

The Region

Michael Woodford

**The Future of
Community Banking**

**Paychecks or Promises
in Detroit?**

**Real Business Cycles,
Recycled**

**Research Digest:
*The Goldilocks Tax***

**Big Data & the
Fed's Next 100**

Executive Editor: Kei-Mu Yi
Senior Editor: David Fettig
Editor: Douglas Clement
Managing Editor: Jenni C. Schoppers
Senior Writer: Phil Davies
Designers: John Biasi, Lori Korte, Mark Shafer



The Region

Federal Reserve Bank of Minneapolis
P.O. Box 291
Minneapolis, MN 55480-0291

Email: letters@mpls.frb.org
Web: minneapolisfed.org

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The Current and Future State of Community Banking*

Narayana Kocherlakota

President
Federal Reserve Bank of Minneapolis

Editor's note: This column is based on remarks presented to the Independent Community Bankers of Minnesota on Aug. 15, 2014, in Brainerd, Minn. The speech's economic review has been deleted for space considerations. The full text is available at minneapolisfed.org.

I want to thank Marshall and other ICBM officers and members for inviting me to your annual conference. I appreciate the opportunity to share my views on community banking with all of you, but just as importantly, I look forward to your questions and our discussion following my talk. Today I will talk mainly about the state of community banking, especially here in Minnesota. Before I begin, just a reminder that the following views are my own and not necessarily those of my Federal Reserve colleagues.

Pairing community banking and economic performance is natural and important. What happens in Main Street credit markets has a significant influence on the broader economy. Community banks are an essential credit provider for Main Street. Community banks have the skills and knowledge to evaluate borrowers who, because of their size, activity or location, are relatively costly for an outside firm to evaluate. As a result, community banks facilitate beneficial economic activity that would not otherwise take place. The individuals and businesses receiving credit from your banks are key components in both local and national economies; they produce valuable output and provide numerous jobs. As I

* The author thanks Ron Feldman, David Fettig, Terry Fitzgerald, Paul Schreck and Sam Schulhofer-Wohl for their assistance with these remarks and the supporting materials.



will describe later, these are central concerns of the Federal Reserve as we seek to promote maximum employment and price stability.

I will make my four main points on the state of community banking.

- Community bank recovery from the financial crisis has been strong with regard to asset quality, but earnings and loan growth have lagged.
- Lagging earnings and loans have raised questions about the cost of new, post-crisis supervision and regulation.
- Low earnings and higher regulatory costs have also raised concerns about community bank consolidation and its potential acceleration.

- In response to these concerns and as a matter of prudent public policy, I strongly support “tailoring” supervision and regulation to reflect the risks and roles of community banks.

I will now describe these issues in more detail.

Community bank conditions

Community banks in Minnesota and the nation experienced a very sharp increase in problem loans during the financial crisis. Fortunately, that trend has now reversed.

Consider a standard measure of problem loans: the ratio of noncurrent and delinquent loans to bank capital and the allowance for loan loss. In the first quarter of 2009, that ratio rose for all loans to 24 percent for the median Minnesota bank, double the 25-year median level of 12 percent. For commercial real estate loans, the problem loan ratio rose to about 9 percent, nine times higher than the 20-year median of 1 percent.

The problem loan story has changed completely. The ratio for total loans is at 9.5 percent for the

[I]t is a matter of considerable public policy concern if regulations, not market forces, are important causes of bank consolidation. Federal Reserve policymakers have recently discussed how better tailoring of supervision and regulation to community banks can be helpful in reducing the extent of this problem. The Federal Reserve does some tailoring already, but I think we should do more.

median Minnesota bank, right around the 25-year low. And the ratio for problem commercial real estate loans for the median Minnesota bank is at 2 percent and rapidly returning to precrisis levels. These same general patterns hold for the nation’s banks.

The low earnings and negative loan growth for the median Minnesota bank have also improved, but not yet to precrisis levels. Return on average assets, a standard measure of profitability, has been holding very steady for the past several years at just below 1 percent. This is clearly better than the trough of 0.5 percent during the crisis. But the 20-year median is 1.15 percent. Currently, the return on average assets of the median Minnesota bank is at 0.94 percent, which is at the 19th percentile for the past 20 years.

Year-over-year net loan growth for the Minnesota

median bank is at 4.6 percent. Again, this is much better than the -4.7 percent crisis trough; indeed, negative growth persisted through the end of 2012. But the 25-year median is nearly 6 percent for Minnesota banks, while 4.6 percent is at the 39th percentile. The nation’s banks show similar general patterns.

So, yes, there has been recovery in important ways for community banks in the state. But other important measures continue to lag historical norms more than five years after crisis depths. This weaker-than-hoped-for performance is one factor raising concerns for community banks about the additional supervision and regulation burden that faces them post-crisis. I’d like to turn to those concerns now.

Post-financial crisis supervision and regulation of community banks

Low earnings levels have many potential sources. Let me mention three. First, on the revenue side, weak loan growth naturally leads to more competition for available loans and drives down returns. Second, if banks can’t make more loans, they typically replace loans going off their books with securities. But securities usually earn less than loans, lowering bank returns. Finally, interest rates are at very low levels, and that compresses bank margins.

Higher costs can also reduce bank earnings, and it is clear that the costs of complying with bank regulation and supervision are increasing. Since the financial crisis, and the 2010 Dodd-Frank Act, supervision of community banks and the entire banking sector has become more intense. This is not a transitory change reflecting weak asset quality. Instead, supervisors have recalibrated risk management expectations broadly for community banks. I see higher expectations continuing to spread across bank operations. Meeting these expectations will increase bank costs.

To what extent has additional supervision and regulation raised costs, reduced earnings and shrunk profits? This is difficult to answer with precision, but analysis at the Minneapolis Fed indicates that reductions to profitability could be material, particularly for the smallest community banks. Our estimates suggest, for example, that the median reduction in return on assets for banks with less than \$50 million

in assets would be 14 basis points if they need to increase staff by half a person, and 45 basis points if by two employees.¹

Reduced returns on assets can encourage capital to flow from the banking industry. Indeed, bankers routinely raise concerns with me about the potential for more regulation to drive consolidation in the industry, a topic to which I now turn.

Community bank consolidation

The number of community banks in Minnesota has been falling for some time. There were 341 banks chartered in Minnesota as of the first quarter of 2014, down from a peak of 760 in 1980. As noted, many are concerned that the rate of decline will rise as increased supervision and regulation depresses earnings. Many bankers also tell me about intangible costs, arguing that some new compliance requirements distract from serving customers. These soft costs could also drive bankers to exit the industry.

My concern is with the public policy aspect of this matter. It is possible that the evolution of information technology may have increased the returns to scale in banking. As a society, we should expect and indeed welcome consolidation as a response to this natural economic force. But there is a policy concern if negative benefit/cost regulation or supervision drives out banks that would otherwise effectively serve customers.

To help determine if new regulations and supervision introduced since the financial crisis have led to more rapid consolidation, the Minneapolis Fed is estimating future consolidation of banks in the United States and Ninth District states based on historical trends. If consolidation exceeds projected rates, that might suggest that new supervision and regulation has changed the dynamics of banking. So far, however, the rate of recent consolidation of Minnesota community banks has been consistent with historical patterns. We continue to monitor consolidation rates relative to forecasts in order to be able to detect changes that are not readily attributable to technological forces. Our website contains quarterly updates of these forecasts.

But both bankers and policymakers are concerned about the long-term health of community banking, not just next year's numbers. How many community banks will exist in 10 years? Of course, I cannot answer this question with certainty, but I can offer a few perspectives. If historical patterns con-

tinue, the number will fall considerably. There will be just 263 banks in Minnesota in 2024, a 23 percent decline from 341 currently, assuming that consolidation over the next 10 years continues the trend seen over the past 30. Or we could assume a slower rate of consolidation, like the 14 percent decline from 1995 to 2005. That would put the number at 293 community banks 10 years from now.

This is an admittedly crude modeling approach. We have also constructed a more elaborate statistical model of the potential long-run decline in the number of banks in Minnesota. Our statistical model is based on the historical movement of banks into, and out of, different asset groupings. Some banks get larger and move from one size bucket to another, while other banks exit the industry altogether. This transitional model—which we use to forecast the number of banks in Minnesota one year out on our website—suggests that the number of banks in the state will fall to 282 in 10 years.

I've discussed three different estimates. They all predict that the number of banks in Minnesota will fall sharply over the next 10 years—from the current 341 to a number in the high 200s. By way of comparison, the median decline in the number of banks for all states across all 10-year periods since 1985 is 25 percent, a bit higher than some of the estimates we provided.

To be clear, these forecasts are only estimates. They should be interpreted accordingly. The actual number of banks may turn out to be smaller—or, indeed, it might turn out to be larger.

Tailoring community bank supervision

I've already noted that it is a matter of considerable public policy concern if regulations, not market forces, are important causes of bank consolidation. Federal Reserve policymakers have recently discussed how better tailoring of supervision and regulation to community banks can be helpful in reducing the extent of this problem.² The Federal Reserve does some tailoring already, but I think we should do more. I'll mention two examples of the kind of tailoring that I have in mind. I'll then turn to two additional steps we might consider.

On safety and soundness, the Federal Reserve and other agencies received excellent comments from community banks on the Basel III proposal. These comments led to changes to the proposed rule

that reduce unnecessary burdens on smaller banks.³ Smaller banks can opt out from having their capital levels vary due to changes in particularly volatile aspects of income. The final rule also allows smaller institutions to continue to count certain types of stock or securities as capital, when larger banks cannot. I think the rule-making process worked well in this instance. Issuing a preliminary rule and receiving comments from bankers allowed the final regulation to better address the actual risks posed by community banks.

On the consumer side, the Federal Reserve has moved to a more risk-focused exam process, from the less flexible previous approach. The new framework allows our examiners to better tailor their exams to the consumer risks that a particular bank may actually pose. Many banks that the Minneapolis Fed supervises do not engage in activities that pose a high risk to consumer protection. And many also have a strong, documented record of compliance and relatively little change in operations. Under the new framework, examiners can more readily eliminate certain areas of review.

The benefits of the new consumer program go beyond a more focused scope. The new framework encourages more of our supervisory work to occur off-site, thereby reducing the on-site burden we put on community banks. At the same time, where there are potentially risky activities, the new framework allows for a deeper dive.

In sum, I think the new consumer exam framework epitomizes the tailoring we need. It's based on an analytical approach aimed at improving supervision, and it also captures institution-specific details where appropriate.

Where can we engage in additional tailoring? Governor Daniel Tarullo has noted potential benefits in reviewing statutes that apply new regulations to all banks. Community banks may not create the risks that a specific regulation addresses. In that vein, he noted the so-called Volcker rule and Dodd-Frank incentive compensation requirements. I strongly agree with Governor Tarullo's point that Congress and supervisors should exempt all community banks from certain regulations. Exempting is the best way to guard against regulatory trickle-down.

A second fruitful approach to additional tailoring concerns supervision, not regulation. I worry that our current supervisory methods establish expectations that are too detailed across too many areas of bank

operations and too wide a swath of banks. Alternatively, supervisors could concentrate on a smaller number of activities that we believe are correlated with bad outcomes. To be specific, supervisors could choose to focus on rapid loan growth, high lending concentrations, specific high-risk types of lending and wholesale funding strategies and skip some of the more detailed reviews. This shift in focus might generate higher returns to society, in terms of improved safety and soundness per dollar spent, than detailed work programs. To be clear: I'm suggesting a tailored approach, and so supervisors could retain the more comprehensive, proscriptive approach for larger, systemically important banks.

I offer these ideas not as final prescriptions, but in the spirit of open inquiry. My main point is that we need to further investigate ways to tailor the supervision and regulation of community banks.

Conclusion

I began this talk describing the important link between what you do as community lenders and what we strive to achieve at the FOMC—namely, to put the economy's resources to work. The FOMC's low-interest rate policy in recent years has certainly provided some challenges for banks, but the Committee's ultimate goal is one that we share with you—a stronger, growing economy that benefits all. On that, I'm sure we can all agree.

Thank you once again for the invitation to join you here today. I look forward to your questions. ■

Endnotes

¹ These examples reflect a baseline scenario with a fixed set of key assumptions detailed on our website at minneapolisfed.org/banking/communitybank/. The impact of new regulatory costs in our model includes the hiring of additional staff, which results in higher total compensation and lower profitability. We then analyze the changes in the distribution of community bank profitability.

