posted their own currency as collateral. These swap lines peaked at nearly $600 billion in December 2008, and on February 1, 2010, the program was terminated. An April 2010 New York Fed study of the program noted that it smoothed disruptions in overseas dollar funding markets. Further, the swaps program was also closely tailored to the need. According to the study's authors: "Pricing of funds offered through the swap lines gave institutions an incentive to return to private sources of funding as mar-

ket conditions improved."[21]

On May 9, 2010, in response to the reemerging strains in U.S. dollar short-term funding markets in Europe, various central banks announced reconstituted temporary U.S. dollar liquidity swap facilities. Like the swap arrangements that expired on February 1, 2010, these facilities enable central banks to conduct tenders of U.S. dollars in their local markets at fixed local rates for full allotment.

What were the losses associated with all of these special liquidity programs? To date, the Federal Reserve has not incurred a single loss on any of them. Many programs reported significant income, which ultimately is turned over to the U.S. Treasury after Federal Reserve expenses are paid. Also, because of the manner in which arrangements are structured, the Federal Reserve bears no foreign exchange risk or credit risk on the swaps program.

E. Firm-specific lending efforts—Bear Stearns and AIG

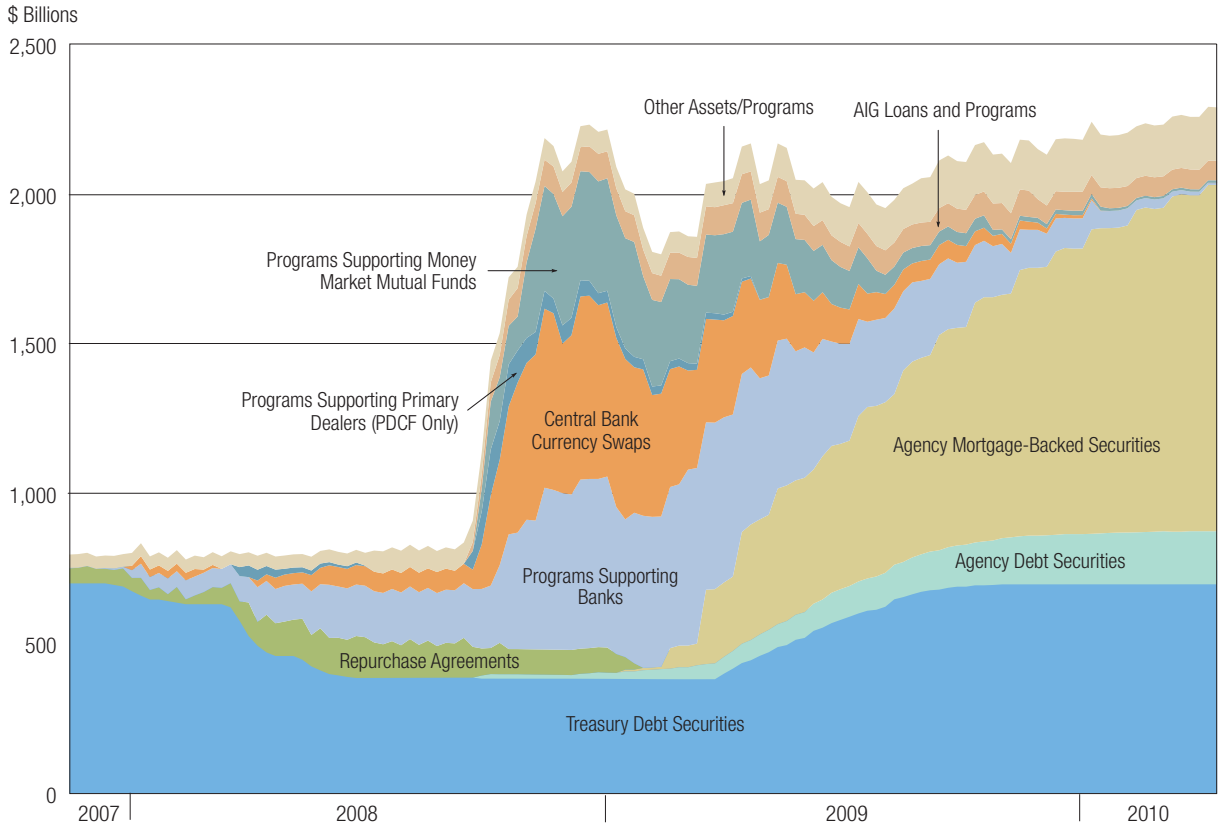
In addition to the creation of the liquidity programs described above, the Federal Reserve System used its emergency lending powers to prevent the disorderly failure of two systemically important firms, Bear Stearns and AIG. This was done to prevent spillover to the U.S. financial system and the economy more broadly.

In the strained funding conditions of March 2008, Bear Stearns—which had been operating on such a highly leveraged basis that it did not have sufficient capital to fund its inventories—found itself unable to borrow enough to meet its needs and in a market too illiquid to sell off its holdings. Without intervention, it would have had to file for bankruptcy on March 14, 2008. To prevent this, the Federal Reserve used its emergency lending powers to lend $29 billion to assist in the acquisition of Bear Stearns by JPMorgan Chase; this money was loaned to a special-purpose vehicle, Maiden Lane LLC, which holds as collateral for the loan a portfolio of Bear Stearns assets. Chairman Bernanke stated that this was a necessary step since the damage caused by a Bear Stearns bankruptcy would be "severe and extremely difficult to contain." A Bear Stearns default, observed Bernanke, would have led to a "chaotic unwinding" of the firm's investments and "the adverse impact … would not have been confined to the financial system, but would have been felt broadly in the real economy through its effects on asset values and credit availability."[22]

Similarly, AIG faced a liquidity crisis shortly thereafter when it, too, was unable to fund its operations in illiquid markets. AIG was also beginning to suffer losses stemming from its activities dealing with subprime mortgages: AIG had a significant securities lending program that dealt in mortgage-backed securities, and it issued credit default swaps funded through investments in mortgage-backed securities. By September 2008, AIG was faced with the dilemma of having to sell large amounts of its holdings in securities to raise sufficient capital in a market where the value of such securities had plummeted. AIG would have had to sell those holdings at a significant loss and, as such, may not have been able to raise sufficient capital to remain solvent. The failure of AIG would have had significant spillover effects and intensified the already severe crisis, worsening global economic conditions. To prevent this from occurring, the Federal Reserve agreed to make loans to AIG to give it the necessary liquidity to allow it to sell its assets over time so that their value could be maximized. As part of the transaction, the Federal Reserve received a 79.9 percent equity interest in AIG, as well as a pledge and later transfer of asset-backed securities, which are held in other special-purpose vehicles, Maiden Lane LLC II and III.

These rescues, which were heavily coordinated with government officials, were extraordinary actions for a central bank and were not without controversy. Certainly, it would have been preferable not to have had to make these types of emergency rescues; yet in those particular circumstances, it was thought necessary in order to avoid major disruptions of institutions directly connected to Bear Stearns and AIG, as well as the indirect connections to the entire financial system. The goals of these programs included their being managed and liquidated in a manner consistent with taxpayers' best interests. The amount of assets held by the Federal Reserve under these programs has remained relatively stable since the time the loans were first made; as of the end of first quarter 2010, their assets totaled approximately $115 billion.

Chart D **Federal Reserve Assets**



II. The Federal Reserve's balance sheet

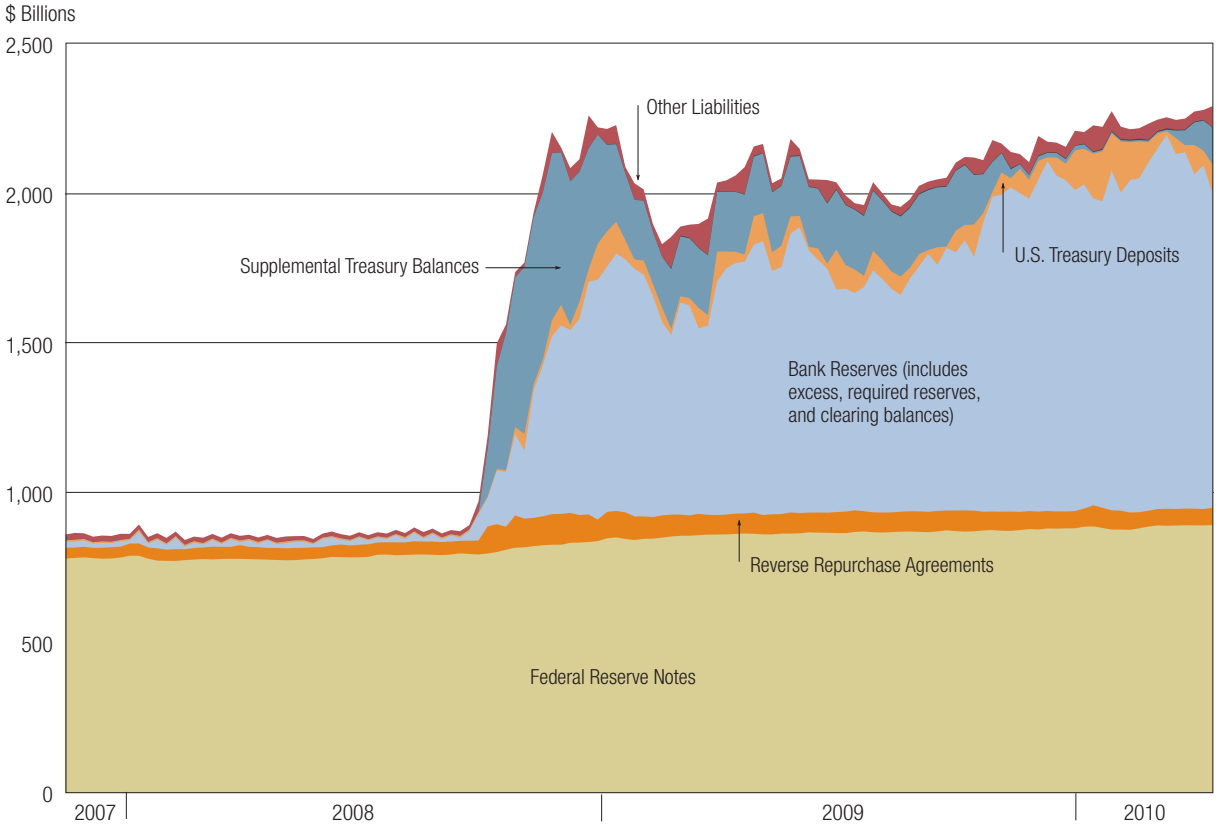
The unprecedented size of the Federal Reserve's balance sheet is a tangible reminder of the stress imposed by the financial crisis. As of the end of first quarter 2010, the size of the Federal Reserve's balance sheet remains at historically high levels with slightly over $2.3 trillion in assets; it has remained between this amount and $1.85 trillion since December 2008. Although the size of the balance sheet has remained rather steady during this time, the underlying composition of assets has shifted significantly. Chart D shows the changes in Federal Reserve asset holdings during the past several years.

Up until September 2008 or so, the level of securities held outright by the Federal Reserve declined as it sold Treasury securities to accommodate its aggressive implementation of liquidity facilities. This period was marked by unprecedented expansion of nontraditional programs and assets such as primary dealer loans, the TAF and central bank swap lines, among others.

But in early to mid-2009, demand for new loans through these special liquidity programs dropped substantially. At that time, the Federal Reserve began a large-scale asset purchase program, buying Treasury securities, federal agency securities and government agency-guaranteed mortgage-backed securities. The loans that now remain on the Federal Reserve's balance sheet can largely be tracked to the extraordinary institution-specific arrangements with Bear Stearns and AIG.

The securities holdings currently on the Federal Reserve's balance sheet are remarkable in two respects. The first is their sheer size—the Federal Reserve owns about $1.1 trillion in agency-guaranteed mortgage-backed securities

Chart E **Federal Reserve Liabilities**



and about $170 billion in agency debt. Those two categories now account for more than half of the Federal Reserve's current total asset holdings; before the crisis, they accounted for a negligible fraction of the total.

Second, unlike the Treasury securities typically on the Federal Reserve's balance sheet, these securities were issued by housing finance agencies (mostly Fannie Mae and Freddie Mac). That said, since these agency securities, like Treasuries, are guaranteed by the U.S. government, they have no default risk for the Federal Reserve (although they do have interest rate and prepayment risk).

While the liability side of the Federal Reserve's balance sheet does not have as many components as the asset side, it also has seen significant compositional changes due to the crisis (see Chart E). In particular, after the Federal Reserve began to pay interest on reserves in October 2008 (when it gained statutory authority to do so), the Federal Reserve's balance sheet was no longer constrained by monetary policy considerations, and the size of programs such as the TAF and central bank swaps could increase as necessary.[23]

While currency outstanding ("Federal Reserve Notes" in chart) remained relatively stable during the crisis, bank reserves rose dramatically, from about $10 billion in August 2008 to $1.2 trillion in February 2010. The last major component of liabilities, supplemental Treasury balances, also has fluctuated as necessary to assist the Federal Reserve in funding its special liquidity programs.

III. Conclusion

The financial crisis left an indelible mark on the nation's economy and will continue to shape policy going forward. The Federal Reserve's emergency

liquidity programs played an important part in reestablishing financial stability, and most are no longer necessary. Therefore, nearly all of the new liquidity programs targeted to banking, primary dealer and money markets have been terminated. The TAF was the most recent to close, conducting its final auction on March 8, 2010. The primary credit term program reverted to an overnight program, also in March 2010. Of all these broader programs, only the TALF continues to operate; it will complete its final loans on June 30, 2010, and its lending is currently limited to loans backed by commercial mortgage-backed securities.

The relatively quick winding down of these programs is a strong indicator that the programs were well-tailored to meet short-term needs during a time of crisis. The liquidity problems at which each was directed have largely been resolved, and financial markets that had seized up during the crisis have been restored to near normalcy.

The assets related to the financial crisis that remain on the Federal Reserve's balance sheet consist of the special arrangements with AIG and Bear Stearns, the TALF, and federal agency debt and agency securities.

The United States, and many other nations, have emerged from the recent financial crisis with body blows—depressed economic growth, significant unemployment and decreased household wealth. These blows to the U.S. economy have been felt deeply by individual households and citizens, and they will continue to have serious consequences for some time to come.

Nonetheless, there is little doubt that outcomes could have been much, much worse. As a major part of the international effort to stabilize financial markets and avert a greater financial meltdown, the Federal Reserve implemented a broad set of traditional and nontraditional programs. These innovative programs provided critical liquidity to markets and played an important role in restoring confidence and stability to the U.S. economy. R

For additional information about Federal Reserve System liquidity programs, see http://www.newyorkfed.org/markets and http://www.federalreserve.gov/monetarypolicy/bst.htm.

Data sources for charts are the Federal Reserve and Bloomberg.

Endnotes

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Robert E. Hall

In a discipline that celebrates specialization, Robert Hall is a Renaissance man. And economics is far the richer for it.

The Stanford economist's extensive publications over four decades—books, blogs, articles and lectures—provide ready evidence of wide-ranging expertise. (The interview below hardly scratches the surface.) As a labor economist, Hall has produced some of the field's most influential models of labor market dynamics and essential articles on labor supply, demand and wages. A scholar of fiscal policy, he built the intellectual foundation for the 1986 tax reform bill as well as recent consumption tax proposals.

His work in financial theory, consumer and corporate incentives, and government policy illuminates regulatory issues currently under debate in Washington. Innovative analysis of stock market valuation by Hall demonstrated the importance of intangible capital. His studies of entrepreneurial incentives (with his wife, economist Susan Woodward) and antitrust theory are pathbreaking.

Hall's research on trading through electronic markets—"digital dealing" is his term—provided one of the first lucid explanations of the economics of then-new Internet phenomena such as eBay. Hall's analytical gifts also have generated important insights on monetary theory and optimal monetary systems. He has done invaluable work as well in growth theory, determinants of productivity, spending on health and economic geography.

