




How the Great Recession Was Brought to an End

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BY ALAN S. BLINDER AND MARK ZANDI¹

The U.S. government's response to the financial crisis and ensuing Great Recession included some of the most aggressive fiscal and monetary policies in history. The response was multifaceted and bipartisan, involving the Federal Reserve, Congress, and two administrations. Yet almost every one of these policy initiatives remain controversial to this day, with critics calling them misguided, ineffective or both. The debate over these policies is crucial because, with the economy still weak, more government support may be needed, as seen recently in both the extension of unemployment benefits and the Fed's consideration of further easing.

In this paper, we use the Moody's Analytics model of the U.S. economy—adjusted to accommodate some recent financial-market policies—to simulate the macroeconomic effects of the government's total policy response. We find that its effects on real GDP, jobs, and inflation are huge, and probably averted what could have been called Great Depression 2.0. For example, we estimate that, without the government's response, GDP in 2010 would be about 11.5% lower, payroll employment would be less by some 8½ million jobs, and the nation would now be experiencing deflation.

When we divide these effects into two components—one attributable to the fiscal stimulus and the other attributable to financial-market policies such as the TARP, the bank stress tests and the Fed's quantitative easing—we estimate that the latter was substantially more powerful than the former. Nonetheless, the effects of the fiscal stimulus alone appear very substantial, raising 2010 real GDP by about 3.4%, holding the unemployment rate about 1½ percentage points lower, and adding almost 2.7 million jobs to U.S. payrolls. These estimates of the fiscal impact are broadly consistent with those made by the CBO and the Obama administration.² To our knowledge, however, our comprehensive estimates of the effects of the financial-market policies are the first of their kind.³ We welcome other efforts to estimate these effects.

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The U.S. economy has made enormous progress since the dark days of early 2009. Eighteen months ago, the global financial system was on the brink of collapse and the U.S. was suffering its worst economic downturn since the 1930s. Real GDP was falling at about a 6% annual rate, and monthly job losses averaged close to 750,000. Today, the financial system is operating much more normally, real GDP is advancing at a nearly 3% pace, and job growth has resumed, albeit at an insufficient pace.

From the perspective of early 2009, this rapid snap back was a surprise. Maybe the country and the world were just lucky. But we take another view: The Great Recession gave way to recovery as quickly as it did largely because of the unprecedented responses by monetary and fiscal policymakers.

A stunning range of initiatives was undertaken by the Federal Reserve, the Bush and Obama administrations, and Congress (see Table 1). While the effectiveness of any individual element certainly can be debated, there is little doubt that in total, the policy response was highly effective. If policymakers had not reacted as aggressively or as quickly as they did, the financial system might still be unsettled, the economy might still be shrinking, and the costs to U.S. taxpayers would have been vastly greater.

Broadly speaking, the government set out to accomplish two goals: to stabilize the sickly financial system and to mitigate the burgeoning recession, ultimately restarting economic growth. The first task was made necessary by the financial crisis, which struck in the summer of 2007 and spiraled into a financial panic in the fall of 2008. After the Lehman Brothers bankruptcy, liquidity evaporated, credit spreads ballooned, stock prices fell sharply, and a string of major financial institutions failed. The second task was made necessary by the devastating effects of the financial crisis on the real economy, which began to contract at an alarming rate after Lehman.

The Federal Reserve took a number of extraordinary steps to quell the financial panic. In late 2007, it established the first of what would eventually become an alphabet soup of new credit facilities designed to provide liquid-

ity to financial institutions and markets.⁴ The Fed aggressively lowered interest rates during 2008, adopting a zero-interest-rate policy by year's end. It engaged in massive quantitative easing in 2009 and early 2010, purchasing Treasury bonds and Fannie Mae and Freddie Mac mortgage-backed securities (MBS) to bring down long-term interest rates.

The FDIC also worked to stem the financial turmoil by increasing deposit insurance limits and guaranteeing bank debt. Congress established the Troubled Asset Relief Program (TARP) in October 2008, part of which was used by the Treasury to inject much-needed capital into the nation's banks. The Treasury and Federal Reserve ordered the 19 largest bank holding companies to conduct comprehensive stress tests in the spring of 2009, to determine if they had sufficient capital to withstand further adverse circumstances—and to raise more capital if necessary. Once the results were made public, the stress tests and subsequent capital raising restored confidence in the banking system.

The effort to end the recession and jump-start the recovery was built around a series of fiscal stimulus measures. Tax rebate checks were mailed to lower- and middle-income households in the spring of 2008; the American Restoration and Recovery Act (ARRA) was passed in early 2009; and several smaller stimulus measures became law in late 2009 and early 2010.⁵ In all, close to \$1 trillion, roughly 7 percent of GDP, will be spent on fiscal stimulus. The stimulus has done what it was supposed to do: end the Great Recession and spur recovery. We do not believe it a coincidence that the turnaround from recession to recovery occurred last summer, just as the ARRA was providing its maximum economic benefit.

Stemming the slide also involved rescuing the nation's housing and auto industries. The housing bubble and bust were the proximate causes of the financial crisis, setting off a vicious cycle of falling house prices and surging foreclosures. Policymakers appear to have broken this cycle with an array of efforts, including the Fed's actions to bring down mortgage rates, an increase in conforming loan limits, a dramatic expansion of FHA lending, a series of tax credits for homebuyers, and the

use of TARP funds to mitigate foreclosures. While the housing market remains troubled, its steepest declines are in the past.

The near collapse of the domestic auto industry in late 2008 also threatened to exacerbate the recession. GM and Chrysler eventually went through bankruptcies, but TARP funds were used to make the process relatively orderly. GM is already on its way to being a publicly traded company again. Without financial help from the federal government, all three domestic vehicle producers and many of their suppliers might have had to liquidate many operations, with devastating effects on the broader economy, and especially on the Midwest.

Although the economic pain was severe and the budgetary costs were great, this sounds like a success story.⁶ Yet nearly all aspects of the government's response have been subjected to intense criticism. The Federal Reserve has been accused of overstepping its mandate by conducting fiscal as well as monetary policy. Critics have attacked efforts to stem the decline in house prices as inappropriate; claimed that foreclosure mitigation efforts were ineffective; and argued that the auto bailout was both unnecessary and unfair. Particularly heavy criticism has been aimed at the TARP and the Recovery Act, both of which have become deeply unpopular.

The Troubled Asset Relief Program was controversial from its inception. Both the program's \$700 billion headline price tag and its goal of "bailing out" financial institutions—including some of the same institutions that triggered the panic in the first place—were hard for citizens and legislators to swallow. To this day, many believe the TARP was a costly failure. In fact, TARP has been a substantial success, helping to restore stability to the financial system and to end the freefall in housing and auto markets. Its ultimate cost to taxpayers will be a small fraction of the headline \$700 billion figure: A number below \$100 billion seems more likely to us, with the bank bailout component probably turning a profit.