² Chair Janet Yellen (federalreserve.gov/newsevents/speech/yellen20140501a.htm), Governor Daniel Tarullo (federalreserve.gov/newsevents/speech/tarullo20140508a.htm) and President Dennis Lockhart (frbatlanta.org/news/speeches/140527_speech_lockhart.cfm) have all spoken to this issue in recent months.

³ See the Summer 2013 *Central Banker* at stlouisfed.org/publications/cb/articles/?id=2415.



Paychecks or Promises?

Lessons from the Death Spiral of Detroit

Employee plans that promise future, not current, compensation expose cities (and firms) to risk

Thomas J. Holmes

University of Minnesota
Federal Reserve Bank of Minneapolis

Lee E. Ohanian

University of California, Los Angeles
Federal Reserve Bank of Minneapolis

Introduction

When employees are compensated on a *pay-as-you-go* basis, accounts are settled paycheck by paycheck, and no future liabilities are implied. In contrast, a *pay-with-promises* plan means that along with current compensation, an employer accepts a liability to provide some additional benefit (such as retiree health benefits) to the employee. Many U.S. cities include a pay-with-promises component in the pay structure of municipal employees. In our recent Federal Reserve Bank of Minneapolis staff report, we provide a detailed examination of how this kind of pay structure interrelates with the growth of cities.¹ This policy paper describes the key issues, summarizes the analysis and discusses our conclusions from that research and their implications for public policy.

Cities face risks of various negative shocks that impact city size and income. We trace through the problems that arise if a city saddled with “legacy” retirement costs associated with pay-with-promises compensation experiences a downturn. We find that the financial distress caused by making good on promises from previous years often leads city officials to increase taxes and cut government services. But these higher taxes and lower government services make the city a less attractive place to live, causing more people to leave, compounding the problem as

Economic Policy Papers are based on policy-oriented research by Minneapolis Fed staff and consultants. The papers are an occasional series for a general audience. Views expressed are those of the authors, not necessarily of others in the Federal Reserve System.

Executive summary

Pay-with-promises compensation plans accumulate liability for future employee benefits, such as retiree health insurance. A simple economic model demonstrates that such plans can exacerbate fiscal crises faced by cities that experience external economic shocks, such as the departure of a major employer. City leaders often raise taxes and/or reduce public services to pay off legacy employee debts, and such steps encourage residents to move out, reducing the tax base and raising fiscal stress. Pay-as-you-go compensation plans are more prudent; they settle liabilities to employees paycheck by paycheck.

the city tries to raise necessary revenues from a decreasing population base. This dynamic between declining city size and higher taxes and lower services is often referred to as a city *death spiral*.

Detroit is the classic example of a death spiral. This city has certainly suffered negative shocks, particularly by the decline of Michigan’s automobile industry. Well-known commentator Paul Krugman has gone so far as to say that “for the most part the city was just an innocent victim of market forces.”² We agree that market declines create adverse shocks for cities, but those shocks have been substantially

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S-722
SIDE 1

DON'T PAY ME WITH PROMISES
TOM HOLMES AND THE OHANIAN

1. I'M SPIRALING DOWN
2. A SHOCK TO ME AND A LEGACY
3. PAY ME NOW OR SEE YOU LATER

An EPP Production

exacerbated because of Detroit's pay-with-promises commitments to city employees. In the face of these liabilities, Detroit has imposed the highest tax rates in the state and provided shockingly abysmal government services, illustrated by the fact that 40 percent of the streetlights are not working. Population has declined 26 percent since 2000. The term *death spiral* is now well-known throughout Michigan, but particularly in reference to Detroit. Even the city manager has admitted: "We are in a death spiral."³

Before getting into specifics, we would like to highlight two features of our paper. First, it provides a simple, formal economic model that we use to evaluate policy questions. While much of the economics underlying our analysis is quite intuitive, working through the issues in a formal model clarifies subtle questions. For example, what are the effects of pay-with-promises schemes when they are completely funded in an "expected value" sense? In other words, what if a city invests money to fund a future benefit, but agrees to absorb investment risks (up or down) by funding any shortfall between promised pay and actual investment return? We show that it is more efficient to use a strict pay-as-you-go system, in which accounts are settled paycheck by paycheck.

As another example, does it make a difference in the analysis whether municipal workers are unionized? Again, this is a subtle question, because nonunion municipal workers, as well as unionized employees, are often compensated under pay-with-promises plans. A formal model helps isolate the specific role of unions in such situations; we come back to this below.

The second feature to highlight is the central analogy in the paper between a firm trying to attract customers and a city trying to attract residents. In both cases, there is downward-sloping demand: A firm that raises its price (or makes a worse product) loses customers; a city raising taxes (or reducing services) loses residents. Economies of scale may exist for cities, just as they do for firms, from "producing" at higher levels. The case is evident for firms. In the example of a city, providing schools or roads for more residents means a lower average legacy burden per resident. And both firms and cities are subject to demand shocks. Analogous to the way fixed legacy costs are a problem for a firm fac-

ing declining demand, they are a problem for a city facing declining demand.

In recent years, private sector firms have moved away from pay-with-promises schemes to pay-as-you-go. For example, private firms now typically contribute to employee 401(k) retirement plans, rather than making the long-term commitments that come with traditional pension plans. Would a similar move make sense for cities as well? Our analysis leads us to believe so.

The qualitative similarities between cities and firms just described suggest that the economic logic for pay-as-you-go compensation applies to cities just as it does to firms. Yes, there are quantitative differences between firms and cities. And we expect the demand faced by a firm to be often more elastic than the demand faced by a city. (It is easier to switch the brand of cars you buy than change where you live.) Yes, the possibility of negative demand shocks may be larger for firms than cities. (The negative shock to Blockbuster of the decline of the videotape rental business obviously was more severe than the negative demand shock to Detroit.) Nevertheless, these are differences in degree, not kind.

Some specifics

Cities face a demand curve for residents. The price for any individual to live in the city includes the cost of any taxes that will need to be paid to reside there. In our analysis, we subtract the value of services the individual receives (e.g., street lights, police protection) from these taxes and call this the *net tax price* of living in a city. As in textbook Econ 101, the lower this price, the greater the quantity of demand. (Here, if the net tax price of city life declines, more residents are willing to move in.) This effect is considered moving along a demand curve.

In contrast, broad factors like the general quality of job and cultural opportunities and amenities like good weather affect demand patterns differently; rather than causing a move up or down an existing demand curve, they actually *shift* the demand curve altogether. For example, if the primary industry of a city collapses, this is considered a downward shift in demand. If a major corporate employer relocates operations to the city, that might shift demand outward.



Lee E. Ohanian and Thomas J. Holmes

Next, we determine what is feasible for the city to offer and construct the analog of a firm's supply curve. We'll refer to this as an "average" net-tax-price curve, because it will be calculated on a *per capita* basis.

There are four parts to the net tax price:

- Average net-tax-price = legacy cost/population (part 1)
curve
- (service x wage)/productivity (part 2)
- + tax distortions (part 3)
- value of service (part 4)

Part 1 equals existing "legacy" costs (i.e., unfunded promises to retirees) divided by population. Legacy costs are fixed, and the greater the current population, the lower the legacy burden on a per capita basis.

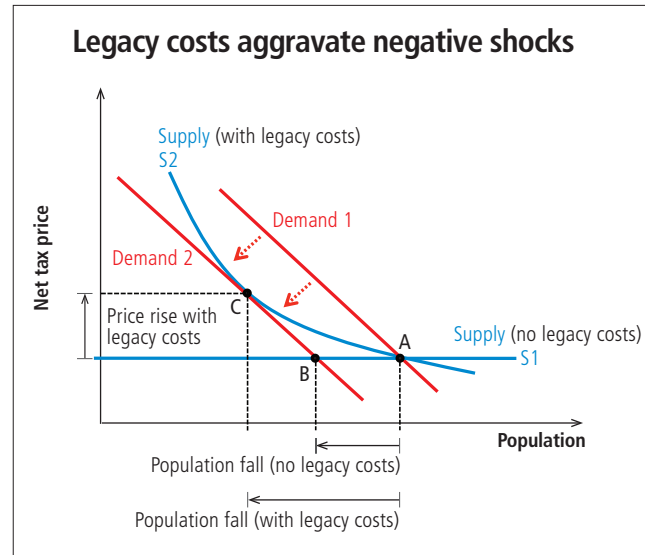
Part 2 equals current per capita expenditures for the current level of government services. This component increases if a city raises service levels or public sector wages and decreases if the opposite occurs. It is lower if public sector productivity is higher.

Part 3 takes into account distortions created by taxation. For example, if a city imposes a higher tax on homeowners if they remodel their property, the homeowners may choose not to go ahead with the improvements. If a city imposes an income tax, a resident may decide to work fewer hours to earn less income. These distortions destroy value and, ultimately, the losses are passed along to the residents who pay the taxes.

Finally, part 4 nets out the value of the public services a resident enjoys in the city, as described earlier.

In the accompanying figure, we've illustrated two cases of an *average net-tax-price curve* that combines all four components. These two curves, in blue, are labeled "Supply."

In the first case, there are no legacy costs, and the resulting supply curve is *perfectly flat* (S1). As a result, adding people does not change the tax situation at all on a per capita basis. In the second case, there are substantial legacy costs (S2). Here the curve is sharply downward-sloping, as the overhead costs are spread across additional people—that is, a high-



er population enables a city to charge each resident a lower per capita tax, as the total costs of providing city services are divided among more people. (Note that in standard textbook analysis, supply curves are upward-sloping, because as a market expands, firm costs rise because firms have to buy their supplies from higher-cost sources, thereby pulling up their average costs of manufacturing. But for a city with high legacy costs, higher volume pulls the per capita burden down.)

Both blue supply curves are drawn such that the equilibrium (where supply and demand meet) at the initial demand curve (Demand 1) is at the point labeled "A."⁴ Now suppose the city experiences a negative shock, such as a decline in the local industry, shifting demand downward, as illustrated by the arrows shifting the demand curve to the Demand 2 position.

With no legacy costs, population declines to the equilibrium at B. *With* legacy costs, the population decline is sharper, as the initial effect of the decline in (labor) demand is magnified by additional exit induced by the higher net tax price (a result of both higher taxes and cutbacks in services, such as fewer streetlights). Equilibrium is at C: lower population and higher net tax price. This is a graphical illustration of a death spiral effect.

Issue analysis

We use this framework to examine the two issues mentioned above: whether the unionization of mu-

municipal employees makes a difference to a city's financial picture and whether it's financially prudent to adopt pay schemes that absorb investment risk when depending on investment returns to fund promised benefits.

As noted above, pay-with-promises compensation schedules can be found for both union and nonunion municipal employees. For this analysis, a key point is that unionized workers tend to get both a higher level of current wages and higher promised benefits. This results in a higher level of legacy costs, which shifts up the supply curve and makes it steeper. With a steeper supply curve, the death spiral magnification effect of a demand downturn becomes even more prominent.

Another potential effect of unions is through the productivity variable that appears in the second term above. Collective bargaining agreements for Detroit's workers, for example, have imposed standard union work rules and work practices impeding management rights.⁵ These work rules can reduce productivity. Reduced productivity shifts up the supply curve (see part 2 above), which makes the city less attractive, shrinking the equilibrium size of the city.

Second, we consider policies that attempt to fully fund (in an "expected-value" sense) future promised benefits, but leave the city on the hook for any deviations between actual returns and expected value. For example, suppose the city offers a defined benefit plan with specified annuity benefits. If the city's investment returns are high, legacy costs will be relatively low since the returns fund a high percentage of legacy cost payments; however, if investment returns are low, then legacy costs will be relatively high.

Our model and graph illustrate the effect on city growth: If the pension bet is favorable for the city, then the supply curve shifts down and city size expands. If the pension bet is unfavorable for the city, the supply curve shifts up and city size contracts. Evidently, having the size of a city depend upon the outcome of a pension bet is not a very sensible way to run a city, and our formal analysis provides justification for this position.