His erudition has range, depth and quality that few economists can match. And the profession has recognized this with honors including the Richard T. Ely lecture in 2001, presidency of the American Economic Association in 2010, and fellowship in the American Academy of Arts and Sciences, Econometric Society and National Academy of Sciences.

Hall's *public* profile, however, is largely confined to the sphere of business cycles, in which he also has unquestioned expertise. That narrow "fame" is due to his chairmanship, for over 30 years, of the committee that determines when U.S. recessions officially begin and end. It is a painstaking and largely thankless task. Pundits and policymakers clamor for the committee's announcements, but inevitably second-guess the decisions made. Committed to the integrity of process and result, Hall has never bent to pressure, manifesting time consistency that monetary policymakers can only envy.

Photography by Peter Tenzer

THOUGHTS ON U.S. MONETARY POLICY

Region: Perhaps we could start with monetary policy. What is your broad view of the Fed's efforts over the past few years to stem the crisis using unconventional monetary policy and strategies?

Hall: First of all, I believe you should think of the Fed as simply part of the federal government when it comes to the financial side of its interventions. If you look at how the federal government responded initially, it was the Treasury that was providing the funds. Of course, TARP [Troubled Asset Relief Program] was there using the taxpayers' money without involvement of the Fed. Also, early in the crisis Treasury deposited hundreds of billions of dollars at the Fed, which the Fed then used to buy assets. So there the Fed was just an agent of the Treasury. It was as if the Treasury took its funds to a broker.

Eventually, the Treasury was impeded from doing that by the federal debt limit. But the debt limit doesn't apply to funds borrowed by the Fed, so it then started borrowing large amounts from banks by issuing reserves. That is what caused all the confusion about thinking this was somehow part of conventional monetary policy.

I would distinguish between conventional monetary policy which sets the interest rate and this kind of financial intervention of buying what appear to be undervalued private securities. Issuing what appear to be overvalued public securities and trading them for undervalued private securities, at least under some conditions and some models, is the right thing to do. In my mind, it doesn't make a big difference whether it's done by the Federal Reserve, the Treasury or some other federal agency.

Region: And what are your thoughts on the best course for a Fed exit strategy?

Hall: That again gets at this confusion. Traditionally, reserves at the Fed pay zero interest in the United States, so in normal times with positive market interest rates, banks try to unload reserves; when they do so, they expand the economy. That does not happen when interest rates in the market are zero because there's no incentive for banks to unload reserves. They can't gain by getting something off their balance sheet if what they buy doesn't yield any more. And during the crisis, there was no differential, nothing to be gained by unloading reserves.

There are two branches to the exit strategy: There's paying interest on reserves, and there's reducing reserves back to more normal levels. They're both completely safe, so it's a nonissue. The Fed itself is just not a danger. It is run by people who know exactly what to do.

As the differential reestablishes, which the markets think is going to happen in the next year or so, then that issue comes up. It would be highly expansionary and ultimately inflationary if market interest rates began to rise above zero and the Fed didn't do something to either reduce the volume of reserves or increase the demand for reserves.

So the Fed has two tools, and Chairman Bernanke has been very clear on this point. He's given a couple of excellent speeches that have described this fully, so it shouldn't be an issue, and I think more or less it's not anymore. The Fed can either leave the reserves out there but make them attractive to banks by paying interest on them, or it can withdraw them by selling the corresponding assets they're invested in. Selling assets will be timely because those investments will have recovered to their proper values; the Fed can sell them and use the funds to retire the reserves.

So, again, there are two branches to the exit strategy: There's paying interest on reserves, and there's reducing reserves back to more normal levels. They're both completely safe, so it's a nonissue. The Fed itself is just not a danger. It is run by people who know exactly what to do. And we have 100 percent confidence they will do it. It's not something I worry about.

FINANCIAL FRICTIONS

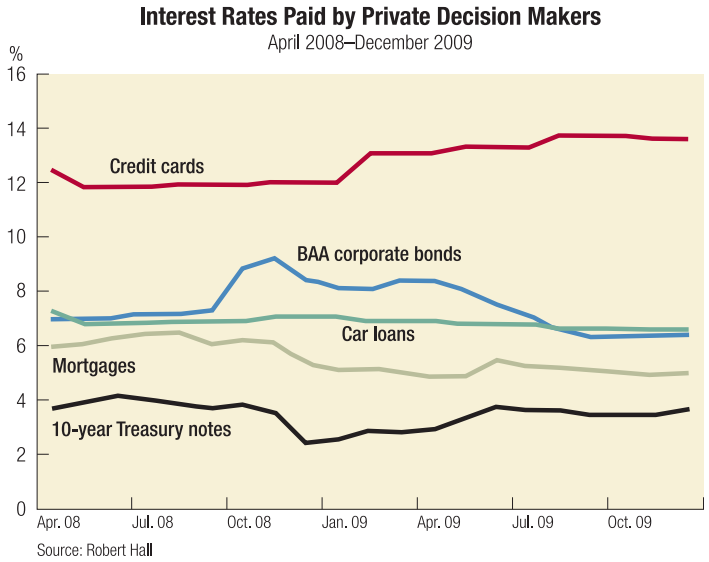
Region: That's reassuring, but I believe you *do* worry about financial frictions…

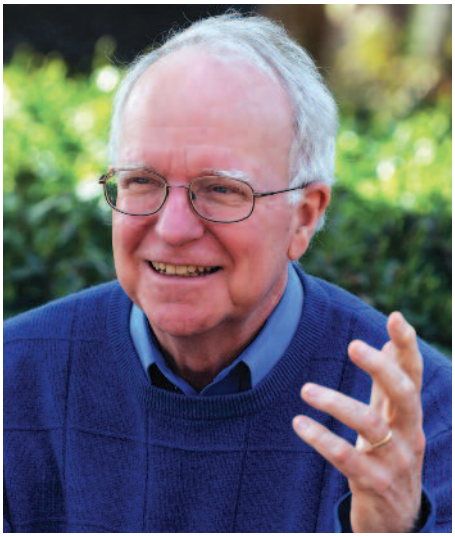
Hall: I do, I do very much.

Region: Your recent paper on gaps, or "wedges," between the cost of and returns to borrowing and lending in business credit markets and homeowner loan markets argues that such frictions are a major force in business cycles.

Would you elaborate on what you mean by that and tell us what the policy implications might be?

Hall: There's a picture that would help tell the story. It's completely compelling. This graph shows what's happened during the crisis to the interest rates faced by private decision makers: households and businesses. There's been no systematic decline in those interest rates, especially those that control home building, purchases of cars and other consumer durables, and business investment. So although government interest rates for claims like Treasury notes fell quite a bit during the crisis, the same is not true for private interest rates.





Even though the Fed has driven the interest rate that it controls to zero, it hasn't had that much effect on reducing borrowing costs to individuals and businesses. ... When private borrowing rates rise and public borrowing rates fall, the difference between them is the amount of friction. ... That's a potent source of trouble.

Most of the undervalued assets that the Fed has bought have been mortgage related. ... There would be a case for expanding that type of policy to other seemingly undervalued instruments.

Between those rates is some kind of friction, and what this means is that even though the Fed has driven the interest rate that it controls to zero, it hasn't had that much effect on reducing borrowing costs to individuals and businesses. The result is it hasn't transmitted the stimulus to where stimulus is needed, namely, private spending.

The government sector—federal, state and local—has been completely unable to crank up its own purchases of goods; the federal government has stimulated [spending] slightly but not enough to offset the decline that's occurred at state and local governments.

Region: Yes, I'd like to ask you about that later.

Hall: So to get spending stimulated you need to provide incentive for private decision makers to reverse the adverse effects that the crisis has had by delivering lower interest rates. So far, that's just not happened. The only interest rate that has declined by a meaningful amount is the conventional mortgage rate. But if you look at BAA bonds or auto loans or just across the board—there are half a dozen rates in this picture—they just haven't declined. So there hasn't been a stimulus to spending.

The mechanism we describe in our textbooks about how expansionary policy can take over by lowering interest rates and cure the recession is just not operating, and that seems to be very central to the reason that the crisis has resulted in an extended period of slack.

Region: So to incorporate that in a model seems quite important.

Hall: Yes, and many, many macroeconomists have turned their attention to that. I've been following the literature and been a discussant at many conferences of other people's work on this. In fact, the Fed is giving a conference at the end of next week, and I'll be presenting my paper on frictions.

Region: Your model is able, I think, to explain a fair amount of the current business cycle by incorporating those frictions.

Hall: I mainly look at, as kind of a thought experiment, how much of a decline in activity occurs when that kind of a friction develops. When private borrowing rates rise and public borrowing rates fall, the difference between them is the amount of friction. I show that that's a potent source of trouble. I haven't tried to align it with history prior to the current crisis. That's an interesting question, but data on historical events aren't always so easy, so that lies ahead.

Region: And the policy implications? What can and should be done to reduce frictions?

Hall: Good question! Well, it does point in the direction of focusing on things like lower rates for corporate bonds, BAA corporate bonds. They appear to be undervalued private assets, although that's not been one of the types of assets that policy has seen as appropriate to buy or to help private organizations to buy. That would be one way to turn.

We've concentrated on doing that in mortgage-related assets. You can see in the picture that it's had some effect. Most of the undervalued assets that the Fed has bought have been mortgage related. It's been kind of an obsession with trying to solve these problems as they arise in home building, but home building is only part of the story. The collapse in other types of investment spending has been equally large. There would be a case for expanding that type of policy to other seemingly undervalued instruments.

That would presumably result in the same pattern you've seen in mortgages. That policy has been successful—differentially successful in depressing mortgage rates as opposed to bond rates or other areas.

EQUITY DEPLETION

Region: Let me ask you about a paper you wrote in December 2008, on equity depletion, defined as the "withdrawal of equity from firms with guaranteed debt." We're all well aware of government bailouts, and implicit or explicit guarantees of financial institutions…

Hall: That paper was actually reprinted in a book that just came out, *Forward-Looking Decision Making* [Princeton University Press, 2010]. It's the last chapter in this book, which is a compilation of the Gorman lectures I gave at University College London in October 2008.

Region: You had a wonderfully provocative statement in it. You declare that equity depletion "appears to be an unlimited opportunity to steal from the government."

Could you tell us what you mean by that? Why does equity depletion occur, and how does it constitute an opportunity to steal?

Hall: George Akerlof and Paul Romer wrote a paper published in 1993 in the *Brookings Papers* that described what they called "looting." The particular form that looting took was through the ownership of a savings and loan; this was a feature of the savings-and-loan crisis of the late 1980s.

As a "looter," you would use the savings and loan to attract deposits, pay the deposits as cash to yourself and then declare bankruptcy. Akerlof and Romer described a number of clever ways of doing that to escape the attention of lax regulators, and that's the type of thing you see in many settings.

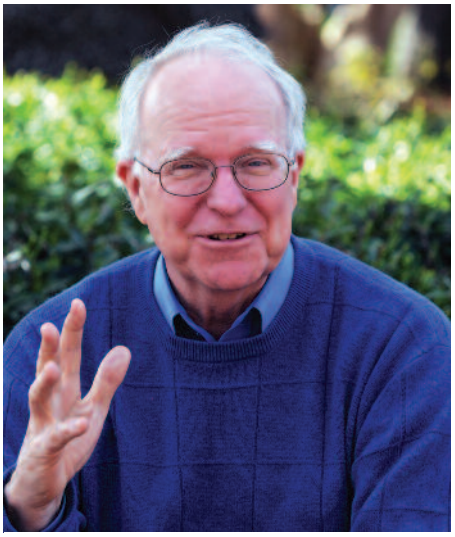
One of the big problems encountered recently is that institutions that have become very undercapitalized were still depleting their equity by paying dividends. The government has had to push very, very hard to get these financial institutions to stop paying dividends. Dividends are exactly equity depletion. With a government guarantee, it's exactly what there's incentive to do—as described in that paper.

On the other hand, it seems we've been much more successful currently than we were in what Akerlof and Romer described as far as preventing the most extreme forms of this conduct.

It's a danger whenever you have guaranteed financial institutions that have gotten into a very low capital situation. They've suffered asset value declines, they've become extremely leveraged and they have this very asymmetric payoff to the owner: If they go under, it's the government's problem; if they recover, it's the owner's benefit. That asymmetry, which is the so-called moral hazard problem, is just a huge issue.

And yet, while we have a lot of institutions in that setting today, we don't see many of them doing things that Akerlof and Romer described, such as paying themselves very large dividends. It's been difficult to get them to cut the dividends, but they have not paid out very large dividends or concealed dividends.

So it looks like we've been somewhat successful in preventing the worst kind of stealing, but the asymmetry is still potentially a big issue. There are way too many bank failures that should not have occurred and especially should not have cost the taxpayers as much as they did.



It's a danger whenever you have guaranteed financial institutions that have gotten into a very low capital situation. They've suffered asset value declines, they've become extremely leveraged and they have this very asymmetric payoff to the owner: If they go under, it's the government's problem; if they recover, it's the owner's benefit. That asymmetry, which is the so-called moral hazard problem, is just a huge issue.

Region: Your thoughts about what measures can be taken to curb this moral hazard?

Hall: The most important thing is to be sure that financial institutions that are guaranteed by the government have large amounts of capital so that the danger of them spending the taxpayers' money rather than their own money is very small. That's a principle that's been deeply embedded in our regulations for a long time.

But I pointed out in this chapter the principle of so-called prompt corrective action, which says if capital goes below this mandated level, which is typically around 8 percent, then something has to be done right away before all the remaining capital gets depleted.

We just have not been successful at doing that. We have principles of regula-

tion that allow the regulators to say that a bank is well capitalized even though the markets know that it's not. Banks have been declared to be well capitalized even when the market value of their debt and the market value of their equity have declined to very low levels.

Regulators seem to ignore something that everyone in the market seems to know, which is that they're shaky. There seems to be a lack of willingness to pay attention to all the signals that a regulator should pay attention to. All they do is look at certain accounting records, which don't reflect what people know.

It's not easy though. There's been a large amount of discussion of this topic among very knowledgeable financial economists. My colleague Darrell Duffie here at Stanford has been a particular leader. There's a group called the Squam Lake Working Group, of which he's a member, that has been advocating ideas like, as a backstop, having long-term debt be convertible to equity. That is what happens in a bankruptcy, but under this strategy it would happen without a bankruptcy. It would happen automatically with certain contingencies and would solve the problem in a very nice way. It would potentially increase the borrowing cost, but it would properly get the incentives right.

A lot of people look to the example of Citibank. Citibank's long-term debt has been selling at a considerable discount, which is a sign that the market knows that there's an issue. So instead of doing what we have done, which is give guarantees of short-term debt with government investments, the alternative that the Squam Lake people are thinking of, and I've been thinking of too, is to somehow convert Citibank's long-term debt into equity, which is the same thing that the market is in effect doing. That would eliminate the danger then that the bank couldn't meet its obligations, in a way that is less burdensome to the taxpayer.

In retrospect, what we did was to save the economy from a tremendous train wreck. But we didn't do it in a way that was as cheap for the taxpayer as it could have been. And, of course, there have been many examples discussed of this.

This is all in retrospect. And I certainly don't criticize the people who were doing it at the time, especially Chairman Bernanke. But looking forward now to the next time this happens, convertible debt would be a huge step forward. If people at the Treasury could have just pushed a button to convert the debt, without needing a new law, they would have done it in a second. There's no doubt about that. They just didn't have that power.