Criticism of the ARRA has also been strident, focusing on the high price tag, the slow speed of delivery, and the fact that the unemployment rate rose much higher than the Administration predicted in January 2009.

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TABLE 1

Federal Government Response to the Financial Crisis

\$ bil	Originally Committed	Currently Provided	Ultimate Cost
Total	11,937	3,513	1,590
Federal Reserve			
Term auction credit	900	0	0
Other loans	Unlimited	68	3
Primary credit	Unlimited	0	0
Secondary credit	Unlimited	0	0
Seasonal credit	Unlimited	0	0
Primary Dealer Credit Facility (expired 2/1/2010)	Unlimited	0	0
Asset-Backed Commercial Paper Money Market Mutual Fund	Unlimited	0	0
AIG	26	25	2
AIG (for SPVs)	9	0	0
AIG (for ALICO, AIA)	26	0	1
Rescue of Bear Stearns (Maiden Lane)**	27	28	4
AIG-RMBS purchase program (Maiden Lane II)**	23	16	1
AIG-CDO purchase program (Maiden Lane III)**	30	23	4
Term Securities Lending Facility (expired 2/1/2010)	200	0	0
Commercial Paper Funding Facility** (expired 2/1/2010)	1,800	0	0
TALF	1,000	43	0
Money Market Investor Funding Facility (expired 10/30/2009)	540	0	0
Currency swap lines (expired 2/1/2010)	Unlimited	0	0
Purchase of GSE debt and MBS (expired 3/31/2010)	1,425	1,295	0
Guarantee of Citigroup assets (terminated 12/23/2009)	286	0	0
Guarantee of Bank of America assets (terminated)	108	0	0
Purchase of long-term Treasuries	300	300	0
Treasury			
Fed supplementary financing account	560	200	0
Fannie Mae and Freddie Mac	Unlimited	145	305
FDIC			
Guarantee of U.S. banks' debt*	1,400	305	4
Guarantee of Citigroup debt	10		0
Guarantee of Bank of America debt	3		0
Transaction deposit accounts	500	0	0
Public-Private Investment Fund Guarantee	1,000	0	0
Bank Resolutions	Unlimited	23	71
Federal Housing Administration			
Refinancing of mortgages, Hope for Homeowners	100	0	0
Expanded Mortgage Lending	Unlimited	150	26
Congress			
TARP (see detail in Table 9)	600	277	101
Economic Stimulus Act of 2008	170	170	170
American Recovery and Reinvestment Act of 2009***	784	391	784
Cash for Clunkers	3	3	3
Additional Emergency UI benefits	90	39	90
Other Stimulus	21	12	21

NOTES: *Includes foreign denominated debt; **Net portfolio holdings; *** Excludes AMT patch

While we would not defend every aspect of the stimulus, we believe this criticism is largely misplaced, for these reasons:

The unusually large size of the fiscal stimulus (equal to about 7% of GDP) is consistent with the extraordinarily severe downturn and the limited ability to use monetary policy once interest rates neared zero.

Regarding speed, almost \$500 billion has been spent to date (see Table 2). What matters for economic growth is the pace of stimulus spending, which surged from nothing at the start of 2009 to over \$100 billion (over \$400 billion at an annual rate) in the second quarter. That is a big change in a short period, and it is one major reason why the Great Recession ended and recovery began last summer.⁷

Critics who argue that the ARRA failed because it did not keep unemployment below 8% ignore the facts that (a) unemployment was already above 8% when the ARRA was passed and (b) most private forecasters (including Moody's Analytics) misjudged how serious the downturn would be. If anything, this forecasting error suggests the stimulus package should have been even larger than it was.

This study attempts to quantify the contributions of the TARP, the stimulus, and other government initiatives to ending the financial panic and the Great Recession. In sum, we find they were highly effective. Without such a determined and aggressive response by policymakers, the economy would likely have fallen into a much deeper slump.

Quantifying the economic impact

To quantify the economic impacts of the fiscal stimulus and the financial-market policies such as the TARP and the Fed's quantitative easing, we simulated the Moody's Analytics' model of the U.S. economy under four scenarios:

1. a baseline that includes all the policies actually pursued
2. a counterfactual scenario with the fiscal stimulus but without the financial policies
3. a counterfactual with the financial policies but without fiscal stimulus
4. a scenario that excludes all the policy responses.⁸

The differences between Scenario 1 and Scenario 4 provide the answers we seek about the impacts of the panoply of anti-recession policies. Scenarios 2 and 3 enable us to decompose the overall impact into the components stemming from the fiscal stimulus and financial initiatives. All simulations begin in the first quarter of 2008 with the start of the Great Recession, and end in the fourth quarter of 2012.

Estimating the economic impact of the policies is not an accounting exercise, but an econometric one. It is not feasible to identify and count each job created or saved by these policies. Rather, outcomes for employment and other activity must be estimated using a statistical representation of the economy based on historical relationships, such as the Moody's Analytics model. This model is regularly used for forecasting, scenario analysis, and quantifying the impacts of a wide range of policies on the economy. The Congressional Budget Office and the Obama Administration have derived their impact estimates for policies such as the fiscal stimulus using a similar approach.

The modeling techniques for simulating the fiscal policies were straightforward, and have been used by countless modelers over the years. While the scale of the fiscal stimulus was massive, most of the instruments themselves (tax cuts, spending) were conventional, so not much innovation was required on our part. A few details are provided in Appendix B.

But modeling the vast array of financial policies, most of which were unprecedented and unconventional, required some creativity, and forced us to make some major simplifying assumptions. Our basic approach was to treat the financial policies as ways to reduce *credit spreads*, particularly the three credit spreads that play key roles in the Moody's Analytics model: The so-called TED spread between three-month Libor and three-month Treasury bills; the spread between fixed mortgage rates and 10-year Treasury bonds; and the "junk bond" (below investment grade) spread over Treasury bonds. All three of these spreads rose alarmingly during the crisis, but came tumbling down once the financial medicine was applied. The key question for us was

how much of the decline in credit spreads to attribute to the policies, and here we tried several different assumptions.⁹ All of this is discussed in Appendix B.