Rather than impose these risks on municipal governments, it makes sense to find insurance products sold by financial intermediates with the capacity to absorb investment risks. (For example,

annuity contracts that look like defined-benefit contracts.) The only difference would be that municipal governments would be off the hook for future commitments—out of the insurance business and better off for the change.

As noted up front, there is an analogy here between a city and a firm; a city can attract residents with low taxes and high service quality just as a firm can attract customers with low prices and high product quality. And cities, like firms, experience demand shocks. Thought of in this way, the recent bankruptcies of General Motors and the city of Detroit have much in common (aside from their close relationship). Both institutions were saddled with huge legacy costs from employee compensation commitments and inefficient work practices. Both experienced negative demand shocks. As part of its restructuring, General Motors has cut back on inefficient work practices and moved close to a "pay-as-you-go" model. To the extent that Detroit also moves in this direction, it will be more resilient in the face of future shocks.

This essay has focused on municipal finance, but our discussion of legacy costs of earlier pay promises may bring to mind national-level legacy costs from promises made to U.S. citizens regarding Social Security and Medicare. We emphasize two important differences between the local and national level. First, it is much easier for individuals to relocate locally than nationally. In fact, at the local level, individuals may be able to switch the municipality where they live without changing jobs. Mobility—where individuals can move to escape legacy costs—played a key role in our discussion.

Second, at the national level, it is more likely that economic shocks average out, compared with the local level. (A bad shock to industry A in city X may be offset by a good shock to industry B in city Y). So, while our arguments apply with most force at the municipal level, they have bite even at the national level. Firms are internationally mobile—far more so than employees—and if federal corporate tax rates are set at high levels to pay retiree legacy costs, some firms may choose to go abroad.

Conclusion and closing observation

In summary, this essay has made a case for cities to use pay-as-you to compensate their employees. As a city with legacy costs collapses into a vicious

cycle of decline, it may become all the more tempting to try to pay workers with promises. Empty city coffers make it difficult to do anything else. Yet this only compounds the problem in the long run. A city may have an opportunity to dig its way out of a current hole by restructuring debt. By changing the way a city compensates its employees, it can lower the probability of getting into trouble the next time.

In fact, just as we put finishing touches on this essay, there was an announcement that Detroit is restructuring its pension system into a hybrid of a defined-*benefit* and a defined-*contribution* system.⁶ At this point, details are sketchy, but a key aspect of the plan appears to be the use of various mechanisms to insulate taxpayers from absorbing risks of variations in future investment returns. In other words, the plan purportedly moves in the direction of the kind of pay-as-you-go system that we have argued for here. ■

Endnotes

¹ See “Pay with Promises or Pay as You Go? Lessons from the Death Spiral of Detroit,” by Thomas J. Holmes and Lee E. Ohanian, Staff Report 501, Federal Reserve Bank of Minneapolis, July 2014.

² See “Detroit, the New Greece,” by Paul Krugman, *New York Times*, July 21, 2013.

³ Detroit Emergency Manager Kevyn Orr, as quoted by Fox News, June 15, 2013. See “Detroit to Default on \$2.5B Debt to Avoid Bankruptcy, Emergency Manager Says.” See also “How Do Cities Get in a ‘Death Spiral,’ and How Can We Stop It?” on Michigan Radio, Nov. 21, 2013.

⁴ At A, the slope of the demand curve is steeper than that of the supply curve. Curves can also intersect at points where the supply curve is steeper. However, supply always flattens out and intersects demand at some other point like A where demand is steeper. In our companion staff report, we explain why we focus on cases like A.

⁵ As explained in the city of Detroit’s, “Proposal for Creditors,” June 14, 2013, employees have held “bumping rights,” allowing them “to transfer across departments based solely on seniority (without regard to merit, relevant qualifications, or experience in the new position).” There have also been standard limitations on management’s right to “revis[e] and eliminat[e] job classifications” and “to implement and modify disciplinary policies.”

⁶ See “Detroit Rolls Out New Model: A Hybrid Pension Plan,” by Mary Williams Walsh, *New York Times*, June 18, 2014.

VIRTUAL FED

The screenshot shows the website for the Federal Reserve Bank of Atlanta. The main navigation bar includes links for Research & the Economy, Banking, News & Events, Education Resources, Consumer Information, Community Development, Publications, and About the Fed. The breadcrumb trail reads: The Atlanta Fed : Careers : The Fed Explained : Federal Reserve System : FedFAQ : Follow the Fed : Holidays : Tours.

The Fed Explained

Do you ever wonder what the Federal Reserve really does, or why it focuses on certain aspects of the U.S. economy? In one convenient location, the Fed Explained offers a range of content that explains the role of the Federal Reserve System and helps a general audience understand the fundamentals of the economy.

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—Joe Mahon

Michael Woodford

Though pundits suggested otherwise, there was no straight-line causality from Michael Woodford's presentation at the Fed's August 2012 Jackson Hole conference to the FOMC's December 2012 adoption of inflation and unemployment thresholds. While both involved "forward guidance" and stressed clear communication about a credible policy path, the timing was doubtless coincidental.

But there is also little question that Fed leaders were already well-steeped in Woodford theory, and quite familiar with the arguments he made in August. For nearly two decades, the New Keynesian model*—of which Woodford is a leading architect—has been a key framework for academic research in monetary economics, and bedrock for research and policymaking at central banks worldwide.

With this framework, Woodford and his co-authors have explored and explained the mechanisms by which monetary policy affects employment and production, as well as interest rates and prices, and because his work has such practical utility and intellectual power, the way policymakers think about policy—and arguably, design it—has shifted fundamentally. His insights into policymaking when nominal interest rates can go no lower have been particularly useful.

Woodford's 2003 *Interest and Prices*—called a "bible for central banks" by some economists—discussed these ideas at length. "Immensely influential," said Princeton economist Lars E. O. Svensson of the book, in awarding the 2007 Deutsche Bank Prize to Woodford for establishing "foundations for ... models now being developed by the most advanced central banks [and] also providing central bankers with a practical framework [for thinking about] monetary policy, in particular the fundamental role of expectations and transparency."

The Deutsche Bank award is one of many Woodford has received. While still a graduate student at MIT, he was selected by the MacArthur Foundation for its inaugural class of "geniuses" in 1981. The Columbia economist has also been recognized with fellowships from the Guggenheim Foundation, Econometric Society and American Academy of Arts and Sciences, and awards from numerous other institutions.

Woodford's intellectual interests are unusually broad. He went to the University of Chicago initially to study physics, then majored in cognitive science, got a law degree at Yale and later chose economics—drawn by both its theoretical rigor and concrete application. "Central banking," he observes, "is one of the human activities where I think there is some real use to relatively abstract theoretical contributions."

*Developed in response to the potent 1970s rational expectations/flexible prices critique of then-dominant Keynesian theory and policy, the New Keynesian model accepted some of the critique but argued that rigidities in pricing caused markets to adjust slowly and could result in undesirable fluctuations in employment and production. Stimulative fiscal and monetary policy—if well-designed and implemented—could therefore be effective in counteracting economic downturns.



EFFECTIVE MONETARY POLICY

Region: I'd like to start with some questions about policy, in particular, forward guidance. In August 2012 at the Fed's Jackson Hole symposium, you gave a very influential speech in which you compared two options for monetary policy when at the zero interest rate bound: forward guidance and quantitative easing (balance sheet) policies.

You argued that essentially both theory and data suggest that forward guidance is likely to be the more effective of the two, and you further recommended that policymakers should make "advance commitment to definite criteria for future policy decisions."

Four months later, at the December Federal Open Market Committee meeting, the Fed *did* adopt forward guidance—in the form of thresholds for unemployment and inflation—along with continued quantitative easing. Did that approach meet the standards you would advocate in terms of definite criteria?

Woodford: It was certainly a step in that direction. Not only was it an attempt to shape expectations by making official statements about future policy, but it was in line with what I had been arguing for in at least one important respect, which is that it was saying something about *criteria* for making a future decision as opposed to trying to announce the future policy settings themselves in advance.

The Fed had already been using statements about future policy as an important part of its efforts to stimulate the economy, particularly dramatically since the previous summer, when it had begun making quite unprecedented statements about specific dates, as far as two years in the future, until which the FOMC anticipated being able to maintain its current unusually accommodative policy. But that approach didn't involve stating *criteria* for making a future decision; instead, it only offered a guess about where the federal funds rate would be at specific future dates.

ON DATE-BASED GUIDANCE

"Date-based guidance" is a less satisfactory way to try to shape expectations about future policy. The most important problem is that it's unlikely that a central bank would really be making a promise ... about future policy in this very specific form of saying where the instrument will be two years in the future.

And, of course, the FOMC *wasn't* really making such a promise. If you looked at the fine print ...

There are various reasons why I think such "date-based guidance" is a less satisfactory way to try to shape expectations about future policy. The most important problem is that it's unlikely that a central bank would really be making a promise or declaring an intention about future policy and make it in this very specific form of saying where the instrument will be two years in the future.

And, of course, the FOMC *wasn't* really making such a promise. If you looked at the fine print of what they said, they hadn't said we *intend* to do this. They hadn't said we *will* do this. They had said we currently *anticipate that future conditions will warrant* our doing it.

Region: The wording was very indefinite, vague: "anticipating conditions," but not saying what might happen if those conditions aren't fulfilled.

Woodford: Yes, and not only that: It didn't even say what *kind* of future conditions those had to be, only that we currently

are anticipating that there will be such conditions, but we don't have to say what kind of conditions those would be. So whether the conditions are shaping up or not, you don't really know. Even as you see the news coming in, you wouldn't really know whether it is or is not developing into the conditions that would warrant the policy. You only know that at some date in the past, the FOMC was anticipating some unstated conditions that it thought for unstated reasons would warrant a particular policy.

That was, I think, an important qualification, although it's not surprising that it had to be so hedged given that the idea that they would really promise two years in advance exactly where the federal funds rate would be—well, that would be a pretty shocking thing to do, if it were an actual promise.

Region: So, then, in December 2012, the Fed moved ahead to explicit unemployment and inflation threshold figures for policy change.

Woodford: That's right. This meant trying to say something about specific criteria you would be looking for, which may or not arise by a certain date, and that should determine whether you are or are not thinking about particular policy changes by that date.

I think that is much more sensible as a way of trying to make a statement about future policy because it is something that you could reasonably say and mean as a statement of intention. And I think it was intended as a statement of the form: "We intend to actually conduct our future deliberations along certain guidelines that we're announcing in advance." From that point of view, it was very much what I was calling for.

Now, the specific *form* of the statement they made was not quite what I had suggested in my lecture, and not really what I would have preferred. But, of course, they had to announce a policy that they thought they could follow.

Region: At Jackson Hole, I believe you said that nominal GDP target policies were more consistent with what you had in mind.

Woodford: Yes. I had specifically suggested that announcing a target path for nominal GDP would be a desirable way to make an advance statement about the criteria that you would be looking at later.

Now, I wasn't saying that to suggest that that's the *only* formula that would be valuable, but I thought it was useful to give a concrete example showing how the thing that I was talking about could be undertaken in practice. It was a simple proposal that nonetheless incorporated the key elements of what I thought was a desirable form of commitment. I also thought it could be understood by a fairly broad public. It incorporated what I *thought* were key considerations that people on the FOMC were likely to be concerned about, although it turned out that evidently it didn't address their concerns as much as I was trying to, because it didn't get much traction with them.

Region: You mention commitment here. But if it were faced with a potential scenario of inflation exceeding 2 percent and unemployment low, the FOMC might want to deviate from the nominal GDP target and raise interest rates. Would you be concerned about time inconsistency issues with a nominal GDP target strategy?

Woodford: Any strategy that seeks to obtain benefits now from giving people a reason to expect something later raises the question of time consistency of the policy: The mere fact that you wanted people to *expect* something earlier may not count as a reason for you to want to actually *deliver* it later. This issue arises in public policy all the time, as Finn Kydland and Ed Prescott explained in their famous paper.

And the way that we deal with this tension is not, or at least not always, to

ON NOMINAL GDP TARGETS

A nominal GDP target path would have the advantage of being a *single* criterion, yet one that conveyed concern both about the real economy and about the price level and nominal variables at the same time.

say that an honest government will never make any promises to do something other than what it should later want to do in any event.