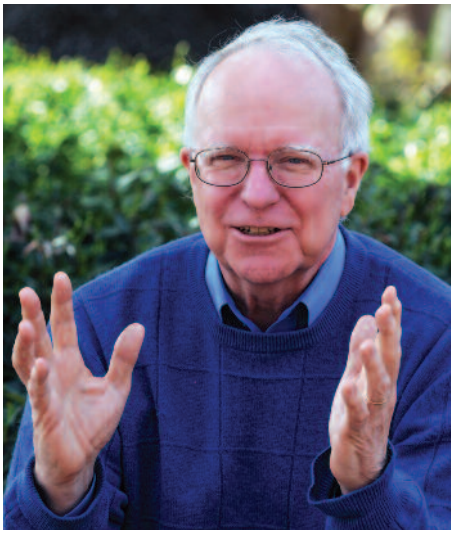
So we need to give regulators that power through some sort of sensible security design. Regulators could do that, and financial institutions wouldn't see it as terribly burdensome because the market would know that the probability of this kind of thing happening again is pretty low. And when it does happen again, which will be sometime in the next century, that button would be there to press, and we wouldn't have the chaos that we had in September of 2008.

GOVERNMENT SPENDING AND GDP

Region: You mentioned earlier the difficulty of stimulating the economy, and I'd like to discuss your work on government multipliers. The federal government's stimulus package has been a topic of heated debate among economists, in terms of how much stimulus it's truly provided and whether more is needed. In a recent paper, you analyze basically what happens to GDP when government purchases goods and services.

Would you give us your rough estimate of the size of the multiplier in the current era of very low interest rates, and share your sense of the impact of the current stimulus package?

Hall: The first thing to say, just looking at the big picture, is that when the idea of a stimulus through federal purchases program came up in the current crisis, the thinking was, "That's feasible. We can increase purchases." And then the question was how much would it raise GDP. There was a vigorous debate, around here anyhow, on this multiplier question.



It takes so long to get [federal government] spending up that typically the spending rises only after the recovery has occurred, and it comes at completely the wrong time. ... But the other fact is that there's been a small increase in *federal* government purchases, but it's been more than offset by declines in *state* and *local* government purchases.

The discussion has shifted now because the premise was that we would be able to raise government purchases. But, in fact, government purchases have *not* increased.

In part that's because it's very difficult and time-consuming to actually get the government to buy more stuff. This has been a critique of fiscal policy as long as I've been an economist, this notion that it takes so long to get spending up that typically the spending rises only after the recovery has occurred, and it comes at completely the wrong time.

Region: We searched in vain for "shovel-ready projects."

Hall: Yes, "shovel-ready" turned out not to be. But the other fact is that there's been a small increase in *federal* government purchases, but it's been more than

offset by declines in *state* and *local* government purchases.

The stimulus bill recognized that that was a danger. We have had these tremendously pinched state and local governments. A lot of them have just had no choice when their tax revenue declined but to reduce spending.

In spite of recognizing that potential when the stimulus program was designed, still the net effect of the crisis and the policy response was for government purchases to decline, not to rise. But by very small amounts. Basically, nothing happened to government purchases. And that was in an environment in which everybody—and certainly Congress was enthusiastic about it—was willing to go for a program with higher purchases. But no matter how hard they tried to turn the knob, it just wouldn't go very far.

Region: So ARRA [American Recovery and Reinvestment Act of 2009] was for naught?

Hall: First of all, you have to take it apart, as I do in that paper, and ask how much of it went directly into government purchases, which is fairly small, or would stimulate state and local purchases, which was also fairly small.

A lot of it was providing income supplements, and there you get into the question of whether the people receiving the supplements increased their spending or not. That's a whole other issue; I'm not commenting on that issue. That's a very difficult question to answer.

To go on to the other part of your question, had there been an increase in government purchases that was successfully achieved, how much would that have increased GDP? The answer I got was around a factor of 1.7, which is at the high end of the range of what most economists were talking about.

I only reached that by thinking very carefully and reading a lot of recent commentary on this question of the implications of having a zero fed funds rate. That turns out to be very important. Others have found that to be true.

So I think that the people who looked at the evidence of what the multiplier is in normal times and said it's maybe 0.8 or 1.0 (which I would agree with) kind of missed the point. There was a lot of, I think, inappropriate criticism.

Valerie Ramey, in contrast, has focused not on the immediate policy question but raised the scientific question about the long-run multiplier. Her numbers are ones that I respect and agree with. They're more in the 0.9 range.

But on the issue of multipliers during periods of zero interest rates, because we didn't have any changes in government purchases during this one time when we've reached the zero interest point, we don't have any good empirical evidence. What we need is a time when interest rates are zero and there's a big increase in government purchases. That just hasn't happened.

So we have no way to know through pure practice; we have to use models. The models are very clear that it makes a big difference when we're at the zero interest rate limit. The normal configuration is that you get this fiscal expansion—the government buys more, but that triggers sort of an automatic response from monetary policy to lean against it. If you shut that down by having interest rates stay at zero, you'll get a bigger effect. That's what this literature says and it's quite a big difference.

TAX POLICY

Region: Of course, this raises the issue of taxes, of needing to pay for deficit spending. And I notice the *Time* magazine cover above your desk about the flat tax.

Hall: From long ago!

Region: Yes, exactly. Your work with Alvin Rabushka on the flat tax was a huge sensation in the early 1980s, as represented by making the cover of *Time*.

Hall: That's right. It's one thing to get your face on the cover of *Time;* it's quite another to get your idea on it! Forget what's-his-name's face!

Region: And I think it can be argued that that helped pave the way toward the 1986 Tax Reform Act.

Hall: We like to think so. I'll accept that.

Region: Twenty-five years later you reissued the book, updated of course, and continue to advocate it as the "most fair, efficient, simple and workable plan on the table."

Given its clear merits and strong advocates, why do you think it's gained relatively little traction in the United States?

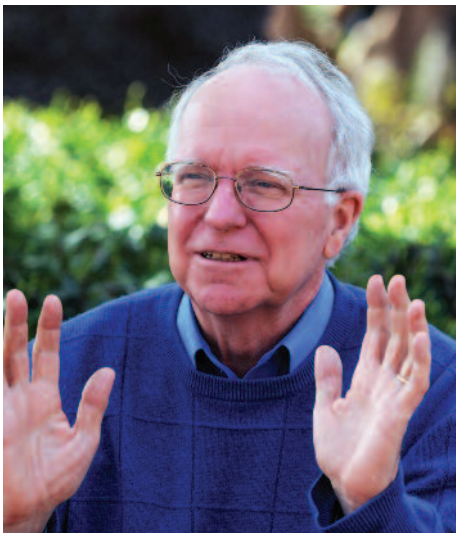
Hall: One important thing to understand is that contrary to some people's impressions, it's not gone very far in the rest of the world either.

Region: Not in central and eastern Europe? Mexico, perhaps?

Hall: Yes, but if you look at their overall tax structure, it's not what we have in mind. Their rates are high because they've adopted income tax systems that work like a flat tax, but they're on top of a very high value-added tax. So the combination doesn't achieve the low rates that we were hoping for.

In the U.S., there's been a lot of backsliding. It looks like there's going to be more and more. The state of California, for example, has a couple of times added surcharges for very high incomes. There seems to be a belief that it's a great idea, that we can get all the revenue we need by taxing high incomes, without regard to the problems that those tax rates create, especially in the longer run. That's one of the things we talk about in our book. There's more to the logic of low marginal tax rates than just the question of who pays the tax.

But another factor I would emphasize is that since 1981 when we first promoted that plan, there's been a dramatic widening of the income distribution in the U.S. That means that the idea of the



Since 1981 when we first promoted that [flat tax] plan, there's been a dramatic widening of the income distribution in the U.S. That means that the idea of the poor paying the same tax rate just seems less viable than it was when the income distribution was tighter.

poor paying the same tax rate just seems less viable than it was when the income distribution was tighter.

The division between a small number of winners in the modern economy, mostly businessmen and lawyers, as opposed to most other people, has grown significantly.

In "others," I include doctors, by the way. One of the amazing things that doesn't get much attention these days is the widening division between doctors and lawyers. It used to be that doctors and lawyers competed for the best houses in Palo Alto. Now they're all lawyers or venture capitalists; they're not doctors.

While there are a lot of good ideas in flat tax reform, it wouldn't be remotely practical to do it with a single positive tax rate now. So I play around with systems that have, say, two brackets. The "not-so-flat" tax. But of course that doesn't have quite the simple appeal that the "flat tax" did. [Laughter]

But there's still a great idea in that book which applies to any tax system, which is, it basically figures out how to implement a value-added tax or other consumption tax in a way that's progressive.

There were two economists on President Bush's Advisory Panel on Federal Tax Reform in 2005, Jim Poterba and Ed Lazear, who really understood that. They pushed pretty hard; that was one of the designs that would make sense for how to do a consumption tax, even though it wouldn't be a flat tax.

The origin of our initial flat tax effort was Rabushka coming to me in 1980 and saying, "I know what the people want. The people want a flat tax, but I don't know quite what that is." And I said, "I know what it is because I've been thinking about it since I was a graduate student." But, of course, for me, it was a consumption tax—an efficient, simple, fair consumption tax. The flatness wasn't so important but, of course, the flat tax name, which Rabushka contributed, was very important politically.

Region: Marketing is important.

Hall: Yes, but now the idea of tax flatness is understandably not as popular.

DYNAMICS OF LABOR MARKETS

Region: You've also done a great deal of research on labor markets. In 1982, you documented the "importance of long-term jobs" in the United States. I'm not sure that's still the case.

Hall: It's still the case. That paper's been replicated quite a few times. It's almost a law of nature. The financial press is constantly telling us how much turnover has increased, how the old days of the lifetime job have disappeared. But there's no particularly strong evidence of that. There are some interesting changes going on, but nothing that dramatic.

Region: A 2005 paper of yours argued that job separation was also fairly stable and what was more important was looking at the hiring process and job finding.

Hall: That's right.

Region: So you've been studying that process carefully, looking at job search dynamics, wage stickiness, wage bargaining, productivity, other factors. You've developed a model that explains labor market fluctuations without assuming what you consider to be unrealistically high labor supply elasticity.

Hall: I think "explain" might be a little bit of an overstatement. I'm not sure how many of my colleagues would agree with the word "explain." [Laughter] I think "accounting for" might be right.

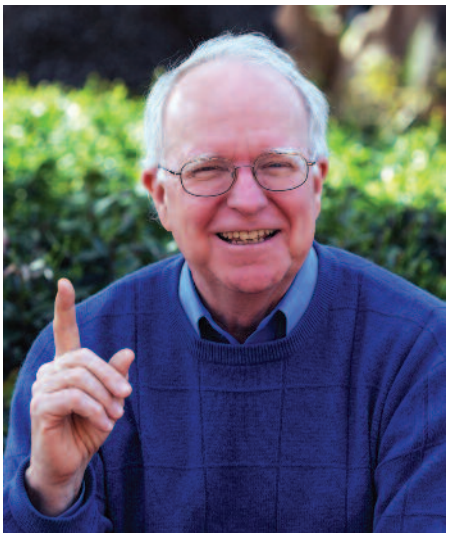
Region: Fair enough. What factors have you found most successful in accounting for job-finding rates? And what are the key drivers of labor market volatility?

Hall: The important feature that controls the job-finding rate is the incentives to employers to create jobs. At any given time, if the incentives are not very strong—it could happen for many different reasons—then employers will do relatively little to try to recruit workers. Job seekers will then have trouble finding jobs, will see themselves at the end of a long line of people waiting for the job.

Interestingly, the number of people who find jobs each month is more or less a constant. Of course, this changes, but it's a pretty good starting point for understanding labor market dynamics that the number of people who find jobs each month is the same in a strong market or a weak market.

In a strong market, you have a relatively small number of job seekers, so each one finds it easy. In a good market, it takes the average person about a month to find another job. In a weak market, there are twice as many people looking, but each one of them is half as likely to find a job each month; the product of the two—the number looking for a job and the fraction of them who find a job—is the same.

So, something like 4 million people find jobs every month. Even with 10



Something like 4 million people find jobs every month. Even with 10 percent unemployment, as recently, we've still seen the same thing. A very large number of people looking, very low job-finding rate for each individual, but the product—the number of jobs filled—is roughly a constant. It's a very important fact about the labor market.

percent unemployment, as recently, we've still seen the same thing. A very large number of people looking, very low job-finding rate for each individual, but the product—the number of jobs filled—is roughly a constant. It's a very important fact about the labor market.

Think about a slack market from an employer's point of view. They see there are all kinds of highly qualified people out there they can hire easily, so they don't need to do a lot of recruiting—people are pounding on the door.

Region: And these days they're census takers.

Hall: [Laughter] Right! So that's the first thing to think about: job creation incentives.

If you ask, how did we get into a situation where job creation incentives have declined? It's that there's been a decline in the profitability of hiring a worker without a corresponding decline in the wage. The incentive to create a job is the difference between what a worker will contribute to the business and what the worker has to be paid.

That's a very simple calculus. But that seems to vary. In a recession, for various reasons, the profit margin from hiring a worker declines, and that reduces job-creating efforts, all the things that keep the labor market moving. And that, in turn, causes it to be difficult for the job seeker to find a job.

There's a great debate going on as to just what the factors are that reduce the additional profit from hiring another worker.

For a while, there was the thinking that movements in productivity—productivity is one of the factors, so if productivity falls and the wage doesn't fall with it, then that reduces the profit margin. But that idea has not worked in the last three recessions because they were periods when productivity was rising, not falling. So the old productivity story has not worked for the last 30 years.

But each of us has our own set of ideas. To tie it to what we were talking about before, financial frictions have the same effect. Increasing financial frictions reduces the desirability of adding workers. That's especially true if there's anything about the employment relationship that has an investment character. If a worker has to be trained and becomes highly productive labor in time, then this question of what the cost of funds is becomes important. A rise in the cost of funds will result in a decline in employment, and that's something a lot of people are looking at right now.

There are many threads to this topic. We're debating actively which ones are most important.

RECESSIONS AND RECESSION DATING

Region: People are wondering when will, or did, the current recession end, but I'd like to ask how you and the NBER [National Bureau of Economic Research] committee you lead decided when it *began*. Many countries define a recession as two quarters in a row of negative GDP growth, and by that standard I think the United States would have entered its recession in, maybe, the third quarter of 2008.

Hall: But that gets back to the whole question of, do you include the peak of real GDP? We always talk about the date of the peak. That helps sort out this timing. The peak occurred in the second quarter of 2008. However, as you know, we declared the peak to be a little earlier than that, December of 2007.

Region: Would you explain what standards—I know it's on the NBER Web site; it's very clear there—but could you elaborate on what standards you use to determine turning points in business cycles?

Hall: Actually, it's not that clear, because these things are always up in the air. [Laughter] There's a certain amount of ambiguity in what we put on the Web site. We haven't resolved some important questions about how this process should work.

Region: Why really do we need a committee, a dating committee, rather than relying on a rule of some sort, like two quarters of negative GDP growth? I think you've been on the committee since it began…

Hall: I'm the only chairman the committee has ever had, for 32 years.

Region: I didn't know you've chaired it the entire time! Well then, you're the right man to ask. Do you think it might be useful for the NBER, in addition to doing what it now does, to also issue something closer to a real-time indicator or signal of recessions—that could be revised for false positives or negatives, along the lines that Òscar Jordà has recommended?

Hall: I think we feel that doing something like that, and in any sense making

it official, would somewhat cloud things because there would be enough type 1 or type 2 errors [false positives or negatives]. We're *very* happy to see that type of research be done; we don't claim any monopoly on this point, and it's been very instructive.

Actually, long ago, in the 1980s, we sponsored a project that informally, unofficially put out a recession probability index that Jim Stock and Mark Watson prepared. It didn't work very well in the 1991 recession, so they stopped doing it after that.

And it didn't work for fairly typical reasons. That was the first recession that wasn't accompanied by a decline in productivity, so it looked somewhat different. So their historical relationships weren't as stable as they hoped.

That's one of the main reasons why automatic rules haven't worked. People have done research on the machine approach for years. In fact, when I was a graduate student and took a computer science course, my project was to write software that would automate this. So it's not a new idea. But it's never worked very well.

Region: It would have missed the 1981 recession if we'd used the two negative GDP quarters rule.

Hall: You mean 1980.