The results

Under the baseline scenario, which includes all the financial and fiscal policies, and is the most likely outlook for the economy, the recovery that began a year ago is expected to remain intact. The economy struggles during the second half of this year, as the sources of growth that powered the first year of recovery—including the stimulus and a powerful inventory swing—begin to fade. Fallout from the European debt crisis also weighs on the U.S. economy. But by this time next year, the economy gains traction as businesses respond to better profitability and stronger balance sheets by investing and hiring more. In the baseline scenario, real GDP, which declined 2.4% in 2009, expands 2.9% in 2010 and 3.6% in 2011, with monthly job growth averaging near 100,000 in 2010 and above 200,000 in 2011. Unemployment is still close to 10% at the end of 2010, but closer to 9% by the end of 2011. The federal budget deficit is \$1.4 trillion in the current 2010 fiscal year, equal to approximately 10% of GDP. It falls only slowly, to \$1.15 trillion in FY 2011 and to \$900 billion in FY 2012.

In the scenario that excludes all the extraordinary policies, the downturn continues into 2011. Real GDP falls a stunning 7.4% in 2009 and another 3.7% in 2010 (see Table 3). The peak-to-trough decline in GDP is therefore close to 12%, compared to an actual decline of about 4%. By the time employment hits bottom, some 16.6 million jobs are lost in this scenario—about twice as many as actually were lost. The unemployment rate peaks at 16.5%, and although not determined in this analysis, it would not be surprising if the *underemployment* rate approached one-fourth of the labor force. The federal budget deficit surges to over \$2 trillion in fiscal year 2010, \$2.6 trillion in fiscal year 2011, and \$2.25 trillion in FY 2012. Remember, this is with *no policy response*. With outright deflation in prices and wages in 2009-2011, this dark scenario constitutes a 1930s-like depression.

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TABLE 2

American Recovery and Reinvestment Act Spendout

\$ bil, Historical data through June 2010

	Currently Provided	2009												09Q1	09Q2	09Q3	09Q4	10Q1	10Q2
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Total	472	0.0	3.4	9.7	20.3	36.6	45.8	24.6	26.9	52.2	30.1	30.4	28.9	13.1	102.8	103.7	89.4	80.8	82.4
Infrastructure and Other Spending	56	0.0	0.0	0.0	0.0	1.5	3.7	1.7	3.2	4.3	3.8	3.9	4.7	0.0	5.2	9.2	12.4	14.1	15.1
Traditional Infrastructure	14	0.0	0.0	0.0	0.0	0.2	0.2	0.8	1.2	0.7	1.8	1.5	1.4	0.0	0.4	2.6	4.6	2.9	3.4
Nontraditional Infrastructure	42	0.0	0.0	0.0	0.0	1.3	3.5	0.9	2.1	3.5	2.1	2.4	3.3	0.0	4.8	6.5	7.8	11.2	11.6
Transfers to state and local governments	119	0.0	3.4	6.6	5.8	9.4	8.4	8.2	8.0	8.4	8.2	8.0	7.7	10.0	23.5	24.6	23.9	17.2	20.2
Medicaid	69	0.0	3.4	6.6	5.4	4.8	4.7	4.5	4.3	4.3	4.1	4.3	4.1	10.0	14.9	13.1	12.6	9.0	9.3
Education	51	0.0	0.0	0.0	0.3	4.6	3.7	3.7	3.7	4.1	4.1	3.7	3.6	0.0	8.7	11.5	11.4	8.2	10.9
Transfers to persons	109	0.0	0.0	0.8	6.1	17.5	7.6	6.1	6.4	6.4	6.4	6.7	6.7	0.8	31.2	18.9	19.8	19.4	18.8
Social Security	13	0.0	0.0	0.0	0.0	11.6	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.1	0.0	0.0	0.0	0.0
Unemployment Assistance	66	0.0	0.0	0.0	4.1	4.1	4.1	4.1	4.5	4.5	4.5	4.8	4.8	0.0	12.2	13.1	14.1	13.6	13.0
Food stamps	10	0.0	0.0	0.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0	1.9	1.9	1.9	1.9	1.9
Cobra Payments	20	0.0	0.0	0.8	1.4	1.3	1.4	1.4	1.3	1.3	1.3	1.3	1.3	0.8	4.1	3.9	3.8	3.9	3.9
Tax cuts	188	0.0	0.0	2.3	8.5	8.3	26.1	8.6	9.3	33.2	11.7	11.9	9.7	2.3	42.8	51.1	33.2	30.2	28.4
Businesses and other tax incentives	40	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	22.0	0.0	0.0	0.0	0.0	18.0	22.0	0.0	0.0	0.0
Individuals ex increase in AMT exemption	148	0.0	0.0	2.3	8.5	8.3	8.1	8.6	9.3	11.2	11.7	11.9	9.7	2.3	24.8	29.1	33.2	30.2	28.4

Sources: Treasury, Joint Committee on Taxation, Recovery.gov, Moody's Analytics

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TABLE 3

No Policy Response

Baseline (with actual policy response)

Simulation of No Policy Response

	08q1	08q2	08q3	08q4	09Q1	09Q2	09Q3	09Q4	10Q1	10Q2	10Q3	10Q4	2008	2009	2010	2011	2012
Real GDP (Bil. 05\$, SAAR)	13,367	13,365	13,251	13,003	12,609	12,324	12,132	12,014	11,903	11,831	11,771	11,760	13,246	12,270	11,816	12,008	12,620
<i>annualized % change</i>	-0.7	-0.1	-3.4	-7.3	-11.6	-8.7	-6.1	-3.8	-3.6	-2.4	-2.0	-0.3	-0.1	-7.4	-3.7	1.6	5.1
Real GDP (Bil. 05\$, SAAR)	13,367	13,415	13,325	13,142	12,925	12,902	12,973	13,150	13,239	13,335	13,400	13,490	13,312	12,987	13,366	13,852	14,552
<i>annualized % change</i>	-0.7	1.5	-2.7	-5.4	-6.4	-0.7	2.2	5.6	2.7	2.9	2.0	2.7	0.4	-2.4	2.9	3.6	5.1
Payroll Employment (Mil., SA)	137.9	137.5	136.6	134.6	131.6	128.4	125.9	124.0	122.8	122.3	121.5	121.3	136.7	127.5	122.0	122.4	125.9
<i>annualized % change</i>	0.1	-1.3	-2.4	-5.7	-8.8	-9.3	-7.7	-6.0	-3.8	-1.5	-2.8	-0.4	-0.7	-6.7	-4.3	0.3	2.9
Payroll Employment (Mil., SA)	137.9	137.5	136.7	135.0	132.8	131.1	130.1	129.6	129.7	130.4	130.5	130.8	136.8	130.9	130.4	132.2	136.0
<i>annualized % change</i>	0.1	-1.2	-2.3	-4.8	-6.4	-5.0	-3.1	-1.3	0.2	2.1	0.4	1.0	-0.6	-4.3	-0.4	1.4	2.9
Unemployment Rate (%)	5.0	5.3	6.1	7.1	8.7	10.6	12.1	13.5	14.0	15.0	15.7	16.2	5.9	11.2	15.2	16.3	15.0
Unemployment Rate (%)	5.0	5.3	6.0	7.0	8.2	9.3	9.6	10.0	9.7	9.7	9.8	9.9	5.8	9.3	9.8	9.8	8.3
CPI (Index, 1982-84=100, SA)	212.8	215.6	218.9	213.6	212.2	212.7	211.4	209.4	208.1	207.2	205.6	204.8	215.2	211.4	206.4	204.4	208.7
<i>annualized % change</i>	4.7	5.2	6.3	-9.3	-2.6	1.1	-2.5	-3.7	-2.5	-1.6	-3.0	-1.6	3.8	-1.8	-2.4	-1.0	2.1
CPI (Index, 1982-84=100, SA)	212.8	215.6	218.9	213.7	212.5	213.5	215.4	216.8	217.6	218.1	218.6	219.4	215.2	214.5	218.4	222.7	229.6
<i>annualized % change</i>	4.7	5.3	6.4	-9.2	-2.2	1.9	3.7	2.6	1.5	0.8	1.0	1.4	3.8	-0.3	1.8	2.0	3.1