For example, we promise not to appropriate people's property, in order to give them an incentive to make productive investments, and in general this commitment—and a common understanding of why the ability of people to rely on it is important—does provide a substantial check on the temptations to seize property that might otherwise arise.

But for that to work, it's important, at the very least, that there be a fairly clear understanding of what the commitment means; and it may also be necessary that enough people can understand the basic logic of what the commitment was intended to achieve, so that it isn't viewed *ex post* as simply a rash mistake that one should hope to be excused from.

A commitment to a nominal GDP target path would raise this issue, but no more than any other form of meaningful forward guidance does and, indeed, no more than does the announcement of an inflation target, as the FOMC made in January 2012.

Apparently some on the Committee are more comfortable with the idea of having to tighten policy to keep inflation from running too high—simply to validate the expectations of low inflation

that you had sought to create earlier—than they are with the idea of allowing inflation that might be temporarily above the long-run target rate, simply to validate expectations that nominal GDP would be allowed to catch up to a previously announced target path.

But at a conceptual level, the issue is no different. Probably the reason they are more comfortable with the idea of disciplining their policy decisions through an announced long-run inflation target is that the potential benefits of such a target have been discussed at greater length. It took the FOMC 35 years to catch up with the scholarly literature on that proposal, after all.

Region: Roughly a year later at a Riksbank presentation, you compared what the Fed had done, the threshold approach, with what you had advocated. What are the advantages of the latter, of a nominal GDP target policy?

Woodford: One advantage is it would be a single criterion; whereas, the thresholds that the Fed announced were two different criteria.

Region: Perhaps dueling criteria, at times.

Woodford: Right. There was a threshold for the unemployment rate, but there was also a threshold for inflation expectations. The question of whether those could be in conflict was being sidestepped. I think they were hoping things would evolve in a way that no tension between the two criteria arose, and that turned out to be right, but it was a gamble. If, say, it had begun to appear that the inflation threshold could be breached before we were anywhere close to the unemployment threshold, there would have been a lot of uncertainty about how policy might develop.

A nominal GDP target path would have the advantage of being a *single* criterion, yet one that conveyed concern both about the real economy and



about the price level and nominal variables at the same time. It would have given an explanation for which substantial stimulus would have continued to be appropriate for some time to come. But it was also a criterion that was intended to reassure people that what looked like very aggressive monetary policy was *not* going to allow inflation to get out of hand. If inflation picked up very much, the FOMC would quickly have reached the nominal GDP target and then would have to restrain nominal demand growth in order not to shoot past the target path. The public wouldn't have to be worried that we were pushing so hard on stimulating the economy that maybe we were going to let demand get totally out of control, and we were just not thinking about that because it wasn't the fire that had to be put out this year.

SHIFTING FROM NUMERICAL THRESHOLDS

Region: Earlier this year, the Fed modified its forward guidance; it relaxed its reliance on numerical criteria and moved toward a qualitative form of forward guidance. What are your thoughts about the wisdom of this new approach?

Woodford: I was not surprised that the FOMC had to change its approach. The unemployment threshold was about to be reached, so it was not providing much guidance about policy in the future. Yet the FOMC wasn't at all inclined to immediately revert to something that would look like precrisis policy, either. The fact that the thresholds ceased to provide useful guidance long before it was time for policy to be "normalized" was, in my view, another of the weaknesses of that strategy.

But given that they had adopted it, it was then difficult to switch to some other form of relatively explicit criterion for what actually *would* determine when it was time to normalize policy. I agree that it wouldn't have made sense to an-

ON SHIFTING FROM NUMERICAL THRESHOLDS

That the thresholds ceased to provide useful guidance long before it was time for policy to be "normalized" was, in my view, another of the weaknesses of that strategy. ... [The FOMC was] left with little alternative but to revert to a much vaguer way of talking about policy intentions.

nounce a new, but lower, unemployment threshold once the old one was reached, and I agree that they shouldn't have felt that the previously announced threshold required them to immediately begin tightening policy. And it would have been hard to switch to a conceptually very different approach to forward guidance, such as a nominal GDP target date, at that late date as well. So they were left with little alternative but to revert to a much vaguer way of talking about policy intentions.

It doesn't seem to me that this vaguer approach to communication was really forced by the complexity of the situation that had arisen. Of course, the situation *is* complex, but it had not become a lot more complex than it been a year and a half earlier. I think it's more that the choice of the threshold formulation in 2012 then made it hard to adopt a better approach when we reached 2014.

OTHER POLICY TOOLS

Region: It's clear that the Fed is tapering and is beginning to experiment with other policy tools beyond quantitative easing and the fed funds rate, mechanisms such as reverse repurchase agreements. What are your thoughts about the potential effectiveness of such tools and the feasibility of implementing them?

Woodford: I am not worried that the Fed is not going to have effective tools for implementing its interest rate policies. We have yet to reach the point where they do want to raise interest rates, but assuming that things evolve as everyone is currently anticipating, we are likely to reach it within the coming year. At that point, I think, there will be tools that allow them to do it.

It will be an interesting experiment in monetary economics because the Fed will be attempting to control short-term interest rates in a situation where almost certainly its balance sheet is going to be unusually large. That means that there are going to be extraordinary quantities of excess reserves in existence, and this means that Fed control of short-term interest rates will not be achievable in the way that it always was in the past: through rationing the supply of reserves. The Fed would maintain a fairly *small* supply of reserves, small enough that there was indeed an opportunity cost of reserves, and it could adjust that opportunity cost fairly precisely through relatively small changes in the supply of reserves.

That won't be the case when we begin tightening policy this time, but I think there are other tools that should be effective. And as you pointed out, they've been actively experimenting with the development of additional tools, just to make sure that there are enough ways to control money market interest rates.

Region: Are there any mechanisms that you think are particularly potent?

Woodford: Well, I think the fact that interest rates can be and are currently being paid on excess reserves is very important. Of course, the Fed asked for that authority from Congress back in 2008 before embarking on the large expansion in the size of its balance sheet. The reason, I think, is that it was preparing for this question that we are going to face within the next year or so: When you have this big balance sheet,

have you given up control over short-term interest rates? The FOMC wanted to be sure the answer to that question was “no,” and it could do that by having the ability to pay whatever interest rate it deemed appropriate on those reserves. So that’s a very important tool, and probably the most important tool that they are going to have when the moment arises.

But you mentioned the introduction of the reverse repo facility, and I think it should also be very useful to have that tool as well. In particular, that should help to address a worry that some people have, who point out that we’re paying 25 basis points of interest on reserves right now, without this placing a floor on the federal funds rate or overnight rates in general. You then might conclude that paying interest on reserves *isn’t* an effective way of controlling other short-term interest rates.

My view is that it’s hard for those other interest rates to trade *too* far below the interest rate being paid on reserves. So I think you should be able to pull them up by increasing the interest on reserves. But if you’re worried that you could raise the interest rate on reserves substantially and it *wouldn’t* pull up those other money market interest rates, then having the reverse repo facility to also push them up, by offering the opportunity to get a certain overnight interest rate through transactions with the Fed, is something that ought to allay that concern.

Region: So the reverse repo facility is a backstop, in your mind, a secondary mechanism that should provide some assurance to markets?

Woodford: My guess is that even without that they would have a pretty good degree of control over overnight interest rates. But I think having the reverse repo facility makes it even more certain that if they want to raise the level of overnight interest rates by, say, 50 basis points or a percentage point, that they can do that, and should even be able to

ON CONGRESSIONAL MANDATES

The idea that you would simply have a price stability mandate and no reference to the real economy at all, I find surprising, particularly after the experience of the past five years.

Clearly, the overriding concern of policy over this period has been ... the labor market, rather than inflation. That anyone would choose at this particular moment to propose that it would be better to force the Fed to focus solely on inflation boggles the mind.

do it with a fair amount of precision.

I think there was more reason to worry about whether the Fed had enough tools with which to influence financial conditions when the problem was finding more ways to loosen conditions. Once the problem becomes one of finding ways to tighten financial conditions, we’ll be facing a more familiar problem, and I think there will be ways to do it.

CONGRESSIONAL MANDATES

Region: Let me shift considerably and talk about congressional mandates.

Since 1977, the Fed has had the dual mandate—to promote price stability and maximum employment. But since the financial crisis if not before, there has been ongoing discussion primarily about whether to jettison the employment part of the mandate, so that the Fed’s focus would be strictly on maintaining price stability.

More recently, others—such as former Fed Vice Chair Donald Kohn—

have suggested adding a third mandate regarding financial stability. Earlier this month, at the National Bureau of Economic Research Summer Institute, the Fed’s Vice Chair Stanley Fischer said that Kohn’s proposal “clearly warrants serious examination.”

What are your thoughts? Should maximum employment be removed from the Fed’s mandate, and would adding financial stability to the mandate be valuable?

Woodford: I’m very surprised by the proposal to eliminate the real economy side of the dual mandate. You could argue that the particular language, “maximum employment,” may not be the most precise description of the objective. But the idea that you would simply have a price stability mandate and no reference to the real economy at all, I find surprising, particularly after the experience of the past five years.

Clearly, the overriding concern of policy over this period has been the state of the real economy and, indeed, the labor market, rather than inflation; in my view, that concern with the real economy has been more justified on this occasion than in many decades; and the Fed hasn’t had to sacrifice price stability in order to help support the real economy. That anyone would choose at this particular moment to propose that it would be better to force the Fed to focus solely on inflation boggles the mind.

In fact, I think that if the Fed’s legislative mandate excluded any concern for the labor market or economic activity, that would have been a straitjacket that would have been pretty unfortunate in the situation that we were just in.

Region: And financial stability?

Woodford: The question whether there should also be a financial stability mandate is a more reasonable one to take up. Though I have to say that I find it a little surprising that people would think that there *isn’t* one. It’s true that the Federal Reserve Act mentions price stability, it

mentions maximum employment and it doesn't, in a similarly direct way, talk about the responsibility for financial stability.

But, historically, if we ask why the Federal Reserve Act was passed at all, we know that Congress established the Fed in response to a financial crisis. From the legislative history, it's clear that the whole point of the Federal Reserve Act was to have an institution that would act to ensure financial stability.

It's true that when the current language of the Federal Reserve Act was drafted in the 1970s, financial stability had become a less central concern, and instead inflation and unemployment were both big problems. Still, the idea that anyone would have thought that it was somehow not the Fed's concern is strange. I find it hard to imagine that if the Fed thinks it should do something out of a concern for financial stability, anyone would actually be able to object that this was overstepping the bounds of what Congress ever wanted it to be concerned with.

Region: But, of course, many people aren't familiar with the Fed's history. Adding financial stability to the mandate would make that responsibility—perhaps assumed by many—more explicit.

Woodford: That's right, and I don't see anything *wrong* with making it more explicit. It's just that it seems to me that an amendment of the act to do this would be fixing something that isn't really a problem.

There are, of course, important questions about the extent to which financial stability considerations should be taken into account in making monetary policy decisions, particularly when one is not already in the midst of, or on the cusp of, a serious financial crisis. But these are prudential questions—do you really know how to do it, and how might it interfere with your other goals to even try?—rather than questions about the legitimacy of the concern.

ON STRUCTURE AND COMMUNICATION

The obvious advantage [of the Fed's decentralized structure] was to have different parts of the country be represented.

You could also argue that [it] is good from the point of view of having checks and balances, in the sense that "groupthink" is more easily avoided.

But there is at least one important problem that [it] creates: Speaking clearly with one voice is a lot harder.

STRUCTURE AND COMMUNICATION

Region: Let me ask about the Fed's structure, which again was set years ago. You've always been a powerful advocate for clarity, communication and transparency with the public—that that's really essential to the effectiveness of Fed policy. The FOMC has become more transparent over the past 20 years, but the structure has not changed dramatically.

Do you think that the structure—with both regional presidents and the central board—tends to *strengthen* or *obscure* policy clarity and communication? Put otherwise, what are the trade-offs of a structure that has geographic representation that provides valuable input from around the country, but also may lead to policy confusion because many Fed presidents are giving speeches and making statements, versus the Fed speaking with just one voice, presumably the Chair's?

Woodford: I think that it does definitely create problems for the transparency and

clarity of communications about policy to have the kind of decentralized structure that the Federal Reserve System has. That doesn't mean that there aren't also advantages to it.