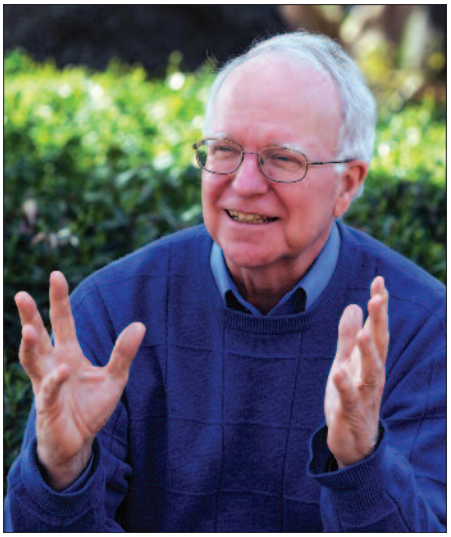
Region: Right, 1980.

Hall: 1981 was no problem. The 1980 recession was just one quarter. And people have said that the 1980 recession was actually just sort of a prelude to the '81 recession. We say no, but it's been said.

Region: It seems it's more of an art than a science then.

Hall: It's a classification problem that the world seems to want an answer to, but it has a shifting structure, and dealing with the shifting structure is the issue. We try very hard to achieve historical continuity.

We don't doubt for a second—and I don't think anyone else does either—that we know when there's a recession. In all the data we look at, certainly in the period when we've had reliable data, which is since World War II, there's never been an episode that's somewhere halfway between a recession and a nonrecession. Every recession has been clear. And they all see unemployment shoot up and typically see GDP decline.



Historical relationships weren't as stable as ... hoped. That's one of the main reasons why automatic rules haven't worked. ... It's a classification problem that ... has a shifting structure, and dealing with the shifting structure is the issue. We try very hard to achieve historical continuity.

The complication in the 2001 recession is that productivity rose enough to offset employment declines, so we have a very pronounced, obvious recession in employment and what's hardly a recession at all in GDP. ... That's material today because, of course, we're seeing the same thing.

We do face issues though. With the most recent revisions of GDP, the 2001 recession essentially doesn't exist. It was a flattening, but as emphasized on our Web site, there are issues of depth, duration and dispersion, but there was neither depth nor duration in what happened in '01. By the alternative measure of total output, real gross national income, the 2001 recession is quite apparent.

To me, it's not an issue because that's just looking at GDP. If we look at employment, as I did in a 2007 Brookings paper on the "Modern Recession,"—by "modern recession" I mean one in which productivity rises…

Region: And monetary policy is under control.

Hall: Monetary policy is stable, exactly. But here I think the key point is about productivity. With rising productivity in a recession, you can see a relatively mild movement in GDP, and there's a long period of GDP growth at the same time that employment is falling.

When people talk about the jobless recovery, it's just another term for productivity growth. That's complicated the process. The complication in the 2001 recession is that productivity rose enough to offset employment declines, so we have a very pronounced, obvious recession in employment and what's hardly a recession at all in GDP.

I'm perfectly satisfied that's a recession because I want to balance the two. To the extent you look just at GDP, though, it would be hard to call that a recession.

That's material today because, of course, we're seeing the same thing. GDP reached a very pronounced trough in the summer of 2009. It's been pretty consistently rising—with one little hiccup recently—since then. So on that standard, we say the trough was in summer of '09 or maybe the fall of '09.

But employment is still declining. We still have not seen a growth month. Everyone is presuming that we will in March—but that'll be the first. You can plausibly make the trough of GDP be in June of '09, but the trough of employment is probably going to be March of 2010. That's a long time.

Not as bad as '01, when the situation was even worse. The trough in employment didn't occur until 2003.

STOCK MARKET VALUATION

Region: Let me ask about the stock market. Roughly a decade ago, you did a lot of work on eCapital, eMarkets and stock market valuation. Your 2001 Richard Ely lecture was an example of that. And you suggested that investors did seem to be fairly estimating the market's value if intangible capital was taken into account. Is that accurate?

Hall: Well, I talked about some individual cases where I thought you could tell the story. There was a discussion of eBay in the Ely lecture. On the other hand, if you look at the results in my *AER* [*American Economic Review*] paper, it observes that intangible capital by that measure was deeply negative in the mid-'70s to about 1980. Now, positive eCapital makes a lot of sense, but negative eCapital is a little hard to swallow. So I'd be careful.

There was something weighing down the stock market from basically 1974 to 1990. eCapital turned positive in 1990. So during that period, there was some undervaluation. It was very clear the stock market later decided it was an undervaluation because if you made a stock market investment in 1980 and held it to 1999, you had a very large excess return in the 20-year period. So I think there are still some mysteries.

In spite of the fact that the valuation that we see in the market right now seems to be in a reasonable range, the returns since 1999 have been way below any benchmarks, which suggests that there was some overvaluation then.

INTELLECTUAL PROPERTY

Region: You've thought and written a great deal, in both technical and lay publications, about the economics of computers and software, as well as venture capital and entrepreneurs. That seems natural given that you were born in Palo Alto and have worked here for a long time.

Hall: Flora Hewlett, married to the Hewlett of Hewlett-Packard, was my father's secretary when he was a Stanford professor. If only he'd bought one share!

Region: You've also devoted some time to studying antitrust economics, and looking at potential for monopoly pricing in upstream supplier markets.

What is your view of the argument that intellectual property, copyright laws and patents inhibit rather than encourage innovation?

Hall: First of all, I think that that's only been directed at patents. I don't think there's any feature of copyright law. It protects the expression. There's an infinite space of melodies that composers can compose and once they do, it doesn't inhibit other composers from composing other songs because there's this infinite space. Every expression is completely unique, so when it comes to expression, I don't think there's any real issue. I

More About Robert Hall

Current Positions

Robert and Carole McNeil Joint Senior Fellow, Hoover Institution, and Professor, Department of Economics, Stanford University; joined faculty in 1978

Previous Positions

Massachusetts Institute of Technology, Professor, 1970–78

University of California, Berkeley, Assistant Professor, 1967–70

Professional Affiliations

President, American Economic Association; President-elect, 2009; Vice President, 2005; Ely Lecturer, 2001

Director, Research Program on Economic Fluctuations and Growth, National Bureau of Economic Research, since 1977; Chairman, Committee on Business Cycle Dating

Member, National Academy of Sciences, since 2004

Member, Advisory Committee, Congressional Budget Office, since 1993

Member, Oversight Panel for Economics, National Science Foundation, 1989; Advisory Panel for Economics, 1970–72

Honors and Awards

Fellow, American Academy of Arts and Sciences, Econometric Society and Society of Labor Economists

Hall of Fame, *Money* magazine, with co-author Alvin Rabushka for their book *The Flat Tax*

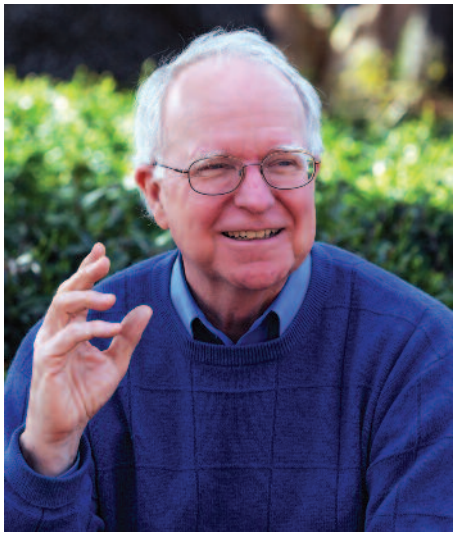
Publications

Author of *Forward-Looking Decision Making: Dynamic Programming Models Applied to Health, Risk, Employment, and Financial Stability* (Princeton University Press, 2010), *Digital Dealing: How eMarkets Are Transforming the Economy* (Norton, 2002), *The Flat Tax* (with Alvin Rabushka, Hoover Institution Press, 2d ed., 1995) and *The Rational Consumer: Theory and Evidence* (MIT Press, 1990), among other books. Widely published in academic journals, with research focused on employment, technology, competition and economic policy

Education

Massachusetts Institute of Technology, Ph.D. in economics, 1967

University of California, Berkeley, B.A. in economics, 1964



Patents shouldn't last forever. The idea of a finite patent life, which is currently around 20 years, does seem to be an important part of the design.

The result of that is that the great majority of innovations ultimately benefit workers in the form of higher wages rather than any permanent stream of monopoly profits going to owners.

think almost everyone believes in a pretty powerful IP rights regime for expression.

When it comes to the things that patents protect, then the patent regime has to do the things that the patent regime claims to do. The patent has to be original; it has to be an innovation. And there the standard of obviousness comes in.

If what's happening is that people are somehow able to figure out what the obvious next logical step is and somehow get a patent on that and then collect royalties from that patent even though it doesn't really make any contribution, then there's something wrong with the patent regime. But I don't think there's any very good evidence that that's actually what's happened.

People make fun of a lot of the patents that the patent office issues, but they don't matter. There's only a much smaller set of patents that have ever attempted to be enforced and have caused any problems. On the other hand, the patent system has generated some very substantial rewards to some true innovations.

You know, it's all in the details. I don't accept a broad condemnation of the patent system. I don't join any of these people who say there shouldn't be any business process patents or there shouldn't be software patents. Some good ideas are implemented in software.

What is a good idea, and what everyone stands by, I think, is the notion that patents shouldn't last forever. The idea of a finite patent life, which is currently around 20 years, does seem to be an important part of the design.

The result of that is that the great majority of innovations ultimately benefit workers in the form of higher wages rather than any permanent stream of monopoly profits going to owners. If that weren't true, you'd see a huge amount of innovation value capitalized in the stock market, but you don't, and that's proof. Consistent productivity growth and corresponding real wage growth is demonstration then that the benefits ultimately of innovation are going to workers. So it's a great thing.

THE STATE OF ECONOMICS

Region: The past few years seem to have brought about a crisis of confidence in the economics profession, with critics suggesting that macroeconomics has failed in some fundamental way. It's a topic addressed by [Minneapolis Fed President] Narayana Kocherlakota in our *Annual Report* this year. Do you agree that the macro profession failed the nation during the financial crisis?

Hall: I don't. There are two parts to the issue. First, did macroeconomists fail to understand that a highly levered financial system based in large part on real-estate debt was vulnerable to a decline in real-estate prices? No way. Many of us pointed out the danger of thinly capitalized banks. We had enthusiastically backed the idea of prompt corrective action in bank regulation, so that banks would be recapitalized well before they became dangerously close to collapse. We watched in frustration as the regulators failed to take that action, even though they had promised they would.

Second, did macroeconomists fail to understand that financial collapse would result in deep recession? Not at all. A complete analysis of that exact issue appears in an extremely well-known and respected chapter in the *Handbook of Macroeconomics* in 1999, written by Ben Bernanke, Mark Gertler and Simon Gilchrist. Depletion of the capital of financial institutions raises financial frictions to levels that distinctly impede economic activity. In particular, credit-dependent spending on plant, equipment, inventories, housing and consumer durables collapses. That chapter is an excellent guide to the depth of the current recession.

Region: Thank you for a great conversation.

—Douglas Clement
March 16, 2010

Awash in Cash

Why do Chinese banks, swimming in savings, invest in U.S. Treasury bills when rates of return are far higher at home? The answer may lie in disparity among Chinese firms in productivity and access to credit

Douglas Clement
Editor

In recent decades, few phenomena have been as globally significant as China's astonishing economic transformation. Over a matter of years, it has transitioned from a poor nation dominated by small farmers and enormous, plodding state-owned enterprises into a dynamic economy where private companies shape international markets and annual GDP growth surges past expectations. As this is written, economists predict that China will soon eclipse Japan as the world's second-largest economy, and it is arguably only a matter of time before the United States, too, places second.

Also remarkable is how China's growth patterns have usurped several core predictions of conventional economic theory. Standard models suggest that capital will flow to where it can be used most profitably; if rates of return are higher in productive country A than in low-productivity country B, capital will flow to A. The same thought applies to companies: Lenders will invest in productive firms that promise higher returns.

But in reality, fast-growing, highly productive China sends an enormous amount of resources to other countries—most notably by buying U.S. Treasury bills, though they pay very little interest—when companies within China could put those resources to use by investing in profitable domestic firms with far higher rates of return. Surprisingly, within the nation, bank loans tend to flow to firms that are relatively unproductive—an inefficiency that is one of the few apparent brakes on China's otherwise unrelenting economic expansion.

What explains these anomalies? Political commentators often argue that the foreign surplus occurs because China manipulates exchange rates, holding the yuan at an artificially low level to the dollar so as to curb spending on imports while flooding foreign markets with underpriced Chinese exports. But recent research by Minneapolis Fed senior economist Kjetil Storesletten and his colleagues provides a simpler explanation, one that relies on disparities among China's firms in their relative productivity and access to credit. Their story, fashioned into a mathematical model, provides a close match to the data patterns seen in China's economy over the past 20 years and suggests that China's growth experience and growing surplus must be understood in light of the structural change the country is going through.

A theory of structural change

In "Growing Like China," forthcoming in the *American Economic Review*, with coauthors Zheng Song of Fudan University and Fabrizio Zilibotti of the University of Zurich, Storesletten proposes a "theory of economic transition" that accounts for both the growing foreign surplus and the high growth/high return to capital that China has experienced in recent decades.

"What motivated this work," said Storesletten in a recent interview, "was that we were totally puzzled

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by two observations. Number one: The rate of return from capital in China is very, very high. That has been shown to hold true if you look at aggregate data or micro data. And number two: At the same time, China is building up a huge surplus [of savings]. So why on earth would a country buy low-paying T-bills instead of exploiting the high rate of return on capital?"

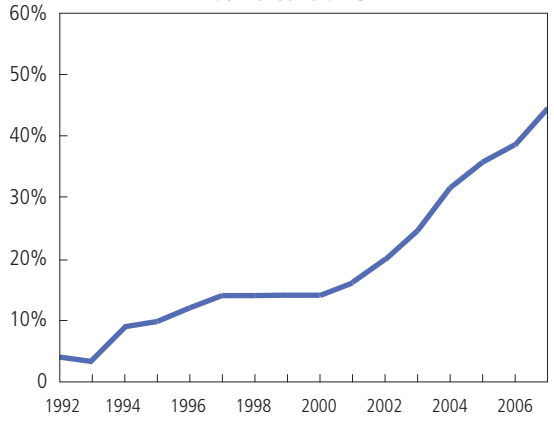
According to neoclassical theory, a country with a high domestic return to capital should attract large capital inflow from investors in other nations. But China has manifested the opposite. Indeed, foreign reserves soared from $21 billion in 1992 to $2,130 billion in 2009.

Of course, China's economy grew at a blistering pace during those years; perhaps the rapid growth in foreign reserves simply represents a constant share of growing economic output. No, the surplus grew faster than the economy itself; in 1992 the surplus/GDP ratio was 5 percent, but by 2009 it was 46 percent (see Chart 1).

"That puzzled us," said Storesletten, "and motivated us to write down a model that asked, 'What if China's savers just cannot get the good investments?' That idea pushed us in a certain direction, and along the way we discovered a bunch of other very interesting facts."

Chart 1.

Chinese Foreign Reserves as Percent of GDP



Source: Song, Storesletten and Zilibotti, "Growing Like China," 2010

In Brief

A Chinese puzzle

- Though their funds could earn much higher returns if invested domestically, Chinese banks invest overseas in low-yield investments like U.S. Treasury bills. Recent research suggests the explanation to this paradox may lie in firms' differential access to bank credit, as well as different levels of productivity.
- The economists theorize that financial constraints limit credit access of productive entrepreneurial firms, while large but unproductive firms have access but don't need funds. Lacking viable domestic opportunities, banks invest overseas.
- The economists' empirical simulations largely support this theory, with a close match between model predictions and actual data trends over the past two decades.