Sources: BEA, BLS, Moody's Analytics

TABLE 4

Baseline vs. No Policy Response Scenario

Difference	2008	2009	2010	2011	2012
Real GDP (Bil. 05\$, SAAR)	66	718	1,549	1,843	1,933
<i>percentage points</i>	0.50	4.93	6.61	2.01	-0.03
Payroll Employment (Mil., SA)	0.12	3.45	8.40	9.82	10.03
Unemployment Rate (%)	-0.05	-1.96	-5.46	-6.55	-6.74
CPI (percentage points)	0.02	1.44	4.17	2.94	1.00

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The *differences* between the baseline scenario and the scenario with no policy responses are summarized in Table 4. These differences represent our estimates of the combined effects of the full range of policies—and they are huge. By 2011, real GDP is \$1.8 trillion (15%) higher because of the policies; there are almost 10 million more jobs, and the unemployment rate is about 6½ percentage points lower. The inflation rate is about 3 percentage points higher (roughly 2% instead of -1%). That's what averting a depression means.

But how much of this gigantic effect was due to the government's efforts to stabilize the financial system and how much was due to the fiscal stimulus? The other two scenarios are designed to answer those questions.

The financial policy responses were especially important. In the scenario without them, but including the fiscal stimulus, the recession would only now be winding down, a full year after the downturn's actual end. Real GDP declines by 5% in 2009, and it grows only a bit in 2010, with a peak-to-trough decline of about 6% (see Table 5). Some 12 million payroll jobs are lost peak-to-trough in this scenario, and the unemployment rate peaks at 13%. There is also a lengthy period of modest deflation in this scenario. The federal deficit is \$1.75 trillion in fiscal year 2010, and remains a disconcertingly high \$1.5 trillion in fiscal year 2011 and \$1.1 trillion in FY 2012.

The *differences* between the baseline and the scenario based on no financial policy responses are summarized in Table 6. They represent our estimates of the combined effects of the various policy efforts to stabilize the financial system—and they are very large. By 2011, real GDP is almost \$800 billion (6%) higher because of the policies, and the unemployment rate is almost 3 percentage points lower. By the second quarter of 2011—when the difference between the baseline and this scenario is at its largest—the financial-rescue policies are credited with saving almost 5 million jobs.

In the scenario that includes all the financial policies but none of the fiscal stimulus, the recession ends in the fourth quarter of 2009 and expands very slowly through summer 2010. Real GDP declines almost 4% in

2009 and increases only 1% in 2010 (see Table 7). The peak-to-trough decline in employment is more than 10 million. The economy finally gains some traction by early 2011, but by then unemployment is peaking at nearly 12%. The federal budget deficit reaches \$1.6 trillion in fiscal year 2010, \$1.3 trillion in FY 2011, and \$1 trillion in FY 2012. These results are broadly consistent with those of the Congressional Budget Office in its analysis of the economic impact of the ARRA.¹⁰

The *differences* between the baseline and the scenario based on no fiscal stimulus are summarized in Table 8. These differences represent our estimates of the sizable effects of all the fiscal stimulus efforts. Because of the fiscal stimulus, real GDP is about \$460 billion (more than 6%) higher by 2010, when the impacts are at their maximum; there are 2.7 million more jobs; and the unemployment rate is almost 1.5 percentage points lower.

Notice that the *combined* effects of the financial and fiscal policies (Table 4) exceed the sum of the financial-policy effects (Table 6) and the fiscal-policy effects (Table 8) in isolation. This is because the policies tend to reinforce each other. To illustrate this dynamic, consider the impact of providing housing tax credits, which were part of the stimulus. The credits boost housing demand. House prices are thus higher, foreclosures decrease, and the financial system suffers smaller losses. These smaller losses, in turn, enhance the effectiveness of the financial-market policy efforts. Such positive interactions between financial and fiscal policies play out in numerous other ways as well.

Conclusions

The financial panic and Great Recession were massive blows to the U.S. economy. Employment is still some 8 million below where it was at its pre-recession peak, and the unemployment rate remains above 9%. The hit to the nation's fiscal health has been equally disconcerting, with budget deficits in fiscal years 2009 and 2010 of close to \$1.4 trillion.

These unprecedented deficits reflect both the recession itself and the costs of the government's multi-faceted response to it.

The total *direct* costs, including the TARP, the fiscal stimulus, and other efforts, such as addressing the mortgage-related losses at Fannie Mae and Freddie Mac, are expected to reach almost \$1.6 trillion. Adding in nearly \$750 billion in lost revenue from the weaker economy, the total budgetary cost of the crisis is projected to top \$2.35 trillion, about 16% of GDP. For historical comparison, the savings-and-loan crisis of the early 1990s cost some \$350 billion in today's dollars: \$275 billion in direct costs plus \$75 billion due to the associated recession. This sum was equal to almost 6% of GDP at that time.

It is understandable that the still-fragile economy and the massive budget deficits have fueled criticism of the government's response. No one can know for sure what the world would look like today if policymakers had not acted as they did—our estimates are just that, estimates. It is also not difficult to find fault with isolated aspects of the policy response. Were the bank and auto industry bailouts really necessary? Do extra UI benefits encourage the unemployed not to seek work? Should not bloated state and local governments be forced to cut wasteful budgets? Was the housing tax credit a giveaway to buyers who would have bought homes anyway? Are the foreclosure mitigation efforts the best that could have been done? The questions go on and on.