The obvious advantage—the reason for setting it up that way—was to have different parts of the country be represented, particularly in light of the fact that different sectors and industries are important in different parts of the economy. And I think that's obviously valuable.

I think you could also argue that a decentralized structure is good from the point of view of having checks and balances, in the sense that "groupthink" is more easily avoided. You have independent staffs producing their own independent analyses, and then you can confront them with each other. There are advantages in having different points of view contend and seeing who ends up winning the argument. That's another thing that's valuable about the decentralized structure. The issue that we spoke about earlier—the FOMC's adoption of a new, more state-contingent approach to forward guidance—had a lot to do with advocacy from some of the regional Bank presidents, including your own Bank's, and I would call that an example of the decentralized structure working well.

But there is at least one important problem that the decentralized structure creates: Speaking clearly with one voice is a lot harder. It's not just that a single decision maker would allow the institution to have just one voice. Even if it was a committee, if its members were all together in Washington, I think it would be a lot easier to hash things out and come to agree on what the committee has chosen as its position. And then even if multiple people were to give speeches on different occasions, I think it would be easier for them all to be conveying the same message.

When the Fed's regional Bank presidents are in different parts of the country most of the time and only meet very briefly, it's probably harder to have the

kind of extensive ongoing discussion that would be needed to really get on the same page. And I think that that is a problem.

It wouldn't be so much of a problem if you thought that the only decision the FOMC has to make is setting a number for the federal funds rate or something like that. And that once that number is decided, everyone can say, "OK, now that we've decided on the funds rate, the meeting is over, we go home and it's going to be implemented." If you thought that's all there was to policy, then it wouldn't really matter that people might have different points of view on why exactly they did or didn't move the rate more in a given meeting; and so brief, infrequent meetings might well be enough—enough to compromise on a number that in any event only applies until the next meeting, even if it is not enough to come to a common view about the strategy behind the decisions.

But it's clear that as a practical issue, it's becoming increasingly important what the institution communicates to the public about where policy is heading, what the thinking is behind that policy and what the criteria are that are likely to be shaping future decisions. It's much harder to communicate a clear view on those kinds of things without the members of the committee having an opportunity to talk to each other at more length than I'm afraid it's easy for them to do in the existing geographically decentralized structure.

And so I think there *is* a problem. Whether this means that the actual structure of the Federal Reserve—or who has the voting rights—really needs to be changed, or whether they can simply organize the decision process so that the different parts of the System communicate more with each other, I'm not sure. But I would urge that it ought to be recognized as an important problem for the current organization of the system. More thought should be given to ways to increase the extent to which there is a robust exchange of views about how to best

ON DECISION MAKING

Why exactly is there not more immediate adjustment of wages and prices when market conditions change?

I think the failure to adjust probably has to do with failures of knowledge to be quite that precise in quite such a timely way.

Understanding what the cognitive limitations are may have important consequences for understanding the nature of those adjustment processes and, in particular, for understanding how policy shapes and influences those adjustment processes.

think about what the policy framework is and how it should be communicated to the outside world.

DECISION MAKING

Region: It hasn't been your primary agenda over the years, perhaps, but you've devoted significant effort to understanding how humans make decisions, incorporating insights from behavioral scientists like Daniel Kahneman and Amos Tversky and neuroscientists such as Paul Glimcher.

In a paper delivered at the 2014 American Economic Association meeting in January, you suggest that cognitive limits have a fundamental role in shaping how we humans make economic decisions. And the model you describe—which hinges on constraints on the information-processing capacity of neural pathways—does a better job of fitting experimental data than did certain competing models.

What implications does that have for micro- and macroeconomic research? And how does this work fit in with your primary research focus on monetary policy?

Woodford: Well, it's something that I have come to pursue deeply, and at least originally this was because of my interest in understanding the foundations of macroeconomics.

Region: These are the true *micro* foundations.

Woodford: That's right. And the reason they are needed is because a key issue for macroeconomics, and in particular for understanding why monetary policy matters, is to understand why adjustments to changing market conditions don't occur more smoothly and more immediately.

It's been a very long-standing observation by economic theorists that in principle the level of wages and prices in terms of a monetary unit shouldn't have any effect on the real economy. It ought to be only the *relative* prices of things that affect supply and demand decisions, and so changes in the value of the monetary unit shouldn't in principle have to have any effect on the real pattern of transactions in the economy.

Region: But, of course, they do.

Woodford: Yes. It seems that they do! So that's a central question for macroeconomics, and particularly for understanding why monetary policy matters. In what one can probably call the mainstream approach to this question—and certainly the one that I've used in a lot of my own modeling—the way that we try to think about that is by supposing that, for some reason, decisions aren't being constantly made, and so prices are not constantly being reoptimized. Then one can look at the consequences for equilibrium and how it adjusts over time under that assumption.



A lot of my work has been trying to develop general equilibrium frameworks in which prices that are not being constantly adjusted are incorporated into the model. Then you can get real effects of monetary policy in those models and understand how equilibrium should be different with different types of policy rules.

But a central question for that kind of modeling is: Why exactly is there not more immediate adjustment of wages and prices when market conditions change? Moreover, there are reasons to worry that the answer to this question about the underlying source of the adjustment delays might actually be important for the conclusions that you get out of the model.

The mainstream approach of the literature of the last few decades has assumed that for some reason—often not too explicitly modeled—decisions about, say, wages or prices are not going to be constantly adjusted. But the models are still set up on the assumption that all of the decision makers are perfectly aware of what market conditions are and what would be currently optimal for them at every point in time, *even though* for some reason it would be costly to adjust, say, their prices or their wages more frequently.

We understand a fair amount about the logic of models like that. In some ways, they were only a small step away from the kinds of intertemporal equilibrium models that we understood how to work with already, and so I think that's why we explored that path first. We did something simple that was not too different from the models we already understood well, so we could understand what we were doing.

But there are important reasons to be worried about whether the model has gotten everything right. I think it's right to suppose that things aren't constantly readjusted optimally, but it may be wrong to think that people are perfectly aware at every moment of what it would be in their best interest to do, if only they

ON DIFFERENT MODELS

I have trouble imagining how anyone could think of the New Keynesian framework as somehow having become hegemonic; in academia and in the research journals, the opposite is true.

It's probably true that in central banks, there is something useful about having a systematic framework. But even in central banks, I don't think it's true that there is no room for alternative approaches.

were not subject to “menu costs” or some other barrier to more constant adjustment. Rather, the failure to adjust probably has to do with failures of knowledge to be quite that precise in quite such a timely way. If you ask what the costs of more frequent price adjustment really are, I suspect they are costs of having to pay more close attention and make more precise decisions all the time about what exactly it's best to be doing.

Now it is possible that if one understood the nature of those constraints better, it would turn out that everything happens just *as if* everyone had perfectly precise awareness, but something was constraining them from moving certain variables more often, and while otherwise everything happens as if they're perfectly aware of what they're doing. But this may not turn out to be the case. Understanding what the cognitive limitations are, and how they are responsible for adjustments not occurring as rapidly, may have important consequences for understanding the nature of those adjustment processes and, in particular, for

understanding how policy shapes and influences those adjustment processes and interacts with them.

DIFFERENT MODELS

Region: Earlier, when talking about structure of the FOMC, you mentioned that one of the advantages of a decentralized structure is letting different theories compete and seeing which wins the day.

The “New Keynesian model,” of which you're a primary architect, is now an essential ingredient in policy research, analysis and policymaking at central banks all over the world. That must give you a true measure of pride and satisfaction.

But on the other hand, do you think there's a risk that it could be “crowding out” other potentially useful paradigms? Are there other, competing models that hold promise?

Woodford: Well, I certainly don't think that our understanding in macroeconomics is already completed, so I would never argue that because we have a good theory we should therefore not try to do any further research, or even explore fairly different approaches. As I said, my *own* work is indeed still pushing on asking whether the foundations can be further improved, without presuming whether an improved model will necessarily deliver something similar to our current understanding, or whether it might result in more far-reaching changes.

It's true that many are using New Keynesian models, and I think they are helpful for understanding some issues. Indeed, some of the central issues raised in the monetary policy debates of the past few years, such as the potential advantages of different forms of guidance about future interest rate policy, would have been difficult to think systematically about without these models—not because they are perfect models, but because what we had before was even less suitable for that purpose. But that's not a claim that some other idea, yet to be developed, won't turn out to add some-

thing important to the New Keynesian framework, or even show that one could dispense with important parts of it because there's actually a better approach.

Region: Are there other potentially promising models? And is there a tendency in the way that economic research is carried out, in central banks and academia, that those ideas are being crowded out or dismissed, essentially discredited before they're given due consideration?

Woodford: Well, I hope that it's not true that promising ideas are discredited too soon. And I have to say I have trouble imagining how anyone could think of the New Keynesian framework as somehow having become hegemonic—maybe in central banks it looks like everyone uses that framework, but in academia and in the research journals, the opposite is true; not only can alternative approaches be explored, but they are most of what gets taught and published.

As to whether it has become a dominant approach among central bank research staff, I would hardly say that it's the only thing that you see. But it's probably true that in central banks, there is something useful about having a systematic framework that you can use to think about a whole series of problems that are going to come up, using a coherent framework and language that aren't rethought from the beginning with every new issue that arises.

The job of central bank staff is to respond to rapidly changing situations in the economy and to be able to brief policymakers on how to think about what's happening. So the balance between time spent using an accepted framework to address applied questions and time spent on more fundamental inquiries into whether a better framework might be possible is somewhat different than in academia.

Also, as we were saying earlier, central banks need to be able to communicate, and communicate in a relatively clear way, about what their approach to what

POLICYMAKER?

My guess is that I'm better at thinking about more long-range issues and underlying conceptual problems, and that other people are better at thinking about what to decide *this* month and how to give the press conference *this* week.

they do is, and from that point of view there will be an advantage to adopting a particular framework, simply in order to be able to send a clear message. That doesn't mean you should never consider changing it, but if you're constantly talking about how everything is up in the air and you're considering many different possible approaches, that makes it harder for people outside to guess what you might or might not be doing next year.

But even in central banks, I don't think it's true that there is no room for alternative approaches, even fairly speculative ones, to be pursued. The development of my own ideas about the foundations of monetary economics would not likely have taken the direction they did without many fruitful discussions with researchers in central banks, at a time when the work was far from the academic mainstream. This included not only discussions with people in the Federal Reserve System, but some very crucial discussions with people at banks like the Bank of Canada, the Reserve Bank of New Zealand and the central banks of Sweden and Norway.

POLICYMAKER?

Region: That leads to my last question, about whether you've considered a more formal policy position. You've been a

valued adviser to many central banks, but as far as I'm aware, you've never had an official policymaking role.

Woodford: That's right.

Region: Have you ever considered it? Do you ever think that your research might have greater impact if you were in a position to implement it? Certainly there have been—are currently, for that matter—prominent central bankers who come from academia. Perhaps this relates to a broader question: Why is monetary economics so elegant in theory, but difficult in practice?

Woodford: Well, I don't think it's a mystery why it's difficult in practice. The world is complicated. I find it more surprising that there is as much use for theoretical clarification as there is, especially compared to a lot of other areas of practical activity. Most practical problems are complicated, and they're dealt with by practical people who use some ideas about what they're doing, but don't use much high-powered theory.

Central banking is instead one of the human activities where I think there is some real use to relatively abstract theoretical contributions. That's because while it is certainly still a complicated issue, it also raises conceptual issues that are of such a nature that it *is* actually helpful to have some theory at your disposal in thinking about how to deal with them.

That's partly because of the abstract nature of the problem, and it's partly because of the thing we've already been talking about, which is that not just *making* a judgment but *communicating* about *how* you make it also matters. That second reason means that even if gut instincts obtained from experience that haven't been conceptualized theoretically could get you to make the right guesses about what to do at a given moment, that really *wouldn't* be enough to completely solve the problem of the modern central banker, because I think they now also need to

be able to talk about what their institutions are doing. That means that there is a role for people who can conceptualize the problem, if only to be able to improve that communication process.

Region: Given that, have you always viewed your role as a theoretician, rather than policymaker, and if so why?

Woodford: That's a question of the division of labor in a complex society, and part of why a society like ours is as productive as it is, is because many people play different roles, and we try to get them slotted into the ones that they're better at.