Very interesting facts

The economists document a number of intriguing empirical realities about China, trends that contrast strongly with economic growth in most other nations. For example, in the United States and Europe, wages have tended to grow at about the same rate as output per worker, Storesletten observes, but in China, the wage rate has increased far less than the value added by workers. So "it is very clear that the pattern of growth is very different from anything that we've seen."

Of course, this pattern grows out of another set of very special circumstances. Until the early 1990s, virtually all industry and all economic activity in cities were state owned. Private industry was essentially absent. But in the aftermath of the Tiananmen Square uprising in 1989 and following Deng Xiaoping's Southern Tour in 1992, the Chinese government began to let private enterprise emerge in every aspect of the economy *other* than the financial sector. (See the Focus on China articles in the December 2003 *Region* online at minneapolisfed.org.)

As a result, investment rates have been exceptionally high, nearly 40 percent. One would expect that over time rates of return on that investment would begin to fall as the most profitable opportunities become saturated. Yet in China, "the rate of

Kjetil Storesletten

PHOTOGRAPH BY MARC NORBERG

return to capital in manufacturing has been increasing since the early 1990s," write the economists, citing an estimate close to 35 percent in 2003.

Ironically, while corporate rates of return are very high, bank savings accounts have yielded little for individuals, just above 0 percent interest. Nonetheless, the Chinese save at incredibly high rates; some estimates put the figure as high as 40 percent of disposable income. Storesletten suggests that the reasons lie in China's huge structural transition that removed the social safety net on which many had relied.

"People are saving like crazy in China. An important reason is that the environment is much riskier than in the 1980s." Why riskier? Because state-owned firms began to shed workers, and private companies who hired them provided fewer benefits and less job security.

"When you look at these numbers, it's just stunning," said Storesletten. "In manufacturing, for example, the share of the labor force employed by private employers was less than 10 percent as late as 1994, and it's above 60 percent now. For the urban sector as a whole, the growth is even larger. So we're really seeing a very rapid change from state-owned firms toward private firms." In less than 15 years, firms change ownership, companies close down and more are created. "Workers find themselves shifted from safe jobs in state-owned firms to a highly uncertain environment with private employers."

And while workers' wages grew during this time span, they didn't increase at the same pace as labor productivity or per capita GDP (for low- to medium-skilled workers, real wages grew about 6 percent annually from 1992 to 2004 compared with 9 percent real GDP per capita growth. Moreover, entrepreneurial earnings grew far faster than wages did, resulting in growing inequality—another salient feature of China's economy.) "Suddenly, people have very risky wages; pensions become highly uncertain. People needed to save a lot more. You would see increased savings rates, not only for the young, but also for the old."

As a result, banks began to accumulate more and more savings deposits, while their primary borrowers, state-owned firms, were taking out fewer loans as their share of production rapidly declined. "So the banks then become awash in cash," observes Storesletten. "And what do they do? They buy T-bills."

A Chinese model

The facts are striking, and at odds with conventional wisdom regarding capital flows both to and within China. How then can theory be refined to explain China's economic transition?

The economists devise a model with two types of companies. Both use capital and labor to produce output, of course, but they differ starkly in their access to financial markets and their levels of productivity. The first type of company, termed "financially integrated," has access to funding from banks that are closely linked to international financial markets. The other type, the "entrepreneurial" firm, *does not* have access to bank credit but *does* have superior skills and operates more productively than the financially integrated firms do.

The fact that the entrepreneurial firms are credit constrained allows the less productive financially integrated firms to survive, at least for a while. But it involves an assumption about how firms are managed. In entrepreneurial firms, the owner achieves greater productivity by delegating authority to a manager and pays the manager a higher wage to deter the manager from stealing output.

"The key assumption is that entrepreneurs are better at monitoring their managers," write the economists. Financially integrated firms are assumed to be weak at corporate governance and supervision of managers, so they always choose centralized organization. This makes them less efficient in exploiting their resource inputs.

How realistic are these assumptions—that firms differ in productivity and in access to credit markets—with regard to China? In their discussion of this question, the economists note that the natural empirical counterparts of the model's entrepreneurial companies and financially integrated firms are, respectively, China's private firms and its state-owned enterprises.

The latter are large, historically dominant companies that have achieved their supremacy through explicit government policy. Highly bureaucratic, they grant little autonomy to management; incentives are

largely unconnected to productivity. "This feature is well documented," report the economists, referring to research showing that profit-linked compensation schemes are rare in state-owned enterprises. Evidence also supports the easy access these enterprises have to loans from state-owned banks.

In contrast, private firms in China have little access to credit from government banks and so rely heavily on self-financing. Why so little access to bank credit? While their paper isn't an empirical investigation, the economists refer to numerous studies documenting that "private firms are subject to strong discrimination in credit markets."

The historical and political traditions that guide relationships between state-owned enterprises and the Communist Party are decisive in lending judgments made by state-owned banks, and the latter control the vast bulk of China's banking sector assets. As Loren Brandt and Xiaodong Zhu wrote in *The Region* several years ago, "The overriding objective of the state banking system has been to provide resources for the state sector." (See "What Ails China?" in the December 2003 *Region* online at minneapolisfed.org.) In addition, the economists write, "the assumption that monitoring is easier within flexible organizations—and most notably in family firms—seems natural."

In any case, "the essential feature of our model's reallocation mechanism is that financial and contractual frictions obstruct the flow of capital towards highly-productive entrepreneurial firms." Were this not the case—if productive entrepreneurs had easy access to credit in China—"the transition would occur instantaneously. … The fact that entrepreneurs must rely on their own savings implies a gradual transition."

A mechanism with friction

The rapidity with which China has transformed suggests that "gradual" is a relative term—the upheaval of the economy and society has been breathtaking. But the economists' model, with credit constraints binding entrepreneurial activity, faithfully follows the outlines of the country's actual historical trend.

In the model, entrepreneurs can't borrow freely, so they're limited in the amount of capital they can acquire. Instead, they hire labor that is readily available at a low price both from the Chinese agricultural sector (witness the massive rural-to-urban migration in recent years) and from state-owned enterprises. With easy access to workers but restricted from borrowing, entrepreneurs operate at far lower capital/labor ratios than do financially integrated firms.

As the model's entrepreneurial firms hire workers, their share of the total employment pool rises, as in Chinese reality. At the same time, investment in financially integrated firms slows, since the highly productive entrepreneurial firms accumulate capital and account for more and more economic output. In addition, the model's math shows that as resources are reallocated toward more efficient entrepreneurial firms, the growth rate of GDP per worker accelerates, and the average rate of return to capital increases as well.

And finally, the model simulates a growing foreign surplus—the starting point for much of this exercise. As investment in financially integrated firms declines, banks see less demand for domestic loans. The government's prohibition of bank lending to privately held firms—a key friction built into the mathematical model—means that entrepreneurs must use retained earnings, not bank loans, to finance expansion.

At the same time, the nation's savings rate increases because entrepreneurs get richer and they save a large share of their income. "Both forces contribute to the growing foreign surplus during the transition," the economists write. And indeed, even though economic output is increasing rapidly, the foreign surplus climbs even faster, leading to a rising foreign surplus/GDP ratio.

Thus, at least in a qualitative sense, the model successfully mimics much of China's actual growth experience: The rate of return from capital doesn't fall, entrepreneurial firms are less capital intensive than financially integrated firms, factors of production reallocate from integrated firms to entrepreneurs, the economy runs a long-term foreign surplus and inequality increases between workers and entrepreneurs.

The economists point out that the model also

sheds light on the experience of other recent "economic miracles." "In spite of important differences," they write, "the 1980s experiences of Korea and Taiwan share some commonalities with the recent development of China. All featured a pronounced reallocation within the manufacturing sector characterized by a strong growth of credit-constrained high-productivity firms. The reallocation was accompanied … by an acceleration in productivity growth and foreign surplus. These features are consistent with the predictions of our theory."

And do the numbers match?

It's impressive when a mathematical model can follow the general *qualitative* outline of an empirical reality—when the laboratory formulas operate consistently with the world itself. But to truly prove its worth, a model must account for the *quantitative* facts—that is, once calibrated to resemble the economy in question, the theoretical model should be able to generate numerical values close to those seen in reality.

Here the economists' model also largely succeeds. In particular, it captures well the rise in private employment, the rise in foreign surplus and the time trends seen in China for investment rates, aggregate savings rates and overall productivity.

They begin by calibrating the basic model to match China's overall economic structure over the past 15 years. The most important aspect of the quantitative model is to set parameters so that the model replicates the empirical differences in rates of return to investment and the capital use in entrepreneurial firms versus financially integrated firms in China.

The calibrated model is then put through repeated computer runs to generate values at different points in time for four key variables:

- the fraction of the (urban) labor force employed by entrepreneurial firms
- the aggregate savings rate
- the net foreign surplus
- the aggregate rate of productivity (referred to as TFP, or total factor productivity)

The accompanying graphs indicate that the model does indeed generate values that closely match trends in actual data, suggesting that the theory behind the model may well explain China's otherwise puzzling economic transition.

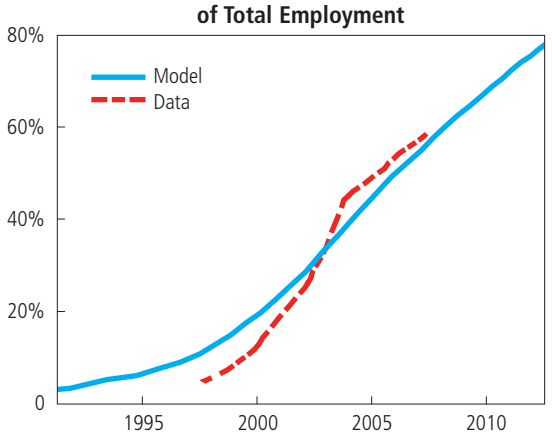
The first empirical fact is that workers have shifted in increasing numbers from state-owned enterprises to private firms. In Chart 2, the solid blue line represents the results from the model over a long time period; the dashed red line shows a very similar rising trend in actual data from 1998 to 2007 in the share of total employment in private firms. The model successfully matches the data—or as the economists put it: "The calibrated economy generates a speed of employment reallocation comparable to its empirical counterpart."

Second, the model does "remarkably well" at matching data trends in China's overall savings rate. Chart 3 shows a solid blue line for the model's predictions and a dashed red line for actual data on savings rates. The data indicate that early in the 1990s savings rates actually decline for a while and then rise beginning in 2000 or so. The model generates a similar U shape, with a decline and then a sharp rise that is driven by the rapid reallocation of resources to the entrepreneurial firms whose owners and managers have high savings rates.

Third, the dramatic climb of foreign reserves as a fraction of GDP, seen in Chart 1 on page 40, is duplicated as the dashed red line in Chart 4 along with the model's values as a solid blue line. The match is close but not perfect, note the economists; the model runs a bit higher than reality until 2002 and then underestimates from 2003 to 2007. "Interestingly," they observe, "the model predicts an acceleration in the foreign surplus from 2007 onwards," due to a sustained increase in savings rates paired with a declining rate of domestic investment.

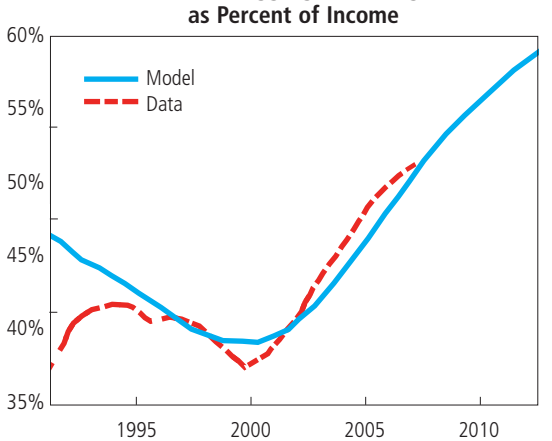
A fourth measure of success for the model regards growth in productivity, or TFP. Chart 5 shows a solid line to represent the model's estimates for TFP growth over the time period. While precise trend data aren't available, the economists write that their results are broadly consistent with recent empirical estimates. The model generates an annual TFP growth rate of 5.9 percent; a 2008 study estimates the figure at about 6.1 percent, and 2009 research provides a range between 4 percent and 7.7 percent.

Chart 2. **Chinese Private Firm Share of Total Employment**



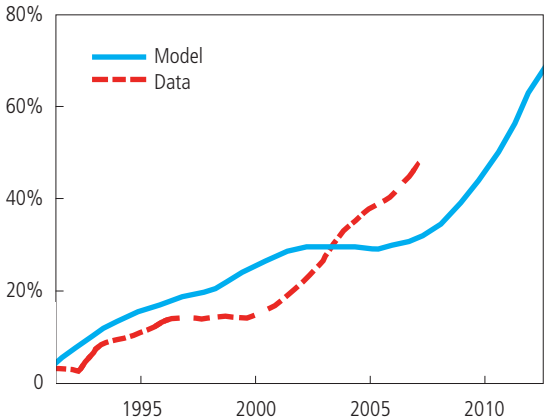
Source: Song, Storesletten and Zilibotti, "Growing Like China," 2010

Chart 3. **Chinese Aggregate Savings as Percent of Income**



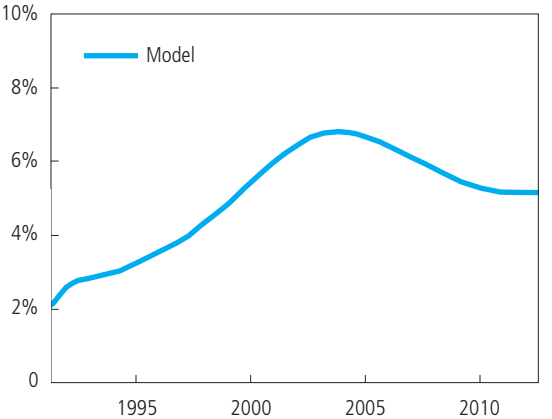
Source: Song, Storesletten and Zilibotti, "Growing Like China," 2010

Chart 4. **Chinese Foreign Reserves as Percent of GDP**



Source: Song, Storesletten and Zilibotti, "Growing Like China," 2010

Chart 5. **Total Factor Productivity Growth Rate in China**



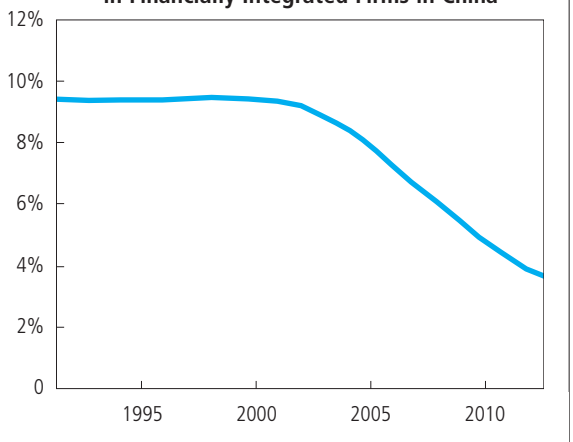
Source: Song, Storesletten and Zilibotti, "Growing Like China," 2010

Weaknesses and future work

The model doesn't succeed in all respects. While it matches some empirical estimates on the proportion of this TFP growth due to reallocation of resources from inefficient financially integrated firms to efficient entrepreneurial firms (about 4.2 percentage points, or 70 percent of the 5.9 percent TFP figure), it is far higher than another estimate. Notes Storesletten: "The biggest shortcoming is that it looks like we get very high TFP growth due to reallocation, perhaps a bit more than is believable."