While all of these questions deserve careful consideration, it is clear that *laissez faire* was not an option; policymakers had to act. Not responding would have left both the economy and the government's fiscal situation in far graver condition. We conclude that Ben Bernanke was probably right when he said that "We came very close in October [2008] to Depression 2.0."¹¹

While the TARP has not been a universal success, it has been instrumental in stabilizing the financial system and ending the recession. The Capital Purchase Program gave many financial institutions a lifeline when there was no other. Without the CPP's equity infusions, the entire system might have come to a grinding halt. TARP also helped shore up asset prices, and protected the system by backstopping Fed and Treasury efforts to keep large financial institutions

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TABLE 5

Simulation of No Financial Policy Response

No Policy Response

Baseline (with actual policy response)

	08q1	08q2	08q3	08q4	09Q1	09Q2	09Q3	09Q4	10Q1	10Q2	10Q3	10Q4	2008	2009	2010	2011	2012
Real GDP (Bil. 05\$, SAAR)	13,367	13,415	13,325	13,073	12,733	12,592	12,565	12,637	12,634	12,647	12,658	12,724	13,295	12,632	12,665	13,065	13,774
<i>annualized % change</i>	-0.7	1.5	-2.7	-7.4	-10.0	-4.3	-0.9	2.3	-0.1	0.4	0.4	2.1	0.3	-5.0	0.3	3.2	5.4
Real GDP (Bil. 05\$, SAAR)	13,367	13,415	13,325	13,142	12,925	12,902	12,973	13,150	13,239	13,335	13,400	13,490	13,312	12,987	13,366	13,852	14,552
<i>annualized % change</i>	-0.7	1.5	-2.7	-5.4	-6.4	-0.7	2.2	5.6	2.7	2.9	2.0	2.7	0.4	-2.4	2.9	3.6	5.1
Payroll Employment (Mil., SA)	137.9	137.5	136.7	134.8	131.9	129.4	127.5	126.4	125.8	125.9	125.8	126.1	136.7	128.8	125.9	127.4	131.3
<i>annualized % change</i>	0.1	-1.2	-2.3	-5.5	-8.2	-7.4	-5.9	-3.5	-1.7	0.4	-0.5	0.9	-0.6	-5.8	-2.2	1.2	3.1
Payroll Employment (Mil., SA)	137.9	137.5	136.7	135.0	132.8	131.1	130.1	129.6	129.7	130.4	130.5	130.8	136.8	130.9	130.4	132.2	136.0
<i>annualized % change</i>	0.1	-1.2	-2.3	-4.8	-6.4	-5.0	-3.1	-1.3	0.2	2.1	0.4	1.0	-0.6	-4.3	-0.4	1.4	2.9
Unemployment Rate (%)	5.0	5.3	6.0	7.1	8.4	9.9	10.9	11.9	11.9	12.5	12.6	12.8	5.8	10.3	12.5	12.7	11.1
Unemployment Rate (%)	5.0	5.3	6.0	7.0	8.2	9.3	9.6	10.0	9.7	9.7	9.8	9.9	5.8	9.3	9.8	9.8	8.3
CPI (Index, 1982-84=100, SA)	212.8	215.6	218.9	213.6	212.3	213.1	213.5	213.3	212.9	212.5	211.9	211.8	215.2	213.1	212.3	212.9	218.0
<i>annualized % change</i>	4.7	5.3	6.4	-9.3	-2.5	1.4	0.9	-0.4	-0.7	-0.8	-1.2	-0.2	3.8	-1.0	-0.4	0.3	2.4
CPI (Index, 1982-84=100, SA)	212.8	215.6	218.9	213.7	212.5	213.5	215.4	216.8	217.6	218.1	218.6	219.4	215.2	214.5	218.4	222.7	229.6
<i>annualized % change</i>	4.7	5.3	6.4	-9.2	-2.2	1.9	3.7	2.6	1.5	0.8	1.0	1.4	3.8	-0.3	1.8	2.0	3.1

Sources: BEA, BLS, Moody's Analytics

TABLE 6

Baseline Scenario vs. No Financial Policy Scenario

Difference	2008	2009	2010	2011	2012
Real GDP (Bil. 05\$, SAAR)	17	356	700	787	778
<i>percentage points</i>	0.13	2.55	2.65	0.48	-0.37
Payroll Employment (Mil., SA)	0.06	2.12	4.46	4.77	4.64
Unemployment Rate (%)	-0.02	-1.00	-2.70	-2.91	-2.81
CPI (percentage points)	0.01	0.69	2.18	1.68	0.69

HOW THE GREAT RECESSION WAS BROUGHT TO AN END

TABLE 7

Simulation of No Fiscal Stimulus

No Policy Response

Baseline (with actual policy response)

	08q1	08q2	08q3	08q4	09Q1	09Q2	09Q3	09Q4	10Q1	10Q2	10Q3	10Q4	2008	2009	2010	2011	2012
Real GDP (Bil. 05\$, SAAR)	13,367	13,365	13,251	13,098	12,875	12,759	12,719	12,761	12,802	12,873	12,931	13,026	13,270	12,779	12,908	13,474	14,216
<i>annualized % change</i>	-0.7	-0.1	-3.4	-4.5	-6.6	-3.6	-1.2	1.3	1.3	2.3	1.8	3.0	0.1	-3.7	1.0	4.4	5.5
Real GDP (Bil. 05\$, SAAR)	13,367	13,415	13,325	13,142	12,925	12,902	12,973	13,150	13,239	13,335	13,400	13,490	13,312	12,987	13,366	13,852	14,552
<i>annualized % change</i>	-0.7	1.5	-2.7	-5.4	-6.4	-0.7	2.2	5.6	2.7	2.9	2.0	2.7	0.4	-2.4	2.9	3.6	5.1
Payroll Employment (Mil., SA)	137.9	137.5	136.6	135.0	132.8	130.6	129.2	128.0	127.5	127.8	127.6	127.9	136.7	130.1	127.7	129.6	133.9
<i>annualized % change</i>	0.1	-1.3	-2.4	-4.8	-6.4	-6.3	-4.3	-3.5	-1.6	1.0	-0.5	0.7	-0.6	-4.8	-1.9	1.5	3.3
Payroll Employment (Mil., SA)	137.9	137.5	136.7	135.0	132.8	131.1	130.1	129.6	129.7	130.4	130.5	130.8	136.8	130.9	130.4	132.2	136.0
<i>annualized % change</i>	0.1	-1.2	-2.3	-4.8	-6.4	-5.0	-3.1	-1.3	0.2	2.1	0.4	1.0	-0.6	-4.3	-0.4	1.4	2.9
Unemployment Rate (%)	5.0	5.3	6.1	7.0	8.2	9.5	10.2	10.8	10.8	11.0	11.2	11.6	5.8	9.7	11.2	11.4	9.5
Unemployment Rate (%)	5.0	5.3	6.0	7.0	8.2	9.3	9.6	10.0	9.7	9.7	9.8	9.9	5.8	9.3	9.8	9.8	8.3
CPI (Index, 1982-84=100, SA)	212.8	215.6	218.9	213.7	212.4	213.2	214.0	214.2	214.3	214.4	214.3	214.6	215.2	213.4	214.4	216.8	223.0
<i>annualized % change</i>	4.7	5.2	6.3	-9.2	-2.3	1.6	1.4	0.4	0.3	0.2	-0.2	0.5	3.8	-0.8	0.5	1.1	2.9
CPI (Index, 1982-84=100, SA)	212.8	215.6	218.9	213.7	212.5	213.5	215.4	216.8	217.6	218.1	218.6	219.4	215.2	214.5	218.4	222.7	229.6
<i>annualized % change</i>	4.7	5.3	6.4	-9.2	-2.2	1.9	3.7	2.6	1.5	0.8	1.0	1.4	3.8	-0.3	1.8	2.0	3.1