In smaller, less complicated societies, anyone who is an economist probably should be involved in government and teaching at the same time, because there aren't as many people to assign to different roles. But in a place like the United States, there are many people to play many different roles.

And my guess is that I'm better at thinking about more long-range issues and underlying conceptual problems, and that other people are better at thinking about what to decide *this* month and how to give the press conference *this* week, and those kinds of things, that require you to be on the ball and adjust quickly to short-range changes in situations. Different people are good at different roles.

—*Douglas Clement*
July 23, 2014

More About Michael Woodford

Current Position

John Bates Clark Professor of Political Economy, Columbia University, since 2004

Previous Positions

Harold H. Helm '20 Professor of Economics and Banking, Princeton University, 1998-2004; Professor of Economics, 1995-98

Professor, Department of Economics, University of Chicago, 1992-95; Associate Professor, 1989-92; Assistant Professor of Business Economics, Graduate School of Business, 1986-89

Assistant Professor, Department of Economics, Columbia University, 1984-86

Professional Activities

Scientific Adviser, Sveriges Riksbank, since 2012

Economic Advisory Panel, Federal Reserve Bank of New York, since 2009; Monetary Policy Panel, since 2004

Research Fellow, Program in International Macroeconomics, Centre for Economic Policy Research, since 2004

Research Associate, Programs in Economic Fluctuations and Growth and in Monetary Economics, National Bureau of Economic Research, since 1994

Series Co-editor, *Handbooks of Economics*, Elsevier Press, since 2013

Node Leader, International Network on Expectational Coordination, since 2012

Editorial Board, *Annual Review of Economics*, since 2010; *American Economic Journal: Macroeconomics*, since 2007

Advisory Board, *International Journal of Central Banking*, since 2008

Frank P. Ramsey Prize Committee, *Macroeconomic Dynamics*, since 2000; Advisory Editor, since 1996

Honors

Fellow, American Academy of Arts and Sciences, since 2004

Fellow, Econometric Society, since 1991

Named one of *Bloomberg Markets*' 50 Most Influential Thinkers, 2013

Deutsche Bank Prize in Financial Economics, 2007

Association of American Publishers 2003 Award for Best Professional/Scholarly Book in Economics, for *Interest and Prices: Foundations of a Theory of Monetary Policy*, Princeton University Press

John Simon Guggenheim Memorial Foundation Fellowship, 1998-99

John D. and Catherine T. MacArthur Foundation Prize Fellowship, 1981-86

Publications

Author, *Interest and Prices: Foundations of a Theory of Monetary Policy*, 2003; editor (with Benjamin M. Friedman), *Handbook of Monetary Economics*, vols. 3A-3B, 2011; editor (with Ben Bernanke), *The Inflation Targeting Debate*, 2005; editor (with John B. Taylor), *Handbook of Macroeconomics*, vols. 1A-1C, 1999; prolific author of research articles on macroeconomic theory and monetary policy

Education

Massachusetts Institute of Technology, Ph.D., economics, 1983

Yale Law School, J.D., 1980

University of Chicago, A.B., 1977

For further background:

columbia.edu/~mw2230/

RBC Reassessed

When official data better account for intangible capital, labor productivity figures are likely to cycle up and down with the broad economy, consistent with real business cycle theory

Douglas Clement

Editor

The source of business cycles—ups and downs in economic activity commonly referred to as booms and recessions—has long been disputed by economists. Some theorists argue that monetary shocks—an unexpected surge in money supply, for example—are the cause. Others suggest structural frictions (a tax, tariff or union) that impede labor markets, for instance, result in reduced production, lower spending and higher unemployment.

But real business cycle (RBC) theory, an influential school of thought pioneered in two papers published in the early 1980s, first by Edward Prescott and Finn Kydland (1982) and a year later by John Long and Charles Plosser (1983), holds that technology shocks provide the major explanation for busts and bursts of economic activity. If an engineer designs a wing modification that enables airplanes to fly more efficiently, ticket prices might fall and tourism increase. If government regulations restrict use of that modification, the positive shock will be reversed.

The recession of 2008-09 presented a strong challenge to RBC theory. The theory implies that labor productivity drops when output drops, as in a recession (and rises when output does, in a boom); in other words, labor productivity is “procyclical.” But government data from the Great Recession showed that productivity rose some-

what—*greater* output per worker, not less—even though output fell dramatically.

This suggested at a minimum that the Recession was an anomaly, not a typical business cycle that technology shocks could explain. At worst (for RBC adherents), the data indicated fundamental weakness in the theory itself: If one of its key predictions wasn’t borne out by the largest recession in decades, perhaps the theory itself was flawed. Regardless, economists soon looked elsewhere for the recession’s source—most notably at disordered financial markets. See, for example, Cristina Arellano, Yan Bai and Patrick J. Kehoe (2012).

In a recent paper, however, Minneapolis Fed economists Ellen McGrattan and Edward Prescott argue that it’s far too soon to abandon RBC theory. Official calculations underestimated the actual drop in economic output, the economists contend, because they neglected a large component of national economic activity: business expenditure on *intangibles* investment. In fact, according to McGrattan and Prescott, theory and (other) data suggest that spending on intangibles dropped significantly during the recession, meaning that economic output—which includes expenditure on intangibles investment—fell far further in reality than indicated by government statistics. Labor productivity—the ratio of total output to hours worked—therefore likely fell from 2008 to 2009, in accord with RBC prediction.

Eulogies for RBC theories are
premature.

As predicted by
Real Business Cycle theory,
U.S. labor productivity likely fell during the Great Recession.

Why do government statistics say otherwise?

Theory and relevant data suggest they dramatically underestimate the actual drop in total economic output because they neglect much actual spending on

**intangible
capital.**

Review, extend, evaluate

Their paper, “A Reassessment of Real Business Cycle Theory” (McGrattan and Prescott 2014), consists of three key sections. The first reviews the basics of an RBC model and addresses two critiques, which they label “naïve” and “sophisticated.” The second section extends the basic model to include intangible capital and finds that the model thus extended supports the idea that “wedges” in labor markets account for observed fluctuations in labor productivity and demonstrates that “*measured* productivities are misleading statistics for judging the theory.” The paper’s final section reviews empirical evidence showing, among other things, that the intangible investments for which direct measures are available are large and correlated with tangible investments.

A key point made by the paper: The very premise of the argument—that economic output declined only modestly, resulting in higher measured productivity (output per worker)—is flawed if calculations haven’t measured investment levels (a part of total output) properly.

How could the calculations be improved, at least theoretically? By accounting fully for investment in corporate assets like research and development, patents, trademarks, skills training, advertising and investments in organization-building: very real, indisputably valuable, but usually hard to measure.

Once investment in this intangible capital is incorporated into measures of total investment, suggest the economists, the drop in total output during the recession will likely seem larger, and measured labor productivity will probably not increase. McGrattan cautions that “we don’t observe all intangible investments so, at this point, we can’t make this a definitive statement. Only if we could observe and measure all intangible expenditure could we be certain.”

Start with the basics

The basic theory is just that: a very bare-bones version of the original models set forth in the Kydland-Prescott (1982) and Long-Plosser (1983) papers. It includes a household (representative of all households) that supplies labor to firms and that, in addition to receiving wages for work supplied, receives dividends from those firms (as part-owners); the firms that produce final goods

for households and the government, as well as intermediate goods for other firms; and a government that has spending obligations financed through taxes on households and firms.

The crucial variables in this mathematical model are those that affect labor in the same way that a tax on labor income does. The variables can change over time and have a strong impact on how many hours of labor households provide to firms. By decreasing take-home pay, labor taxes encourage workers to supply fewer hours in the workplace.

Another important variable is the level of new investment made by firms, and in this basic model, new investments are made only in *tangible* capital: machinery, tools, buildings and the like.

McGrattan and Prescott quickly address two critiques of this basic model insofar as it’s capable (or not) of accounting for data patterns of the Great Recession. The first—the “naïve”—is that it doesn’t include complex financial markets or disruptions therein that some argue were central to the recent crisis; therefore, it can hardly be considered relevant to the recession that followed. True, it doesn’t, admit McGrattan and Prescott, but the lack of myriad sophisticated financial instruments doesn’t discredit the model itself. “At issue is whether the theory is a good abstraction for making reliable predictions,” they write. However, the inclusion of firms that raise funds and make new investments with those funds is a key part of the model; therefore, “it may well be a fine approximation.”

The more “sophisticated” critique is that the model’s predictions for output, investment and employment patterns in the recessionary period may strongly deviate from reality. Indeed, that is the motivation for the paper: RBC theory predicts that labor productivity (that is, output/labor hours) should decline during a recession, but the data show the opposite. *This* critique needs serious consideration.

So, is something fundamentally at fault with the theory? Is it now obsolete, unable to aid economists or policymakers? Or is the theory essentially valid and simply missing an element that would align model predictions and reported data? McGrattan and Prescott have dealt with this doubt before in closely related research and, as they write in a 2012 paper, “we find that eulogies for RBC theories are premature.”



Niedorf Visuals

Ed Prescott



Stan Waidhauser

Ellen McGrattan

Using a technique developed previously to analyze specific components of business cycle fluctuations (V. V. Chari, Patrick J. Kehoe and McGrattan's 2007 business cycle accounting method), McGrattan and Prescott determine that the theory requires “time-varying *labor wedges*, that is, something affecting the [effective tax on labor hours supplied by households] in addition to government tax policy.”¹

In the next section of their paper, McGrattan and Prescott track down the source of that “wedge,” modify the model accordingly and find that fault lies not in RBC theory itself, but in the data as measured. They find that the bare-bones model lacks an important feature. The missing element? The easily overlooked, but absolutely essential *intangible* capital. Like RBC theory itself, intangible capital can't be seen or touched, but it's crucial.

The basic model plus intangibles

The economists extend the model with a fuller description of the “technology.” That is, they incorporate *two* types of capital inputs, tangible *and* intangible. Again, tangible capital is structures, equipment, machinery—stuff you really can see and touch. Intangible capital includes research and de-

velopment, software, artistic originals, brand equity and organizational capital.

The U.S. government taxes these two things differently, and that's part of why including intangibles makes a difference to model results. Intangible capital is usually treated as an immediate annual expense—like wages paid—when computing taxable income. Counted as an annual expense, it isn't included in business value added and thus not in gross domestic product (GDP).

Also, they can be used differently: Intangible capital—ideas or information—can be used by many people at the same time. Economists say it's “nonrivalrous.” Tangible capital, on the other hand, is rival. A wrench or a factory can be used for only one purpose, by one party, at any given time.

Firms in this extended model have the same goal as in the basic model: maximizing the expected stream of after-tax dividends. But with two kinds of capital, dividends must be defined differently. (Each has different depreciation and tax rates, for instance, and intangible capital can be used nonrivalrously.)

“These minor adaptations of the basic theory,” write McGrattan and Prescott, “can have a significant effect on the key predictions.” Because official calculations of total output (GDP) haven't hereto-

fore included intangible capital investment, total output hasn't been fully measured; therefore, labor productivity (that is, output/labor) couldn't be estimated accurately.

In 2008, the Bureau of Economic Analysis' measure of GDP included only software, a small part of all intangible investment. The BEA expanded its coverage of intangible capital in 2013, including investment in research and development, and artistic originals. Nonetheless, a significant amount of spending on intangible capital remains unaccounted for, including investment in brands and organizational capital. As McGrattan and Prescott write elsewhere, "in other words, it is possible to observe high measured labor productivity while output is low if some output is not included in the statistic but all hours of work are included" (Minneapolis Fed Working Paper 694, p. 3).

In the typical calculation, labor productivity is the ratio of the nation's real value added (that is, inflation-adjusted GDP) to the number of labor hours provided.² If, to the numerator, you add total national investment in intangible capital (times the relative price of that investment to consumption), you'll come up with a far more realistic sense of actual labor productivity. *That* is the missing labor wedge: the seemingly invisible expenditure on intangibles.

Significantly, this missing element—the price of intangible investment relative to consumption, times the amount of intangible investment—"is time varying," write the economists. And "it fluctuates in just the right way," as they found in earlier research (2012). Which is to say, its inclusion in the RBC model delivers predictions consistent with the notion that labor productivity is "procyclical"—drops during recessions and rises with booms. With this extension of the RBC model, the economists find that, indeed, labor productivity will rise and fall in concert with the economy as a whole. "Thus," they conclude, "there is no *logical* inconsistency between theory and aggregate data."