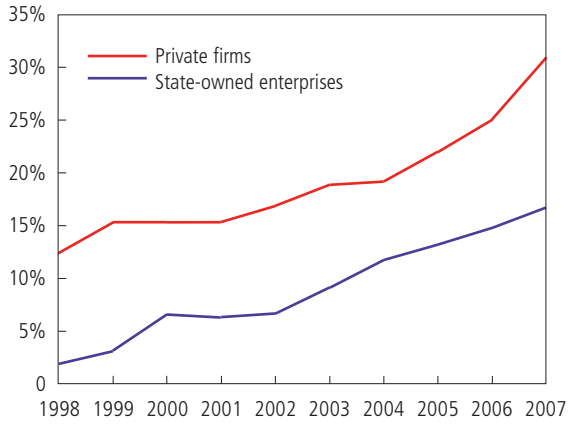
The model also misses in estimating average rates of return in both state-owned and private firms. The model generates a decline in the rate of return from investing in, for example, financially integrated firms (see Chart 6), but the data indicate that rates of return actually increased substantially from 1998 to 2007 for both state-owned enterprises

Chart 6. **Model Estimated Rate of Return in Financially Integrated Firms in China**



Source: Song, Storesletten and Zilibotti, "Growing Like China," 2010

Chart 7. **Actual Rates of Return for State-Owned and Private Firms in China**



Source: Song, Storesletten and Zilibotti, "Growing Like China," 2010

and private firms (see Chart 7).

The economists suggest that this weakness may be due to their model not accounting for reallocation *within* each type of firm; that is, average profitability of private firms or of state-owned firms should grow as less productive companies of each type exit their respective industries. Indeed, an extension of the model in a later section of the paper does just this for financially integrated (or state-owned) firms. "We do explore some heterogeneity within financially integrated firms," observes Storesletten. "But that's an important limitation that we need to explore further."

Even with these limitations, the model and the theory that underlies it have clear implications. China's foreign surplus, driven by imperfect domestic financial markets, will continue to grow as long as large state-owned enterprises leak their workers to private firms and entrepreneurs are prohibited from borrowing from banks. If, however, the Chinese government were to instruct state-owned banks to start lending to private firms, this would reverse the foreign surplus position and increase both wage and GDP growth as labor and capital become allocated more efficiently.

While the policy implications seem clear, the political reality is far different, as Storesletten well knows. Still, China has seen massive political as well as economic transformation over the past 20 years, and liberalization of bank lending—though far from the current trend in Western nations—is a conceivable reality for the world's most dynamic economy. R

Far Afield?

Capital flows and China haven't been central to Storesletten's research agenda. That could change

International capital flows are a departure for Kjetil Storesletten, to some extent. Most of his research has focused on labor economics, risk sharing and asset pricing, and with Jonathan Heathcote and Giovanni Violante, he has explored the importance of heterogeneity to quantitative macroeconomics. (See "We Beg to Differ" in the June 2009 *Region* online at minneapolisfed.org.)

But in 2006, he met co-author Zheng Song when teaching a short Ph.D. course in economics at China's Fudan University. The two then collaborated with Fabrizio Zilibotti of the University of Zurich on "Rotten Parents and Disciplined Children," developing a theory of government expenditure and public debt that merges politics and economics. Later, the three began to explore the puzzles behind "Growing Like China"—wondering why a country with such a profitable but credit-constrained entrepreneurial economy was investing enormous sums in low-yield U.S. Treasury bills.

In this, the economists were guided by the research of others. "One paper that we have been very much inspired by was done by Chang-Tai Hsieh and Peter Klenow," noted Storesletten. "In some sense, our whole model started with [their work, which] looked at micro data and computed TFP [total factor productivity] for each firm and how constrained each firm is in terms of capital. They found, for example, that state-owned firms have much easier access to credit and private firms that are very efficient have little access to credit." The Hsieh-Klenow paper estimated that if capital and labor were allocated more efficiently in China, manufacturing productivity would climb between 30 percent and 50 percent. (For a broader look at Klenow's work, see "Price Signals" in the September 2003 *Region* online at minneapolisfed.org.)

Song, Storesletten and Zilibotti's research was also influenced by an important body of economics literature examining capital flows between rich and poor countries. In a famous 1990 paper, Robert Lucas asked, "Why Doesn't Capital Flow from Rich to Poor Countries?" as neoclassical theory predicts. "This is a central question for economic development," wrote Lucas, and four possible answers he discussed briefly have formed a research agenda for many economists.

Capital allocation

An influential article in this literature by Pierre-Olivier Gourinchas and Olivier Jeanne suggests that capital flows among poor countries themselves are also quite puzzling. "[A]llocation across developing countries is the opposite of the predictions of standard textbook models," they wrote. "Capital does not flow more to the countries that have a higher marginal product of capital."

It's "a beautiful paper by Gourinchas and Jeanne, a twist on the Lucas puzzle," observed Storesletten. "[They] show that the countries that have fast TFP growth are precisely the countries that are running surpluses. And developing countries that have low TFP growth are running deficits. They call that the capital allocation puzzle."

Song, Storesletten and Zilibotti turn the focus on China precisely because it is one of the world's *most* productive developing countries yet runs one of the world's *largest* surpluses by sending capital to the world's richest nation. And while none of Storesletten's other research to date has dealt with China, it's clear he's been hooked since he began to learn more about its economy. "Honestly, I find it very difficult *not* to be interested in China," he said.

And as China grows as an economic, cultural and political power, that's likely to be true for us all.

—Douglas Clement

Too Big to Forget

A research conference at the Minneapolis Fed honors the legacy of former President Gary Stern

Gary Stern was a tolerant boss. That, perhaps, was the overarching theme of the April 23-24 conference held at the Minneapolis Fed to honor the former bank president and author, with Ron Feldman, of the prescient 2004 book *Too Big to Fail*.

More specifically, the theme was that Stern's tolerance and patience made the Minneapolis Fed a great incubator of economic research during his 24-year tenure as president. Good research takes time and doesn't benefit from bureaucratic interference. Academics can be testy, and if you pester them about their output, they might pack up and head to a more hands-off environment. There are few places outside a university where academic freedom flourishes, and an organization like the Federal Reserve probably doesn't seem that it would be such a place.

But as a Ph.D. economist himself, Stern recognized that creating such an atmosphere was essential for allowing his research staff and consultants to generate ideas that would inform good policymaking. He also knew it was important to nurture the partnership between the Minneapolis Fed's research department and the economics department at the University of Minnesota that first developed in the 1970s.

To thank Stern for his own contributions to economic thought and for nurturing the work of other economists, alumni of that partnership gathered at the Minneapolis Fed to present recent research on macroeconomics, finance and monetary policy. "It's a strange gift to somebody to make him sit through two days of research," said Thomas Sargent, professor at New York University and a member of the University of Minnesota faculty and Minneapolis Fed adviser in the 1970s and '80s; Sargent himself was instrumental in developing modern macroeconomics.

Sargent's joke drew big laughs from the crowd, many of whom came a long way to Minnesota on a cold, rainy weekend precisely to sit through research presentations. Since much of Stern's career was devoted to ideas, the conference was hardly a white elephant for him or other attendees, especially because most of the presentations related to ideas in his work, topics which happen to be very much in the public eye since the financial crisis.

For example, Saturday's first presentation, by University of Minnesota professor and Minneapolis Fed consultant V. V. Chari, was of a model of bank bailouts Chari developed with Patrick Kehoe of the Minneapolis Fed and Princeton University. In this model, the government would prefer not to bail out failing financial institutions, but will do so when actually confronted with a failure. This inconsistency creates a "moral hazard" problem in which banks take on more risk than they would if the government could truly commit to and follow a no-bailout policy. Chari and Kehoe argued that this dilemma implies a role for regulation beforehand. The paper essentially formalizes some of the ideas in Stern and Feldman's book.

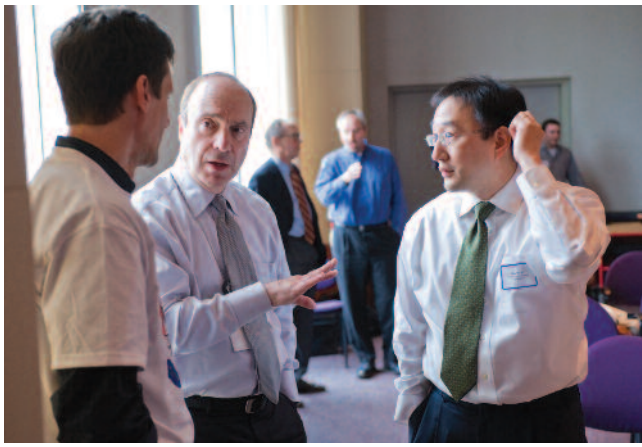
Though presentation topics ranged from Social Security and retirement finance to changes in productivity in cement manufacturing, the macroeconomic effect of financial crises was the major focus. The Minneapolis Fed's Warren Weber gave a historical account of pre-Civil War bank insurance systems and their effects on moral hazard. Other presenters on bank crises included John Boyd of the University of Minnesota, who discussed how to measure crises accurately, Cristina Arellano of the Minneapolis Fed on the effect of financial crises on firm growth rates and Urban Jermann of the University of Pennsylvania on macroeconomic models with financial shocks.

Naturally, the event wasn't all research. At the end of the first day, a party featured a roast of Stern and a dinner with speeches by both Stern and current Minneapolis Fed President Narayana Kocherlakota. To see the full agenda as well as draft papers and slides, visit minneapolisfed.org/research/events/2010_04-23/index.cfm.

—Joe Mahon

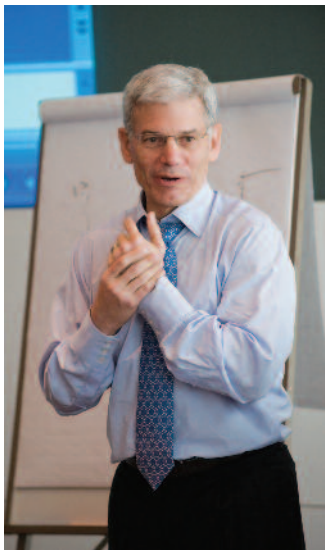
Gary Stern

Robert Lucas,
University of Chicago



Andrew Atkeson, UCLA; Arthur Rolnick, Minneapolis Fed;
Kei-Mu Yi, Philadelphia Fed

Neil Wallace, Pennsylvania State University;
Thomas Sargent, New York University



Robert Litterman,
Goldman Sachs Group

Edward Green, Pennsylvania State University

Ellen McGrattan, Minneapolis Fed;
Edward Prescott, Arizona State University

Warren Weber, Minneapolis Fed

Research Digest

The Region often includes one or two articles about economists at the Minneapolis Fed and their current work. Research Digest is a new *Region* feature that provides shorter summaries of recent economic research papers.

In this issue, the Digest discusses work by Fatih Guvenen and colleagues on the interplay of tax policies, wages and incentives to increase human capital; and by James Schmitz and his co-authors on how cartels can diminish productivity.

Taxes, Wages and Human Capital

Progressive tax policies decrease before-tax wage inequality, suggests research by Fatih Guvenen and colleagues, by diminishing motivation to acquire higher education and job skills.

If a country adopts tax policies with the aim of reducing economic inequality, might that policy unintentionally undermine other policy objectives like widespread higher education and better job training? Indeed, can efforts to reduce inequality result in lower GDP—an actual decline in economic well-being? More broadly, what determines wage dispersion in modern economies, and how do those determinants interact with technological progress and government policies?

These are the questions addressed by Minneapolis Fed visiting scholar Fatih Guvenen and colleagues in Staff Report 438, "Taxation of Human Capital and Wage Inequality: A Cross-Country Analysis." Their answer, in a nutshell: "Government policies can strongly influence the response of an economy to technological change by distorting individuals' incentives to undertake human capital investment, which keeps inequality low but at the cost of lower aggregate output."

PHOTOGRAPH BY STEVE NIEDORF

U.S.-European comparisons

Guvenen, with Burhanettin Kuruscu and Serdar Ozkan, analyzes wage trends to understand why wage inequality in the United States is substantially higher

Research Digest

An article on Fatih Guvenen's work on the equity premium puzzle appeared in the December 2009 *Region*.

Their answer, in a nutshell: "Government policies can strongly influence the response of an economy to technological change by distorting individuals' incentives to undertake human capital investment, which keeps inequality low but at the cost of lower aggregate output."

than in Europe and why the U.S.-European differential increased from 1980 to 2003. Their focus is on the impact of labor income taxes on determinants of wage inequality, especially on individuals' incentives to build human capital.

They begin by presenting some data. Averages for 1978-1982 show that wages at the 90th percentile in the United States were 3.8 times higher than those at the bottom 10th percentile, while in six European countries, the 90/10 ratio was 2.5. Two and a half decades later (2001-2005), wage inequality had jumped in the United States to a 90/10 ratio of 4.8, while the European inequality ratio was a modestly higher 2.7. In sum, U.S. wage inequality was higher and growing faster than in Europe.

There are many possible explanations for these trends, note the economists. Some of them, such as labor union activity and minimum wage laws, are likely to be most relevant for the lower end of wage distribution. But in recent years, they point out, most of the rise in wage inequality has appeared in the upper end of the distribution, suggesting that human capital plays a significant role. That observation motivates their focus on progressive taxation and human capital.

Taxes and inequality

Their first step is to document two empirical facts relating tax policies and inequality in the United States and Europe over recent decades.

Number one: They show that countries with more progressive tax schedules—meaning the tax rate is higher on higher wages—have significantly lower *before*-tax wage inequality. That is, even prior to taxes being taken out of paychecks, the high-to-low wage ratio is much lower in countries where tax schedules put a bigger bite on the rich. So in Finland, for instance, which has a very progressive tax schedule, the 90/10 ratio for wages before taxes is lower than in the United Kingdom, which doesn't tax higher wage earners so heavily compared with lower wage earners.

Number two: They document that progressivity in tax schedules is also negatively correlated with increases over time in wage inequality. So, in Finland and Sweden, both with very progressive tax rates, wage inequality grew more slowly from 1980 to 2003 than it did in the United States or United Kingdom, with far less progressive schedules.

Why would tax rates have an impact on wage inequality before taxes are even taken out of those wages? The economists focus on incentives to acquire human capital; in other words, they investigate whether workers facing a progressive tax schedule might realize they'll take home less of their wages if they earn more, and so make less of an effort to raise their earnings potential through more education or job training.

The economists then build a model of individual decision making. An individual can decide at each point in time—given wages, taxes, schooling costs and so on—whether to go to school, work at a job or be unemployed. They'll acquire skills in school or while working and thereby raise their earnings potential, but wage inequality can arise because people

Research Digest

differ in their ability to acquire new skills. In this model, individuals make a decision about what to do (school, work or unemployment) that's affected by wage tax schedules.

If after-tax earnings will be reduced by progressive tax rates, suggests the economists' model, individuals will be less motivated to earn more and therefore less motivated to acquire skills that raise their pay. "Progressive taxation compresses the (after-tax) wage structure, thereby distorting the incentives to accumulate human capital," write the economists. And that leads to the relationship found in the data: a negative correlation between progressivity and before-tax wage inequality.

Matching the data

And indeed, their model (which also incorporates national unemployment insurance and pension systems, as well as idiosyncratic shocks to worker efficiency) does a good job of matching the data, particularly at the high end of the earnings scale. Recall the economists' data showing that U.S. wage inequality was substantially higher than in European nations, especially in 2001-2005. The model generates a high U.S.-European inequality differential, too, accounting for about half of the difference found in the data. When focusing on inequality among higher wage earners (the 90/50 ratio as opposed to the 90/10 ratio), the model explains over three-quarters of the U.S.-European difference. This makes sense, say the economists, since taxes are likely to have their greatest impact on those who have acquired higher human capital. In contrast, institutions such as labor unions are likely to have a greater impact on wage differentials at the lower end of the wage distribution.

The model also does a reasonable job in explaining *trends* in wage inequality. Modeling for "skill-biased technological change"—that is, changes in workplace technology that raise earnings for those with higher skills such as computer literacy or management—the economists are able to generate trends similar to those seen in reality. Their model explains over 40 percent of the U.S.-European difference in rising wage inequality and nearly 60 percent of the difference at the higher end of the earnings scale.

Finally, the economists look at inequality trends when technology and tax progressivity both change. Focusing on Germany and the United States, they estimate that decreased U.S. progressivity in wage taxation during the 1980s and '90s explains a very large part of the increase in inequality over that period, and technology changes a far smaller portion. This observation is timely, given current debate about whether to increase progressivity in the U.S. tax schedule.