Sources: BEA, BLS, Moody's Analytics

TABLE 8

Baseline Scenario vs. No Fiscal Stimulus Scenario

Difference	2008	2009	2010	2011	2012
Real GDP (Bil. 05\$, SAAR)	42	209	458	378	336
<i>percentage points</i>	0.32	1.26	1.90	-0.75	-0.45
Payroll Employment (Mil., SA)	0.04	0.76	2.65	2.59	2.11
Unemployment Rate (%)	-0.01	-0.40	-1.40	-1.58	-1.24
CPI (percentage points)	0.01	0.50	1.35	0.86	0.21

HOW THE GREAT RECESSION WAS BROUGHT TO AN END

functioning. TARP money was also vital to ensuring an orderly restructuring of the auto industry at a time when its unraveling would have been a serious economic blow. TARP funds were not used as effectively in mitigating foreclosures, but policymakers should not stop trying.

The fiscal stimulus also fell short in some respects, but without it the economy might still be in recession. Increased unemployment insurance benefits and other transfer

payments and tax cuts put cash into households' pockets that they have largely spent, supporting output and employment. Without help from the federal government, state and local governments would have slashed payrolls and programs and raised taxes at just the wrong time. (Even with the stimulus, state and local governments have been cutting and will cut more.) Infrastructure spending is now kicking into high gear and will be a significant source of jobs through

at least this time next year. And business tax cuts have contributed to increased investment and hiring.

When all is said and done, the financial and fiscal policies will have cost taxpayers a substantial sum, but not nearly as much as most had feared and not nearly as much as if policymakers had not acted at all. If the comprehensive policy responses saved the economy from another depression, as we estimate, they were well worth their cost.

Appendix A: Some Details on the Financial and Fiscal Policies

Troubled Asset Relief Program

The Troubled Asset Relief Program (TARP) was established on October 3, 2008 in response to the mounting financial panic. As originally conceived, the \$700 billion fund was to buy “troubled assets” from struggling financial institutions in order to re-establish their financial viability. But because of the rapid unraveling of the financial system, the funds were used for direct equity infusions into these institutions instead and ultimately for a variety of other purposes.

Some elements of the TARP clearly have been more successful than others. Perhaps the most effective was the Capital Purchase Program—the use of TARP funds to shore up banks’ capital. It seems unlikely that the system would have stabilized without it or something similar. A small amount of TARP money was eventually used to facilitate the purchase of troubled assets through the Fed’s TALF program and Treasury’s PPIP program. The volume of transactions was small, but the TALF appears to have improved the pricing of these assets, thus reducing pressure on the system as a whole. The TARP also helped bring about the orderly bankruptcies of GM and Chrysler, forestalling what otherwise would have been a disorderly liquidation accompanied by massive layoffs during the worst part of the recession. The TARP has probably been least effective, at least to date, in easing the foreclosure crisis.

While TARP’s ultimate cost to taxpayers will be significant—it is projected between \$100 billion and \$125 billion—it will fall well short of the \$700 billion originally proposed. Indeed, the bank bailout part will likely turn a profit. To date, more than half the banks that received TARP funds have repaid them with interest and often with capital gains (on options) as well.

TARP history

The nation’s financial system nearly collapsed in the fall of 2008. Fannie Mae and Freddie Mac and insurer AIG were effectively nationalized; Lehman Brothers, Wachovia, and Washington Mutual failed; Merrill Lynch and Citigroup staggered, and nearly every other

major U.S. financial institution was contemplating the consequences of failure. There were silent deposit runs on many money market funds, and the commercial paper market shut down, threatening the ability of major nonfinancial businesses to operate. Global financial markets were in disarray.

Poor policymaking prior to the TARP helped turn a serious but seemingly controllable financial crisis into an out-of-control panic. Policymakers’ uneven treatment of troubled institutions (for example, saving Bear Stearns but letting Lehman fail) created confusion about the rules of the game and uncertainty among shareholders, who dumped their stock, and creditors, who demanded more collateral to provide liquidity to financial institutions.

The TARP was the first large-scale attempt by policymakers to restore stability to the system. In late September 2008, the U.S. Treasury and Federal Reserve asked Congress to establish a \$700 billion fund, primarily to purchase the poorly performing mortgage loans and related securities that threatened the system. Responding to a variety of economic and political counter-arguments, Congress initially rejected the TARP, further exacerbating the financial turmoil.

With the financial panic intensifying and threats to the economy growing clearer, Congress quickly reversed itself, however, and the TARP was established on October 3, 2008. But with the banks deteriorating rapidly and asset purchases extremely complex, the TARP was quickly shifted to injecting capital directly into major financial institutions. Initially, this meant buying senior preferred stock and warrants in the nine largest American banks, a tactic subsequently extended to other banks.

TARP costs

While Congress appropriated \$700 billion for the TARP, only \$600 billion was ever committed, and as of June 2010, only \$261 billion was still outstanding (see Table 9). TARP’s ultimate cost to taxpayers probably will end up close to \$100 billion, nearly half of that from GM.¹² While this is a large sum, early fears that much of the \$700 billion would be lost were significantly overdone.