Microdata

So, their argument is sound insofar as it concerns national-level data, but does it hold up to closer scrutiny, at the level of actual firm expenditures on tangible and intangible capital? Is investment in

intangibles *quantitatively significant* for individual industries?

McGrattan and Prescott examine data gathered by the Bureau of Economic Analysis, which in 2013 created an "intellectual property products" category as part of its general intangibles group. This new category includes research and development, and artistic originals. (Previously, BEA data on intangibles included only software expenditure.) McGrattan and Prescott point out that it's a huge, previously ignored, investment category: As a fraction of all private, fixed nonresidential investment in 2012, a full third was devoted to IP, a portion consistent since the early 1990s. About 45 percent went to equipment and the remaining fifth to structures.

In some industries, IP investment is even more significant. In the BEA's computer and electronic products category, IP investments are currently "about *four times* larger than investment in both equipment and structures," they observe. Moreover, IP investment and equipment investment (and to a lesser extent, investment in structures) are correlated. IP spending surged during the late 1990s, reached a peak in 2000, fell, then rose and fell again during 2008-09. Equipment spending followed some same cyclical pattern. McGrattan and Prescott suggest that if the BEA were to broaden its coverage to include other forms of intangible investment (advertising, marketing and organizational capital), data series on these cyclical trends would look even more dramatic.

McGrattan and Prescott also look at 2008-09 data from annual 10-K reports of the largest 500 U.S. advertisers, and research and development spenders. They find that both groups (top advertisers and top R&D spenders) had significant capital expenditures, sales and employment in 2008, and that both faced large declines in all such categories—tangible and intangible—the following year, a tight correlation further suggesting that during the Great Recession, real GDP—and labor productivity—fell further than indicated in BEA data that didn't include all intangibles.

Thus, conclude the economists, "the microevidence suggests that our basic macrotheory—extended to incorporate intangible investments—is worthy of further investigation before declaring it useless," as some have deemed RBC theory. Or to echo their 2012 paper, eulogies are premature. ■

Endnotes

¹ A “labor wedge” is something that prevents households from providing the number of hours of labor they ordinarily would, given prevailing wage rates (what they receive for an hour’s work and the consumption that provides them) and the value they place on another hour of leisure instead of additional consumption. More technically and accurately, it’s the difference between the marginal rate of substitution of consumption for leisure and the marginal product of labor. Wedges account for whatever difference may exist.

² Labor productivity for the business sector (probably the most cited statistic) is real value added for the business sector divided by business hours.

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For further background:

McGrattan and Prescott have been researching the economic significance of intangible capital for over a decade. Some of their earlier work is reviewed in “The Untouchables” in the December 2005 issue of *The Region*.
minneapolisfed.org/publications_papers/pub_display.cfm?id=3256

Research Digest



Jonathan Heathcote

The Goldilocks tax

An elegant economic model reveals the benefits of less progressive taxation

How progressive should taxes be? Economists have wrestled with this central question in public finance since the 19th century, when governments began to levy graduated-scale income taxes, which put more of the tax burden on richer households. A definitive answer emerges from research by a trio of economists, including Jonathan Heathcote, a senior research economist at the Federal Reserve Bank of Minneapolis.

“Perhaps the key feature of the model is its tractability,” Heathcote said in an interview. “We were able to put all these various factors into a model that you can solve with pen and paper at the end of the day.”

“Optimal Tax Progressivity: An Analytical Framework” (Minneapolis Fed Staff Report 496, online at minneapolisfed.org) investigates how the optimal tax schedule—one that has just the right amount of progressivity, maximizing welfare—compares with the U.S. tax system.

Research Digest

Progressive taxation serves as an additional buffer against these income fluctuations. “Part of what the government is trying to do through the tax system is to provide some insurance against idiosyncratic shocks,” Heathcote said.

Joining Heathcote in the research are Kjetil Storesletten, an economics professor at the University of Oslo (and formerly at the Minneapolis Fed), and New York University economist Giovanni L. Violante.

The authors construct a model economy containing the key determinants of ideal progressivity, including factors such as skill investment and private insurance against earnings shocks that have received little attention from other researchers. For all its richness, the model is transparent and easy to mine for insights into the forces that shape optimal progressivity.

“Perhaps the key feature of the model is its tractability,” Heathcote said in an interview. “We were able to put all these various factors into a model that you can solve with pen and paper at the end of the day.”

The results of their experiment show that a benevolent, utilitarian government would enact a less progressive tax system than the one currently in force in the United States. A flatter tax schedule would still offer people some protection against the vicissitudes of the labor market while boosting productivity and economic output.

The role of private insurance in lowering optimal marginal tax rates leads the investigators to propose a progressive tax on household consumption rather than earnings; such a tax would enhance welfare by better preserving incentives to work.

Progressive versus regressive

In designing tax systems, governments strive to strike a balance between the social benefits of progressivity and the economic downside—the distortions higher marginal tax rates introduce into labor markets.

Progressive taxes provide a measure of protection against income loss due to layoffs, disability or other misfortune; those whose income falls are taxed at lower rates. Progressivity is also a redistribution mechanism to offset differences in learning ability, work skills and other life circumstances that contribute to income inequality. But requiring high earners to pay proportionally more tax diminishes incentives to work more hours and to invest in skills that enhance productivity. Both effects reduce aggregate economic output.

Myriad factors influence optimal

progressivity, the sweet spot that maximizes welfare. Heathcote, Storesletten and Violante construct a model—known as a dynamic general equilibrium model—to parse the subtle interplay of these factors. Some model elements, such as the elasticity of hours worked to the tax rate, are well understood by economists. Others, such as the responsiveness of skill investment to the progressivity of the tax system, the capacity of households to smooth income fluctuations and the role of desired public spending on tax progressivity, are less well understood. Integral to the model are mathematical rules describing consumers’ expenditures, hours worked and earnings.

In the model economy, people at different skill (and income) levels choose how much to consume, work and invest in skills, given the prevailing tax schedule. These choices also depend on people’s willingness to work and their learning ability. The resulting cross-sectional distribution of skill investment affects the relative scarcity of higher- and lower-skill workers and their respective contributions to economic output.

All types of workers experience periodic disruptions to earnings, in the model. There are two types of income shocks: predictable or temporary changes that households can smooth by drawing upon savings or

Research Digest

Effects on labor supply and skill investment play roughly equal roles in lowering progressivity in the model. “In the absence of either one of these channels, optimal progressivity would be substantially higher,” the authors write.

participating in other forms of private risk sharing, or insurance; and persistent shocks—such as a prolonged layoff or illness—that can’t be smoothed privately. Uninsurable shocks typically trigger adjustments to consumption—cutbacks or (in the case of a positive shock such as a pay raise) increases in household spending.

Progressive taxation serves as an additional buffer against these income fluctuations. “Part of what the government is trying to do through the tax system is to provide some insurance against idiosyncratic shocks,” Heathcote said. But in the model, the government prefers to provide protection against shocks that affect household consumption rather than the transitory ones that can be insured against privately.

Most people don’t consider government purchases—goods and services that are provided by the government—in their labor market decisions. But publicly provided goods factor into progressivity because the less people work and

invest in skills that increase their earning power, the less revenue is raised to finance such goods. This hidden benefit of more regressive taxation is included in the model.

Not too hot, not too cold

Running the model yields a Goldilocks prescription for progressivity—a system in which marginal tax rates increase with income at just the right pace. The optimal average marginal tax rate is 24 percent, seven points lower than the one in place in the mid-2000s (since then the U.S. tax system has become more progressive). The economists estimate that such a reduction in progressivity would boost welfare by the equivalent of half a percent of lifetime consumption for the average household.

Effects on labor supply and skill investment play roughly equal roles in lowering progressivity in the model. “In the absence of either one of these channels, optimal progressivity would be substantially higher,” the authors write.

The value of publicly provided goods is also a strong force muting progressivity in the simulation. By encouraging people to work more hours and invest in skills, a flatter tax schedule supports increased public spending. (Alternatively, in the model, if households put no stock in government-provided goods and services the optimal tax

rate is very close to the mid-2000s schedule.)

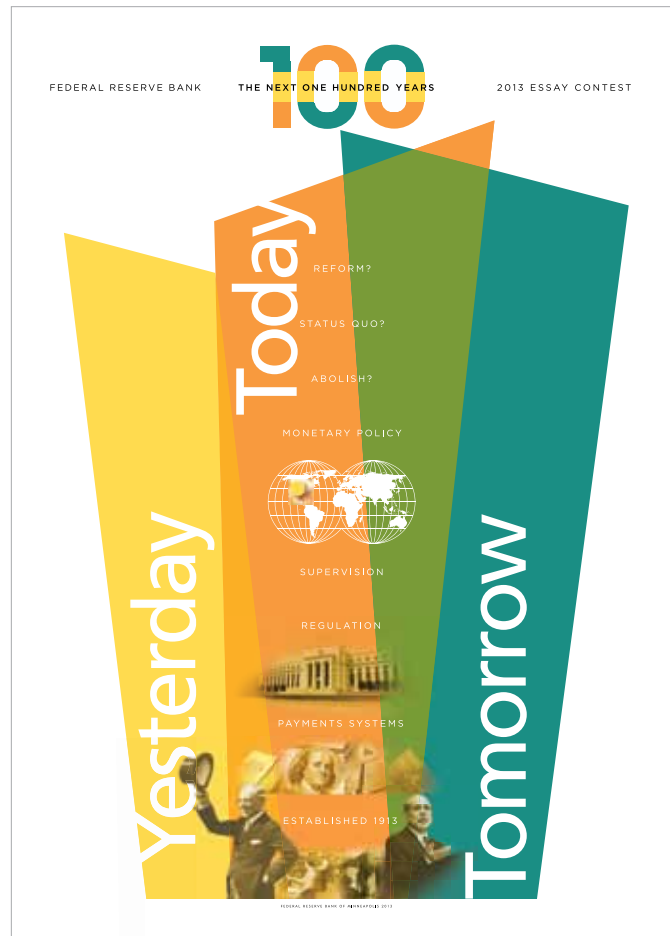
One finding surprised the researchers: Progressivity does little to further the policy goal of reducing pretax wage inequality. Less skill investment increases the scarcity of higher-skill workers, raising their wages relative to lower-skilled workers and offsetting the direct income-leveling effect of a narrower range of skills.

Because private insurance partially protects against income shocks, Heathcote, Storesletten and Violante propose a novel change to the tax code—a progressive tax on consumption. Progressively taxing earnings reduces the incentive of a household that experiences a positive, temporary wage shock to work longer hours—make hay while the sun shines. A progressive consumption tax, on the other hand, would exempt savings, sparing the household from automatically moving into a higher tax bracket. Thus, people would retain their incentive to work more and set aside savings for a rainy day.

“The government wants to make sure that the taxes it levies don’t interfere with the private insurance that’s already operating in the background,” Heathcote said. “It turns out that the way to provide some public insurance without distorting private insurance is to tax consumption, not earnings.”

— Phil Davies

2013–2014 Student Essay Contest The Future of the Fed



Essay Topic

**The Federal Reserve:
The next 100 years**

This spring the Minneapolis Fed held its 26th Annual Student Essay Contest, which is open to all high school students in the Ninth Federal Reserve District. The contest drew more than 160 essays from schools throughout the district. The winning essay is published here. Other top essays can be found at minneapolisfed.org under the Student Resources section of the Community & Education tab.

Thirty finalists each received \$100. The third-place winner received an additional \$200, and the second-place winner an additional \$300. The first-place winner, Peter Otness of Edina High

School in Edina, Minn., received an additional \$400 and was offered a paid summer internship at the Minneapolis Fed.

In the centennial year of the Federal Reserve System, students were asked to consider what sorts of roles, if any, the Fed should play in the economy over the next 100 years. As background, a primer on the Fed's functions and activities was provided. Arguments could be made to abolish the Fed or to change its responsibilities. Entrants were encouraged to take a critical approach, but to bolster their arguments for change with solid economic reasoning.

Student Essay Contest Winner

The Federal Reserve of the Next 100 Years: The Promise of “Big Data”

Peter Otness

Edina High School
Edina, Minn.