"The mechanisms studied … provide a promising direction for understanding [U.S.-European] differences in wage inequality," conclude the economists. "The most important policy difference for wage inequality is the progressivity of the income tax system, which is responsible for about two-thirds of the model's explanatory power. In addition, endogenous labor supply plays an important amplification role for wage inequality when interacted with progressivity."

—Douglas Clement

Research Digest

PHOTOGRAPH BY MARC NORBERG

The Bitter Effect of Cartels

In a case study of the U.S. sugar industry, James Schmitz and co-authors demonstrate that cartels can lead to big reductions in productivity.

The word "cartel" usually conjures dark images of drug lords or oil producers, but it can also apply to something as, well, sweet as sugar. In the United States, the government established a legal cartel of the sugar industry for four decades, and the effects of that cartel are the focus of a recent Minneapolis Fed staff report, "The Economic Performance of Cartels: Evidence from the New Deal U.S. Sugar Manufacturing Cartel, 1934-74 " (SR 437).

In economics, a cartel is any organization of producers or sellers of a good who collude to raise prices by controlling supply, effectively acting as a monopoly. Understandably, most research on cartels has focused on their ability to raise prices, but there are also reasons to believe they affect productivity.

First, in competitive markets, producers compete by driving down prices, but competition may also compel them to innovate, leading to increased productivity and economic growth. In contrast, a monopoly producer may have incentive to neither decrease price nor innovate.

Second, some cartels are government-organized, such as the U.S. sugar cartel and others set up in the 1930s as part of federal anti-Depression programs known collectively as the New Deal. Government planners might not be primarily concerned about productivity. The goal of most New Deal cartels, for example, was quite explicitly to prevent prices from falling.

While there is a lot of research on how monopolies and cartels influence prices, there is very little research on how they affect productivity.

A sweet case study

To help remedy this deficiency, James Schmitz of the Minneapolis Fed, along with Benjamin Bridgman of the Bureau of

Research Digest

In competitive markets, producers compete by driving down prices, but competition may also compel them to innovate, leading to increased productivity and economic growth. In contrast, a monopoly producer may have incentive to neither decrease price nor innovate.

Economic Analysis and Shi Qi of Florida State University (both former Minneapolis Fed research analysts), examined the U.S. sugar cartel. Unlike other New Deal cartels that were short-lived, the sugar cartel was in effect for 40 years, providing a wealth of historical evidence for economic research. Good measures of productivity for sugar refining are available, a further boon to research.

When the cartel was set up in 1934, it had two main features. First, there were provisions limiting the supply of sugar. In addition to import quotas, firms that refined sugar were given sales quotas, which in effect kept new firms from entering. To protect incumbent farmers from the entry of new farmers, the cartel agreement set acreage quotas for farmers that were tied to precartel acreage.

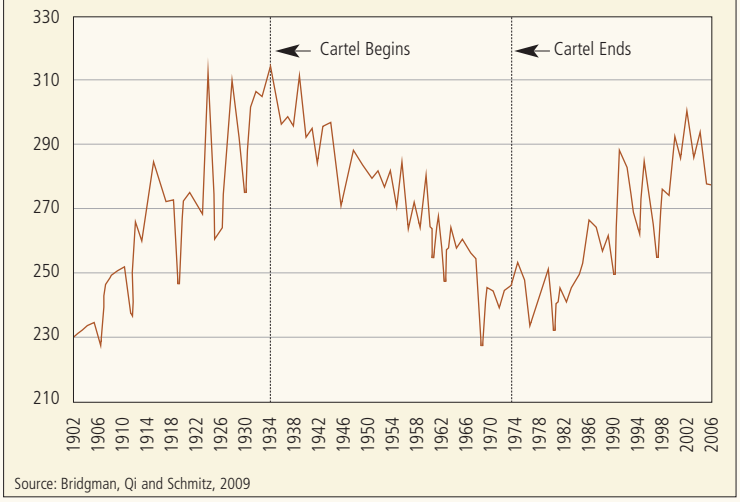
The second main feature was a subsidy paid to farmers based on the amount of sugar contained in their crop, financed by a tax on the output of sugar refining factories. This overall arrangement lasted until 1974, when the world price of sugar skyrocketed, and the U.S. industry and politicians decided the program was no longer beneficial. U.S. sugar producers, however, continue to benefit from import quotas and other protections.

Running in place

The most visible effect of the cartel was how it limited supply. Acreage quotas prevented the entry of new farmers, but they also locked in the 1934 geographic pattern of sugar production. Though shifting land or labor prices might have made some areas more attractive to sugar producers, the cartel "distorted" production decisions by discouraging relocation: Refining factories wouldn't move to new areas where farmers didn't have quotas.

In fact, even though over the life of the cartel it became less costly to produce sugar beets in the Midwest than in the West—largely due to increasing relative land and labor costs in the latter (particularly California)—the industry remained primarily in Western and Plains states. The economists find that after the cartel ended, the share of national sugar beet production fell in Western states while it increased

Pounds of Sugar Per Ton of Beets
U.S. Recovery Rate



Source: Bridgman, Qi and Schmitz, 2009

Research Digest

in Midwestern states, where production costs were lower.

By locking the industry into less productive regions, therefore, these cartel provisions reduced productivity.

Evidence from a "natural experiment"

The authors also argue that the cartel's tax-subsidy scheme would have reduced productivity. Prior to the cartel, the only source of revenue to the industry was sugar actually *extracted* from beets at the factory. But the cartel's subsidy to farmers introduced a new source of industry revenue, one tied to the total amount of sugar in the beet crops before extraction, calculated as the percentage of sugar in each beet times the total tonnage of beets produced.

This subsidy introduced another potentially productivity-hampering distortion. That's because it encouraged farmers to produce larger crops with more total sugar, even though it resulted in lower-quality beets whose sugar was harder to extract at the factory.

In theory, then, the sugar cartel should have reduced quality and productivity. The authors offer an array of evidence that it did so in practice, as well. They look at the recovery rate—the amount of sugar produced per ton of beets processed. During the cartel, from 1934 to 1974, the recovery rate fell from 310 pounds of sugar per ton of beets to about 240 pounds. Not long after the cartel ended, the rate began to climb (see chart).

This subsidy introduced another potentially productivity-hampering distortion. That's because it encouraged farmers to produce larger crops with more total sugar, even though it resulted in lower-quality beets whose sugar was harder to extract at the factory.

Correlation isn't proof of causality, so to build a stronger case that these changes were the effect of the cartel, the economists compare industry performance across regions. They argue that the subsidies should have led some regions, particularly California, to have greater reductions in recovery rates than others, such as the Midwest. Why? Arid areas using irrigation could increase beet tonnage (but reduce beet quality, as measured by recovery rate) by increasing irrigation close to harvest time. Areas reliant on rainfall couldn't use this tactic.

Using factory-level data, the researchers find that the cartel reduced recovery rates in all areas, but rates fell further in California and other arid Western states than in the Midwest (down 5.3 pounds per year versus 2.1 pounds). This significant regional difference is consistent with the theory's predictions.

—Joe Mahon

BOOK REVIEW  BOOK REVIEW

Institutions or Individuals?

Different views on financial collapse

"The history of the world is but the biography of great men," said Scottish historian Thomas Carlyle in a famous 1840 Portman Square lecture, and ever since, scholars have embraced the Great Man theory, the idea that influential individuals—saints, generals, politicians, leaders of all sorts—shape the course of history. Understanding the past through the prism of people as disparate as Mohammad and Mussolini, from Alexander Hamilton to Adolf Hitler, has long provided a convenient structure and—perhaps—a cogent explanation.

But critics of the theory have countered that powerful individuals are themselves shaped and their actions channeled by even greater societal forces; analyzing history as if individual people can change humanity is naïve and simplistic, they contend. Cultures, economies, laws and institutions are at the heart of change, and individual actions are the result, not the cause, of historical transformation. As English philosopher Herbert Spencer observed: "The genesis of a great man depends on [a] long series of complex influences."

Economists tend to reject the Great Man theory—and not only because it was Carlyle who anointed economics "the dismal science" (in his 1849 proposal to reintroduce slavery in the West Indies, no less). Economists analyze markets, after all, and individuals are simply agents responding to incentives within those markets. Market forces, not men, make economic history.

This debate comes to mind when observing recent events in Washington and New York, as legislators debate financial reform, and as regulators look into financial firms whose executives may have misled investors, and thereby "contributed to the recent financial crisis," as stipulated in the Securities and Exchange Commission complaint against Goldman Sachs and its employee, Fabrice Tourre.

At the core of both regulatory reform and regulator inquiries is the question of whether financial crises are caused by bad policies or bad people. And by extension, can future crises be avoided by reshaping regulatory rules and institutions, or is punishment of individual scoundrels the best deterrent to future bad actors? Congress, it seems, is of two minds: At the same time that it drafts major regulatory reform legislation, it scolds big bank CEOs in well-publicized hearings.

The "institutions or individuals" dispute is also reflected in the novels reviewed in this issue of the *Region*. On the surface, *Union Atlantic,* by Adam Haslett, and *The Privileges,* by Jonathan Dee, display striking parallels. Both are set on the east coast of the United States in the early-to-mid-2000s; their most prominent characters rise from working class backgrounds to the heights of the financial world under the wing of (somewhat) blindly loyal mentors, and with the aid of young subordinates who carry out their illegal financial bidding. Each protagonist—spoiler alert!—ends up in a foreign land, largely untouched by the law.

But while both novels depict individuals creating and coping with financial booms and busts, institutions play a prominent role only in *Union Atlantic*. Though written before the 2007-09 crisis, it provides a prophetic if fictional account of an investment bank whose imminent collapse might be prevented through efforts coordinated by the Federal Reserve, which may deem it too big to fail.

The Privileges, in contrast, focuses on the internal motives of a couple skirting the law in New York's financial world. Yes, the term "bailout" is mentioned once in *The Privileges,* but in reference to spouses saving one another from bad life choices, not to a financial firm rescue. In *Union Atlantic,* a bank bailout is a fundamental plot point.

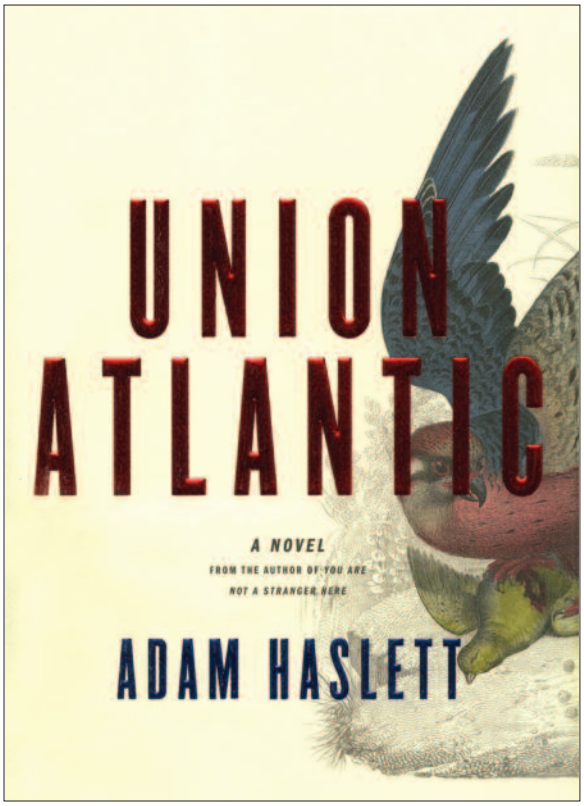
The Privileges, in other words, can be said to lie in the Great Man camp: Individuals are the central actors; their personal goals motivate them, their morals channel their actions and those actions move markets. The book explores how individual needs—for money, status and identity—can subvert the financial system, but the system itself is almost peripheral. Individuals, not institutions, are the focus.

Characters are also essential to *Union Atlantic,* but the role of financial institutions—the Federal Reserve in particular—is far more significant. Indeed, *Union Atlantic* provides a remarkably lucid and largely accurate description of the Fed and the international financial system, and of how investment banks operate prior to and during financial crises.

With all of that as preface, we've provided reviews of both novels. Each book is an excellent read; which of them you pick up may depend on your world view. From one of our reviews you'll appreciate a novelist's grasp of a financial system in distress and how the system copes. From the other, you'll see how a writer explores the psyche of those who game that system.

As dismal economists, it must be said, we're partial to the first approach.

—The Editors



Union Atlantic
By **Adam Haslett**
Knopf Doubleday
304 pages

Reviewed by **Ryan Williams**
Associate Librarian

The havoc wreaked by the Great Recession has inspired a desperate scramble for answers. Like investigators sifting through tangled wreckage at a crash site, financial world experts have labored to piece together a convincing and complete story about what went wrong and who ought to be held responsible. Although economists, journalists, politicians, bankers, regulators and innumerable others have all generated theories (ranging from the studiously rational to the apoplectically partisan) on the nature and causes of the disaster, no overarching consensus has yet emerged.

Into this melee of conflicting narratives enters a bold and perhaps foolhardy new challenger: Adam Haslett, a fiction writer of modest renown, whose audacious novel *Union Atlantic* takes a swinging stab at penetrating the mysteries of a financial world in crisis. At first glance, Haslett would seem unlikely to measure up to the task. Although his sole previous book, the 2003 story collection *You Are Not a Stranger Here,* received critical plaudits including nominations for the Pulitzer Prize and the National Book Award, Haslett's work is not well-known outside literary circles. More significantly, Haslett, who attended the Iowa Writers Workshop and earned a law degree from Yale, possesses no obvious background qualifying him to slice convincingly through the Gordian knot of questions presented by the crisis.

It's perhaps surprising, then, that when Haslett loses his footing in *Union Atlantic,* his stumbles do not stem from flaws in his understanding of economics and finance, but instead from faults in literary technique. He favors broad caricatures over realistic characters, and his prose quavers uncomfortably between the functional ("A rabid Bruins fan, his conversation didn't extend much beyond hockey and derivatives") and the florid ("Anywhere people lived memory collected like sediment on the bed of a river, dropping from the flow of time to become fixed in the places time ran over"). Fortunately, such problems don't overwhelm, and Haslett displays a knack for bringing the financial world to life on the page. He stages several entirely credible scenes within the bowels of a big bank teetering on the edge of collapse and succeeds equally in bringing off passages set in the august interiors of the Federal Reserve Bank of New York.

No detail related to the inner workings of the financial system is too trivial to escape his attention: At one point, he pauses to note that all of the paintings hanging in the New York Fed building were produced by artists who lived in the Second District and then cites the precise terms on which they're borrowed from the Metropolitan Museum of Art. In another passage, he offers a lyrical paean to the importance of payments systems—a miraculous feat for any author. Clearly this is a writer who has done his homework.

That Haslett actually completed the book not long before the recent crisis took place offers further testament to the quality of his research. Indeed, Haslett turned in his manuscript the same week that

Lehman Brothers went under. In light of that fact, some sequences in the book are uncannily prescient—such as when his fictional New York Fed president deliberates over whether to prevent the imminent collapse of a too-big-to-fail megabank.

No doubt professionals will be able to spot the occasional error, and *Union Atlantic* won't stand as the definitive diagnosis of the ailing global financial system. Regardless, Haslett offers a highly plausible account, and has succeeded in producing a substantial and engrossing first novel.

"Special plans"

The fictional bank in the eye of the storm is called Union Atlantic, and many of its troubles stem from a series of risky but lucrative operations engineered by a brash, amoral investment banker named Doug Fanning. At 37, Doug reigns over Union Atlantic's ominously named "Division of Special Plans," a shadowy unit dedicated to pumping up the bank's size and strength. Before his arrival, Union Atlantic was a conservative and well-behaved regional institution, one that "took in deposits, offered checking accounts to the public, and made loans to businesses." But then Doug went on a spree of acquisitions, and the bank quickly bulked up to mammoth proportions, like a veteran slugger on steroids. Although the numbers he posted were suspiciously stratospheric, nobody saw fit to object—at least not while his team continued to knock everything out of the park.