The largest use of the TARP funds has been to recapitalize the banking system via the Capital Purchase Program. At its conception, the CPP was expected to amount to \$250 billion. Instead, its peak in early 2009 was actually about \$205 billion, and as financial conditions have improved, many of the nation’s largest banks have repaid the funds. There is only \$67 billion outstanding in the CPP. Banks also paid an appropriately high price for their TARP funds in the forms of restrictions on dividends and executive compensation, and additional regulatory oversight. These costs made banks want to repay TARP as quickly as possible. Since nearly all CPP funds are expected to be repaid eventually with interest, with additional proceeds from warrant sales, the CPP almost certainly will earn a meaningful profit for taxpayers.

Approximately \$200 billion in TARP funds were committed to support the financial system in other ways. Some \$115 billion went to three distressed and systemically important financial institutions: AIG, Bank of America, and Citigroup. BofA and Citi have repaid what they owed, but the \$70 billion provided to AIG is still outstanding, and an estimated \$40 billion is now expected to be lost.¹³ Other efforts to support the financial system, including TALF, PPIP, and the small business lending initiatives have not amounted to much, quantitatively, ensuring that the costs of these programs to taxpayers will be minimal.

The TARP commitment to the motor vehicle industry, including GM, GMAC, Chrysler, and various auto suppliers, totaled more than \$80 billion. Approximately half of this is estimated as a loss, although the actual loss will depend significantly on the success of the upcoming GM initial public offering.

For taxpayers, the costliest part of the TARP will likely be its efforts to promote residential mortgage loan modifications, short sales, and refinancings via the Homeowner Affordability and Stability Plan. All of the \$50 billion committed for the various aspects of this effort are expected to be spent and not recouped.

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TABLE 9
Troubled Asset Relief Program

\$ bil	Originally Committed	Post-FinReg	Currently Provided	Ultimate Cost
Total	600	475	261	101
CPP (Financial institutions)	250	205	67	-24
Tarp Repayments			138	
Losses			2	
Dividends, Warrant proceeds			21	
AIG	70	70	70	38
Citi (TIP)	20	20	Repaid	0
Bank of America (TIP)	20	20	Repaid	0
Citi debt guarantee	5	NA	Repaid	0
Federal Reserve (TALF)	55	4	4	0
Public-Private Investment Fund (PPIP)	30	22	10	1
SBA loan purchase	15	0	>1	0
Homeowner Affordability and Stability Plan	52	49	41	49
GMAC	13	13	13	4
GM	50	50	43	25
GM (for GMAC)	1	1	1	0
Chrysler	13	13	11	8
Chrysler Financial Loan	2	2	Repaid	0
Auto suppliers	5	5	Repaid	0

Sources: Federal Reserve, Treasury, FDIC, FHA, Moody's Analytics

Capital Purchase Program

The CPP has been the most successful part of the TARP. Without capital injections from the federal government, the financial system might very well have collapsed. It is difficult to trace out such a scenario, but at the very least the resulting credit crunch would have been much more severe and long-lasting. As it is, private financial and non-financial debt outstanding has been contracting for nearly two years.

The financial system is still not functioning properly—small banks continue to fail in large numbers, bank lending is weak and the private-label residential mortgage and commercial securities markets remain largely dormant—but it is stable. Evidence of normalization in the financial system is evident in the sharp narrowing of credit spreads. For example, the spread between Libor (the rate banks charge each other for loans) and Treasury bills hit a record 450 basis points at the height of

the financial panic (see Chart 1). Today, despite the uncertainty created by the European debt crisis, the Libor-T-Bill bill spread is nearly 25 basis points, close to the level that prevailed prior to the crisis. Nonetheless, while depository institutions are lending more freely to each other, they remain reluctant to extend credit to businesses and consumers.

A variety of other policy initiatives helped restore stability to the financial system. The unprecedented monetary policy response, the bank stress tests, and the FDIC's guarantees on bank debt issuance as well as higher deposit insurance limits were all important. Yet none of these efforts would likely have succeeded without the CPP, which bought the time necessary to allow these other efforts to work.

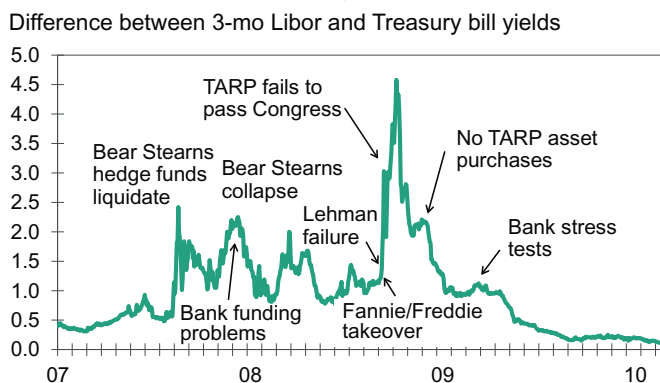
Toxic assets

TARP has also been useful in mitigating systemic risks posed by the mountain of

toxic assets owned by financial institutions.¹⁴ Because institutions are uncertain of these assets' value and thus of their own capital adequacy, they have been less willing and able to provide credit.

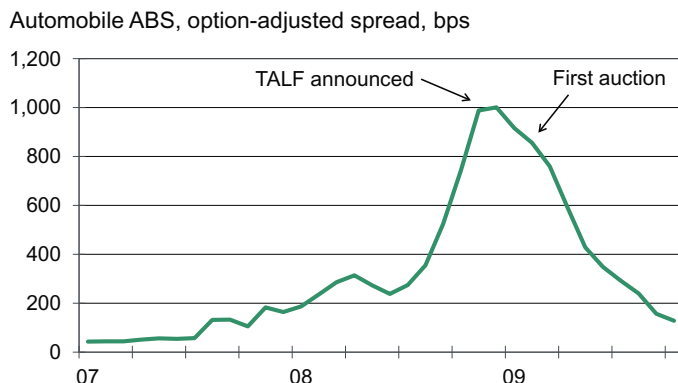
The Fed's TALF program and Treasury's PPIP program provided favorable financing to investors willing to purchase a wide range of "toxic" assets. TARP funds were available to cover the potential losses in both programs. While neither program resulted in a significant amount of activity, they did help support asset prices as interest rates came down and spreads over risk-free Treasuries narrowed.¹⁵ When TALF was announced in late 2008, the option-adjusted spread on auto-loan-backed securities stopped rising, topping out at a whopping 1,000 basis points (see Chart 2). By the time of the first TALF auction in early 2009, the spread had narrowed to 900 basis points, and it is now hovering close to 100 basis points. While

Chart 1: The Financial System Has Stabilized



Sources: Federal Reserve Board, Moody's Analytics

Chart 2: TALF Caused ABS Spreads to Narrow



Source: BofA Merrill Lynch

this narrowing of spreads was driven by a multitude of factors, arguably most important was the TALF.