Over the next 100 years, “big data” will revolutionize the Federal Reserve’s conduct of monetary policy. Currently, Federal Reserve policy is based on economic data that at any given time are “only partially known, as key information on spending, production, and prices becomes available only with a lag.”¹ As a result, policymakers may be forced to “act on the basis of misleading information.”² In the future, the availability of vast amounts of data, along with the computing power to interpret and analyze it—so-called big data³—will allow the Federal Reserve to react more quickly and effectively to changes in the U.S. economy. While there will still be uncertainties regarding the timing and magnitude of the economy’s response to Federal Reserve policy, lags and misleading information will no longer be significant impediments to policymakers.

The impact of lags and gaps in economic data can be seen in the lead-up to the financial crisis of 2008-09. On Sept. 16, 2008, the day after the collapse of Lehman Brothers, the Federal Open Market Committee kept its target for the federal funds rate at 2 percent.⁴ While the transcript of that meeting shows considerable uncertainty on the part of FOMC members about what was currently happening in key sectors of the economy,⁵ the FOMC ultimately concluded that the “current stance of monetary policy is consistent with a gradual strengthening of economic growth” beginning in 2009.⁶ The Fed’s economists also projected a stabilization of the housing market.⁷ As we now know, the U.S. economy was on the edge of a precipice. While the preliminary August 2008 payroll report released 11 days before the meeting showed a decline of 84,000 jobs,⁸ revised numbers for this

period showed a decline three times as large.⁹ Far from stabilizing, the downturn in the housing market was accelerating, with rapidly declining prices and rising mortgage delinquencies.¹⁰ Initial estimates of fourth quarter 2008 GDP were of a contraction at a rate of 3.8 percent per year.¹¹ Later estimates for this period show that the actual decline was at a rate of 8.9 percent per year.¹²

In September 2008, information that could have provided an accurate, up-to-the-minute assessment of the economy did exist: It consisted of the many transactions occurring in every sector of the economy, recorded in real time in the computer networks and accounting systems of private sector companies and government agencies. Access to this real-time information on payroll tax payments, unemployment filings and average hours worked would have provided the FOMC with insight into the actual, not perceived, employment situation. Information on daily retail sales and prices would have revealed spending and growth trends. Information on mortgage payment delinquencies, which were rising rapidly, would have corrected any impression of a housing market recovery. However, while the information existed, the means to collect, analyze and provide it to FOMC policymakers, on a real-time basis, did not. Their response to the deteriorating economy was hampered by the substantial “recognition lag”¹³ to which the economic information they needed was subject. A key to better economic policy, especially critical in times of financial crisis and dislocation, is access to this information in real time and on a larger scale, coupled with analytical tools to enable policymakers to interpret it quickly and accurately. This is what big data offers.¹⁴

The promise of big data in improving economic policy can already be seen in the Billion Prices Project, which tracks prices in the United States and other countries on a daily basis by using

“web scraping” techniques to gather, from publicly available sources, the prices of certain identified goods.¹⁵ In comparison, the traditional consumer price index is still determined from data manually (and more expensively) collected for approximately 80,000 items,¹⁶ with CPI data for a particular month available after a lag of approximately two weeks (chained CPI is not final until more than a year later).¹⁷ Over the past five years, BPP data have closely tracked the CPI.¹⁸ The BPP detected not only drops in prices that occurred as soon as two days after the collapse of Lehman Brothers, but also the price recovery that began in January 2009, well before the same information became available through the CPI.¹⁹

However, big data will not automatically lead to better economic reports or forecasts. Correct interpretation and modeling of data by economists and statisticians will still be necessary. Big data has enormous potential, but without careful analysis and modeling, the information it provides may be inaccurate. An example of a large data set that nonetheless produces an apparently flawed result is the monthly ADP private sector employment forecast. While ADP’s report is based on 23 million payroll records from over 400,000 employers,²⁰ in the past six months it has varied by an average of 65,000 jobs per month, or 35 percent, from the authoritative final monthly numbers provided by the Bureau of Labor Statistics.²¹ It may be that the ADP sample is not broad enough or is not properly modeled. In any case, the discrepancy illustrates the caution necessary in using data derived from a large sample that may appear to have produced a reliable result. Economic data are inherently noisy, and providing good reports and forecasts to policymakers requires separating out “the signal from the noise.”²² The availability of big data does not remove the need for common sense, economic theory or careful research design.²³ There will still be a need for the discretion of experienced FOMC officials in making economic policy.

The Federal Reserve should seek real-time access to government and private-company data on economic activity and should invest in the human and computing power necessary to fully utilize these data.²⁴ Access to databases will need to be subject to carefully designed protections for proprietary business information and consumer privacy. The types

of relevant data are virtually limitless, but some of the more important would be daily sales information from bricks-and-mortar and online retailers, payroll tax payments, energy use, and mortgage and credit card payments and delinquencies. In the Ninth District alone, information from companies such as Target, UnitedHealth Group, Best Buy and U.S. Bancorp, and from government sources such as the Minnesota Department of Revenue, would provide valuable real-time economic data.

In September 2008, a Federal Reserve economist wondered whether he could take the current retail sales report at face value, noting that “we’ve been head-faked a number of times by the retail sales data, which are subject to some pretty substantial revisions.”²⁵ With comprehensive, accurate real-time data, he would have had the answer to his own question. The information provided by big data will lead to better policymaking by the Federal Reserve of the next 100 years. ■

Endnotes

¹ Board of Governors of the Federal Reserve System. 2005. *The Federal Reserve System: Purposes and Functions*, 9th ed. Washington, D.C.: Board of Governors of the Federal Reserve System, p. 18. Accessed March 16, 2014, at federalreserve.gov/pf/pf.htm.

² Ibid.

³ “Big data generally is defined as a collection of large datasets that cannot be analyzed with normal statistical methods.” Sara Royster. 2013. “Working with Big Data.” Bureau of Labor Statistics, *Occupational Outlook Quarterly* (Fall, p. 3). Accessed March 16, 2014, at bls.gov/opub/ooq/2013/fall/art01.pdf.

⁴ Board of Governors of the Federal Reserve System. 2008. Minutes of the Federal Open Market Committee. Sept. 16, p. 8. Accessed March 16, 2014, at federalreserve.gov/monetarypolicy/fomcminutes20080916.htm.

⁵ Board of Governors of the Federal Reserve System. 2008. Transcript of Meeting of the Federal Open Market Committee. Sept. 16. Mr. Dudley: “It takes a while for us to get the reports from the clearing bank (p. 7).” Mr. Stockton: “[S]ome of the 0.4 percentage point increase in the unemployment rate last month could be statistical noise (p.20).” Mr. Lockhart: “Anecdotal reports ... support the view that the economy is quite weak but not deteriorating markedly. ... I am also starting to hear some reports that housing markets feel as though they are beginning to stabilize (p. 28).” 78-79: Mr. Warsh: “We are not trying to monitor the broader economy, which we might not be able to measure too much (pp. 78-79).” Accessed March 16, 2014, at federalreserve.gov/monetarypolicy/fomchistorical2008.htm.

⁶ Board of Governors of the Federal Reserve System. 2008. Minutes of the Federal Open Market Committee. Sept. 16, p. 8.

⁷ Board of Governors of the Federal Reserve System. 2008. Transcript of Meeting of the Federal Open Market Committee. Sept. 16, p. 20.

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¹⁰ Federal Reserve Bank of St. Louis. 2014. "S&P Case-Shiller 20-City Home Price Index." Accessed March 16, 2014, at research.stlouisfed.org/fred2/series/SPCS20RNSA; "Delinquency Rate on Single-Family Residential Mortgages, Booked in Domestic Offices, Top 100 Banks Ranked by Assets." Accessed March 16, 2014, at research.stlouisfed.org/fred2/series/DRSFRMACBS.

¹¹ Bureau of Economic Analysis. 2009. "Gross Domestic Product: Fourth Quarter 2008 (Advance)." Accessed March 16, 2014, at bea.gov/newsreleases/national/gdp/2009/gdp408a.htm.

¹² Eugene P. Seskin and Shelly Smith. 2011. "Annual Revision of the National Income and Product Accounts." *Survey of Current Business* 91 (August, p.12). Accessed March 16, 2014, at bea.gov/scb/pdf/2011/08%20August/0811_nipa_annual_article.pdf; Bureau of Economic Analysis. 2011. FAQ: "How Did the Recent GDP Revisions Change the Picture of the 2007-2009 Recession and the Recovery?" Aug. 5. Accessed March 16, 2014, at bea.gov/fag/index.cfm?fagid=1004.

¹³ Lloyd B. Thomas. 2011. *The Financial Crisis and Federal Reserve Policy*. New York: Palgrave Macmillan, p. 203.

¹⁴ Uran Einav and Jonathan Levin. 2013. "The Data Revolution and Economic Analysis." Prepared for the NBER Innovation Policy and the Economy Conference. April 23, p. 4. Accessed March 16, 2014, at nber.org/chapters/c12942.pdf.

¹⁵ Alberto Cavallo. 2012. "The Billion Prices Project: Building Economic Indicators from Online Data." Presented at the Meeting of the Group of Experts on Consumer Price Indices, United Nations Economic Commission for Europe, Geneva, May 31, p. 3. Accessed March 16, 2014, at unece.org/stats/documents/2012.05.cpi.html.

¹⁶ Bureau of Labor Statistics. 2013. FAQ: "How Are CPI Prices Collected and Reviewed?" Aug. 15. Accessed March 16, 2014, at stats.bls.gov/cpi/cpifag.htm#Question8.

¹⁷ Bureau of Labor Statistics. 2014. Release Calendar: Schedule of Releases for the CPI. Accessed March 16, 2014, at www.bls.gov/schedule/newsrelease/cpi.htm; Bureau of Labor Statistics. 2007. "The Consumer Price Index (Updated 06/2007)." Chap. 17 in *BLS Handbook of Methods*, p. 5. Accessed March 16, 2014, at bls.gov/opub/hom/pdf/homch17.pdf.

¹⁸ Einav and Levin, p. 10.

¹⁹ Alberto Cavallo. 2010. "MIT Sloan Professors Publish Real-Time Inflation Rates Around the World in 'Billion Prices Project.'" Billion Prices Project @ MIT. Nov. 8. Accessed March 16, 2014, at bpp.mit.edu/mit-sloan-professors/.

²⁰ ADP Research Institute. National Employment Trends, Report FAQs. Accessed March 16, 2014, at <http://www.adpemploymentreport.com/common/docs/ADP-NER-FAQ.pdf>; Harry J. Enten. 2013. "How Good Is ADP at Forecasting the Monthly BLS Jobs Reports?" *Guardian* (London, May 4). Accessed March 16, 2014, at theguardian.com/commentisfree/2013/may/04/adpforecasting-monthly-bls-jobs-reports.

²¹ Calculations by author. Data from ADP Research Institute. National Employment Trends, National Employment Report. Accessed March 16, 2014, at adpemploymentreport.com/; Bureau of Labor Statistics. Current Employment Statistics Highlights: February 2014 (March 7, 2014). Accessed March 16, 2014, at bls.gov/web/empsiUceshighlights.pdf.

Month	BLS Final	ADP	Variance
December 2013	84,000	238,000	154,000
November 2013	274,000	215,000	59,000
October 2013	237,000	130,000	107,000
September 2013	164,000	166,000	2,000
August 2013	202,000	176,000	26,000
July 2013	149,000	200,000	51,000
Average Variance			66,500

²² Nate Silver. 2012. *The Signal and the Noise: Why So Many Predictions Fail—But Some Don't*. New York: Penguin Press.

²³ Einav and Levin, p. 26.

²⁴ The Federal Reserve is already taking steps to "enhance the Board's data environment," creating in 2013 a new Office of the Chief Data Officer and including a redesign of "data governance and management processes" as one of six priorities identified in its 2012-2015 Strategic Framework. These actions were taken in recognition of the "growing quantity of data and an increased need to share data more broadly." Board of Governors of the Federal Reserve System. 2013. Strategic Framework 2012-2015, p. 14. Accessed March 16, 2014, at federalreserve.gov/publications/gpra/files/2012-2015-strategic-framework.pdf.

²⁵ Board of Governors of the Federal Reserve System. 2008. Transcript of Meeting of the Federal Open Market Committee. Sept. 16, p. 19.