After taking it on the chin in the post-9/11 bear market and the Argentine debt crisis, Doug decided to engage in proprietary trading—investing the bank's own money and with the bank's profits alone in mind. Although this would not have earned Paul Volcker's approval, it succeeded marvelously at boosting Union Atlantic's short-term bottom line. Unwilling to stop there, Doug soon expanded into extremely risky and unambiguously illegal activities. When a subordinate with his hand in the till incurs an enormous loss in a fraudulent deal, Doug's superiors finally start asking questions, and the bank's enormous exposure comes to light. With Union Atlantic on the verge of implosion, Doug's boss has little choice but to beg the Fed for mercy.

"Truth lay in the aggregate numbers"

Thus we meet levelheaded Henry Graves, president of the New York Fed, who reacts to Union Atlantic's troubles swiftly and pragmatically in the hope of forestalling the collapse of the global financial system.

Henry's father, "a scourge to penny-stock fraudsters and pyramid schemers," worked for Roosevelt's SEC, and from him Henry inherited a trust in "the government as the good leveler of the field." But unlike his father, a zealous true believer, Henry favors moderation and holds that there is no better way to look out for the little guy than to promote stability and safety on a broad systemic level. "Truth lay in the aggregate numbers," he concludes during the thick of the Union Atlantic crisis, "not in the images of citizens the media alighted upon for a minute or two and then quickly left behind."

Then there's Charlotte Graves, Henry's decidedly immoderate older sister, a teacher who believes that the small-town New England of her youth has lately become overrun by ignoramuses who favor short-term profit over history, nature and culture. In Henry's eyes, Charlotte is "the classic mid-century Democratic idealist, who'd lived long enough to see hope's repeated death," and for Haslett, she serves as the foil to Doug's rapacious brand of free-market fundamentalism.

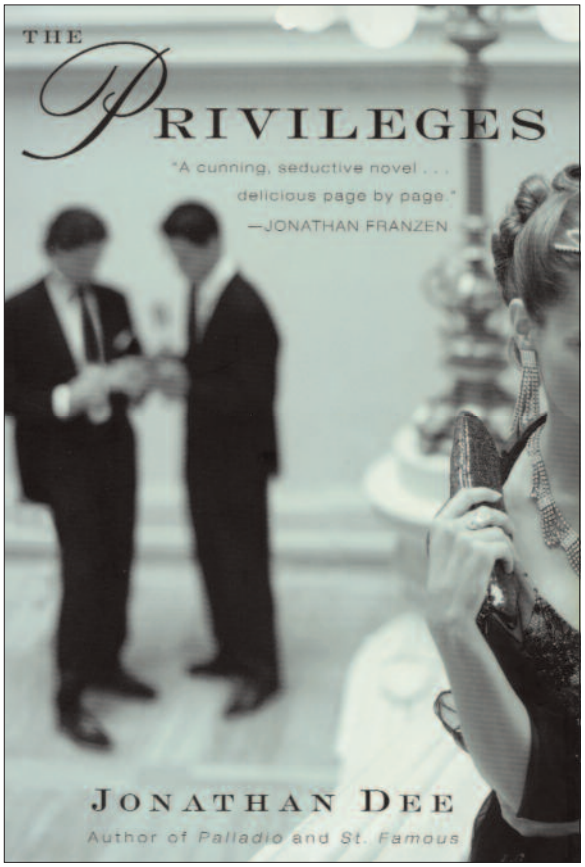
Haslett develops this parallel without subtlety: As much as Doug is a caricature of a greedy banker, Charlotte too neatly represents the soft-hearted and muddle-headed opposite. But the fact that he portrays Doug as little short of a sociopath does not mean he holds all bankers in low esteem—and indeed, another Union Atlantic employee acts selflessly and courageously during the bank's darkest days. The heroes and villains of the novel are distributed widely and without prejudice among bankers, regulators and ordinary citizens. Ultimately, Haslett's aim is not to advocate for any one point of view, but instead to demonstrate strengths and weaknesses of each and to warn that the clash of ideologies can transform a bad situation into a catastrophe. Like Henry Graves, Haslett aims for the middle path.

This does not mean that Haslett wholeheartedly endorses Henry's course of action. The book's conclusion evinces little hope that the actions of well-meaning individuals like Henry (or institutions like the Fed) can succeed in protecting citizens and economies from systemic threats. But Haslett sees no better alternative than Henry's rational moderation and clearly believes that the world would be worse off if cooler heads lacked the power to hold immoderate people like Doug and Charlotte in check.

The whole story

Union Atlantic closes without taking a stand on the contentious issues surrounding financial crises. Readers seeking transcendent clarity will not find it here; the book's thicket of carefully crafted ambiguities and ironies remains almost entirely unresolved. This approach is sometimes extremely frustrating, particularly when Haslett seems perversely determined to make his novel as complex and confusing as the global financial system itself.

But in the end, Haslett's refusal to see his subject matter (as opposed to his characters) in terms of black and white becomes the book's greatest strength. An economist must argue that a given model does a better job of elucidating an issue than competing explanations, a politician must justify choosing one policy over others and a journalist must struggle to articulate the account of events that comes closest to objective truth. But a novelist works under none of these burdens and is freed to embrace any and all viewpoints on a controversial issue, or to uniformly reject them as inadequate or incomplete. Every policy decision creates winners and losers, and no news story or economic model can hope to perfectly represent the astoundingly complex and frequently contradictory real world. But fiction thrives on ambiguity, and it is in that respect that Haslett's novel offers a unique contribution to the discourse on the financial crisis. *Union Atlantic* presents a potent reminder that no single narrative about a crisis can hope to tell the whole story. R



The Privileges
By **Jonathan Dee**
Random House
258 pages

Reviewed by **Cynthia Baxter**
Executive Assistant

People have always been fascinated by the super rich—"Lifestyles of the Rich and Famous" was a ratings winner for 11 years. *Forbes* annual list of the richest Americans is hugely popular. We love to hear about the Vanderbilts, the Rockefellers, the Donald.

Criminals hold the same fascination. Where would entertainment be without crime? No "Godfather," "Bonnie and Clyde" or (gasp!) "CSI."

So we are *really* fascinated by that special hybrid, the criminal super rich—Bernie Madoff, Martha Stewart, Tom Petters—and Wall Street tycoons and

financial world wizards who play by their own shady rules and pocket billions. We may be outraged at big bank bailouts and AIG bonuses, but we're no less intrigued by the people at the heart of the schemes that, legal or not, seem criminal in their consequences. Who are these people? Why do they do it? *The Privileges* is Jonathan Dee's answer.

The inside story

As Gordon Gekko said in the movie "Wall Street," "If you're not inside, you're outside." Reading Dee's new novel takes the reader deep inside, not just the life of privilege, but the path that his protagonists, Adam and Cynthia Morey, take to get there. This is a dramatic whirlwind of a novel with darkly comic touches in which the life that the Moreys want, they get by sheer dint of desire. They chart their path with startling certainty that all will go precisely as planned. And, yes, for the most part it does.

In the flurry of Wall Street's recent heyday—just before crisis struck—this charmed couple begins their life together with impatience and a "faith in their own future, not as a variable but as a destination." They are determined that their future—and soon, that of their children—must be one of limitless possibility, which to them, equals wealth. Their surname's similarity to "Money" seems more than coincidence.

Adam and Cynthia marry straight out of college. Adam signs on with a private equity firm and quickly finds success. But before long, ambition soaring, and with curiosity bred of arrogance about his money-making acumen, Adam dives into the dark side of the markets. He never looks back.

For her part, Cynthia raises the children, April and Jonas, with equal parts anxiety and pride. She wants them both to need her and to be completely independent so that she can "do some good in the world, or at last to feel like her presence in it was value-added." She gets her wish: Along with a vast apartment overlooking Central Park, she has a life of social engagements in which she is the central figure—and no plastic surgery needed (but it will not be ruled out). And the children become independent in ways she might not have intended, as they struggle with the notoriety that comes with their family's fortune.

Dee creates complex characters, especially with Cynthia Morey. She is beautiful and ambitious for herself and Adam, and like Adam, she is motivated by more than wealth. Their drive is to be more than just a part of the 1 percent of society that they rub elbows with. They demand of themselves that they will rise above even that tiny segment of the population. Dee provides a lively, scary, funny and ultimately captivating look into a side of human nature that most of us only try to imagine as yet another criminal mogul headlines the news.

Rules of their own

As in his previous novel, *Palladio,* Dee explores characters who would rather devise their own rules than live by an order that doesn't give them what they want or, perhaps, need. His sometimes furious, driven, powerful, intelligent and conscience-free characters always have forward movement; they don't hesitate for a second, and they don't apologize. *The Privileges* is a portrait of people who don't need to rationalize the criminal manner by which they get what they want; after all, they deserve it. Dee's portrayal of the Moreys is both penetrating and nuanced, conveying the sense that they are completely human—not black and white caricatures, but flesh and blood. It is easy to get sucked into a kind of weird empathy for the Moreys, particularly the daughter April, who provides the most straight-out-of-the-tabloids twist to the novel.

Also as in *Palladio,* Dee delves into the world of art. He describes the New York art scene as a game of finding something that no one else has found, a test of who can first acquire the previously undiscovered. Jonas, who has embraced his ordinariness rather than his wealth, gets deeper into the avant-garde than he bargains for.

There is no time wasted in this novel; Cynthia and Adam never stand still. The only time they do stop to reflect is to complain that they are not moving. They are full of impatience, waiting for "a new day to start," annoyed by "toxic stasis" and distressed that "time was going by, and the life around you started to calcify."

Adam does not see the need to stop at mere success. As he amasses an almost unthinkable level of wealth, his ethical checklist is lost in the vortex his rise has created. He tells himself he is one of the few who has the courage and ability to actually get what he thinks everyone wants. He feels "invincible, like a martyr, like a holy warrior"

at his success in the game of finance.

Cynthia is similarly unencumbered by anything other than an instant of concern—not fear—that Adam might be caught. In a key scene, Adam commits himself full time to his illegal schemes and tells Cynthia about the true nature of his work. A moment passes when a tear just might fall, but then, no. She buys in 100 percent. Like Adam, she has complete belief that they have earned their place in the top echelons of the rich for no reason other than they made it happen as they decided they would.

This is the time for Cynthia to get to that "value-added" position on the philanthropic side of society. She sees no incompatibility between the money she donates and how it is made. "People would love nothing better than for you to turn out to be hypocrites and scumbags instead of the generous, caring family that you are," their attorney cautions when Cynthia's self-named charitable foundation is in danger of becoming involved in scandal. Her response? To notice that her badly hungover daughter—at the center of the scandal—is "irreducibly gorgeous," and their money, regardless of provenance, will keep her name stainless.

Take a breath

The novel is neatly divided into four sections, allowing readers to take a breath before racing along with the Moreys' steady rise to the top. Each section is the next phase in the journey for Cynthia and Adam, a journey contained in Manhattan, the Hamptons and fleeting trips to exotic, offshore-banking locations. The decisions they make to propel them ever higher and wealthier are a natural progression, so the novel, like the Moreys, is constantly moving.

Dee has taken a completely unsentimental look at this world of people who truly personify the end justifying the means. Adam and Cynthia believe that "money was its own system, its own language, its own governing principle." There is nothing in particular they want in life other than everything. Yet Dee has managed to create complex and funny characters who are not entirely unsympathetic. They may be mercenary to the nth degree, but they are not cynical—they seem, if not honest, then straightforward, candid even, and unapologetic. Adam's choice to do what the "legions of pathetic sullen yes-men" won't do is treated as a logical career move, not a greedy grab at the high life.

Nor does Dee apologize for or psychoanalyze his characters. There is no attempt to show that a hidden motive accounts for their decision to obtain wealth illegally. It is simply the most direct path to their goals. And so Dee has crafted a thoroughly good read about people we might expect to despise, but don't. His exploration of "who" and "why" subverts that impulse. He makes the Moreys—and their factual counterparts—human, not evil; they are barely even criminal, except that, in the end, they are. R

Virtual Fed

Fed 2.0

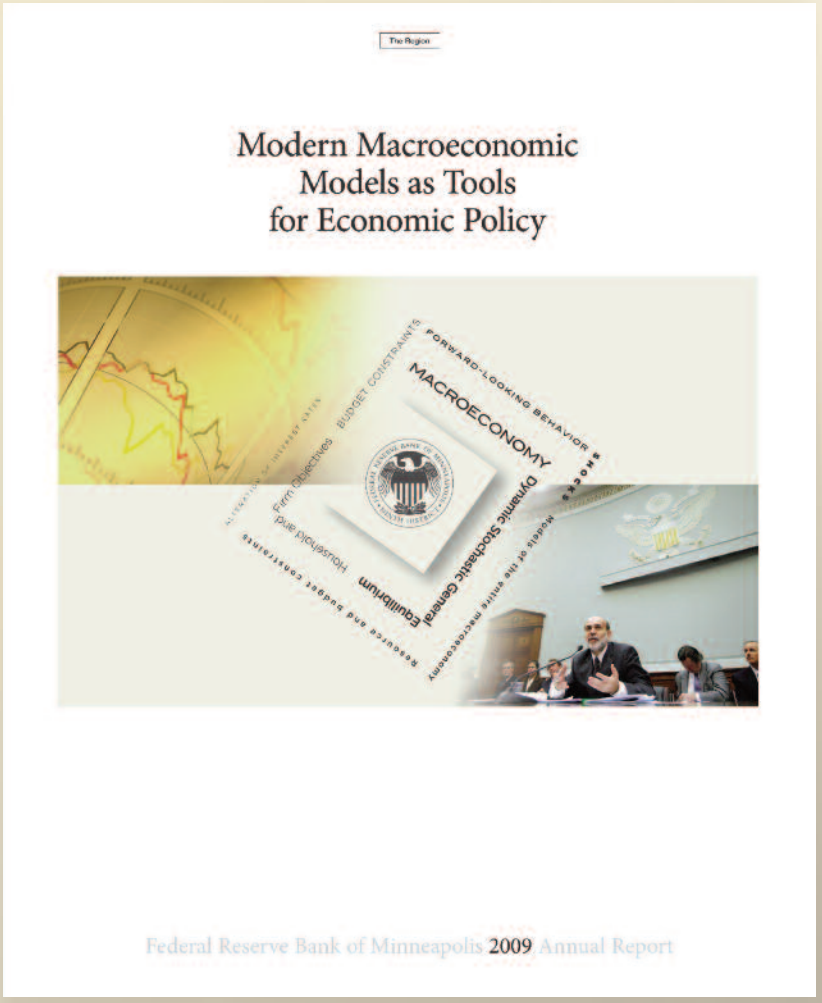
Twitter, the social networking tool that lets users regularly broadcast bite-sized messages, seems ubiquitous. Those just learning about it often consider Twitter a medium for the self-absorbed, thinking that users are simply writing inane, ungrammatical updates about what they had for lunch. But Twitter can be a powerful tool for communicating with the world at large, which is why so many companies and organizations have adopted it.

The Federal Reserve System is no exception; the Minneapolis Fed and several other District banks maintain active Twitter accounts. Content varies from news, research and data releases to job listings. District banks with Twitter accounts include Boston, Cleveland, Minneapolis, New York, Philadelphia, Richmond, San Francisco and St. Louis. Some banks have multiple channels; track them all down by searching twitter.com. While all "tweets" are public, if you want to follow them on an ongoing basis, you can set up a Twitter account, and you'll be notified of updates.

Follow @minneapolisfed by visiting twitter.com/minneapolisfed. (But no, you won't learn what we had for lunch today.)

—Joe Mahon

Find the 2009 *Annual Report* at minneapolisfed.org



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The incentive to create a job is the difference between what a worker will contribute to the business and what the worker has to be paid.

—Robert Hall