The TARP also supported asset prices by forestalling the collapse of AIG, Bank of America, and Citi. Had these huge institutions failed, they might have been forced to dump their toxic assets at fire-sale prices, thereby imperiling other institutions that owned similar assets. In a sense, the troubled assets owned by AIG, BofA and Citi were quarantined so they would not infect asset markets and drive prices even lower. The government still owns nearly all of AIG, and although it has been selling its Citi shares, it continues to hold a sizable ownership stake.¹⁶

Auto bailout

TARP also was instrumental in assuring the orderly bankruptcy of GM and Chrysler and supporting the entire motor vehicle industry. Without money from the TARP, these firms would have very likely ceased as going concerns. The liquidation of GM and Chrysler would have in turn caused the bankruptcy of many vehicle part suppliers and, as a result, Ford as well.

Without government help, the vehicle manufacturers' Chapter 11 restructurings would have likely turned into Chapter 7 liquidations. Their factories and other operations would have been shut down and their assets sold to pay creditors. The collapse in the financial system and resulting credit crunch made financing the companies while they were in the bankruptcy process all

but impossible. Debtor-in-possession (DIP) financing is critical to pay suppliers, finance inventories, and meet payroll while companies restructure. It is risky even in good times, so DIP lenders become senior creditors when a bankruptcy court distributes a firm's assets and can charge high rates and fees for their risks. Yet in the credit crunch that prevailed in early 2009, it is unlikely that DIP lenders would have taken such risks. Money from the TARP was necessary to fill this void.

GM and Chrysler have now been significantly rationalized and appear to be financially viable even at depressed current vehicle sales rates. GM has already begun to repay its government loans, and there is even discussion of when it will go public. Ford, which did not take government funds, is doing measurably better, and conditions across the industry have improved. Production is up and employment has stabilized (see Chart 3). This seemed unlikely just a year ago, and TARP was instrumental in the turnaround.

Foreclosure crisis

The TARP has been less successful, at least so far, in combating the residential mortgage foreclosure crisis. TARP is funding the Housing Affordability Stability Plan, or HASP, which consists of the Home Affordability Mortgage Plan (HAMP) and the Home Affordability Refinancing Plan (HARP).

The HAMP's original strategy was to encourage homeowners, mortgage servicers, and mortgage owners to modify home loans,

primarily by temporary reductions in interest rates and thus in monthly payments—not by principal reductions. Yet take-up on the HAMP plan has fallen well short of what policymakers hoped.¹⁷ The reason: Many home loans are so deeply under water that, even with modifications that lower monthly payments, they face high probabilities of default. Thus, mortgage servicers and creditors have little interest in making such modifications. To address this impediment, the administration made a number of changes to HAMP in spring 2010 to encourage principal write-downs. While this approach is expected to work better, it is too soon to tell.

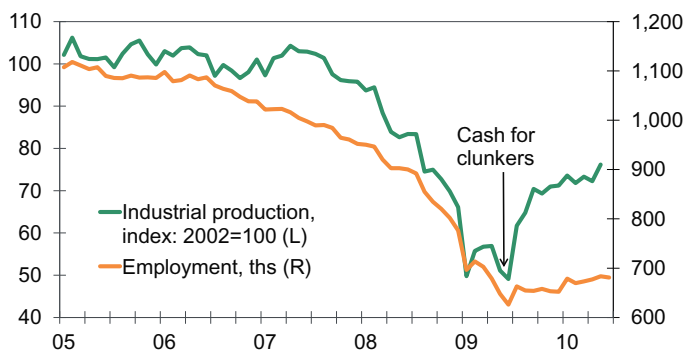
The idea behind the HARP was to allow Fannie and Freddie to refinance loans they own or insure—even on homes whose market values have sunk far below the amounts owed. The take-up on the HARP has been particularly low because homeowners need to pay transaction costs for the refinancing and are not permitted to capitalize these costs into their mortgage principal. Some homeowners whose credit characteristics have weakened also find that the interest rates offered for refinancing are not low enough to cover the transaction costs in a reasonable time.

The HAMP and other foreclosure mitigation efforts have slowed the foreclosure process a bit. Mortgage servicers and owners have been working to determine which of their troubled mortgage loans might qualify for the various plans. The slower pace of foreclosures and short sales has resulted in

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Chart 3: Autos Go From Free Fall to Stability

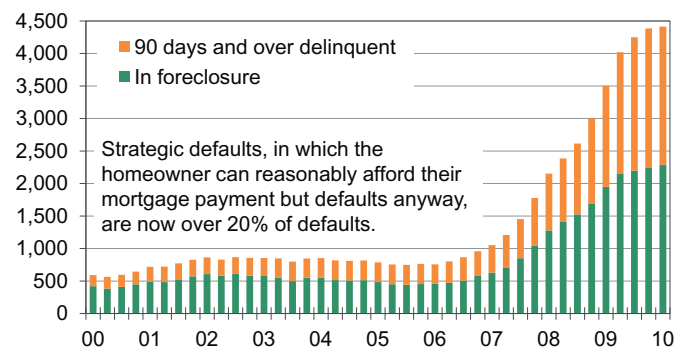
Motor vehicles and parts



Sources: Federal Reserve Board, BLS

Chart 4: The Foreclosure Crisis Continues

First mortgage loans, ths



Sources: Equifax, Moody's Analytics

more stable house prices this past year, but troubled loans are backing up in the foreclosure pipeline. As of the end of June 2010, credit file data show an astounding 4.3 million first mortgage loans in the foreclosure process or at least 90 days delinquent (see Chart 4). For context, there are 49 million first mortgage loans outstanding; so this is almost 9% of the total. Mortgage servicers and owners are deciding that many of these loans are not viable candidates for the HAMP plan, and have begun pushing these loans towards foreclosure. Thus foreclosures and short sales are expected to increase measurably in the coming months, which would put even more downward pressure on house prices.

Policymakers are hoping the revised HAMP and other private mitigation efforts will work well enough to reduce foreclosures and short sales and thus prevent house price declines from undermining the broader economy.

Fiscal Stimulus

Like the TARP, the government's fiscal stimulus has grown unpopular. There appears to be a general perception that, at best, the stimulus has done little to turn the economy around, and at worst, it has funded politicians' pet projects with little clear economic rationale. In fact, the fiscal stimulus was quite successful in helping to end the Great Recession and to accelerate the recovery. While the strength of the recovery has been disappointing, this speaks mainly to the severity of the downturn. Without the fiscal stimulus, the economy would arguably still be in recession,

unemployment would be well into the double digits and rising, and the nation's budget deficit would be even larger and still rising.

In the popular mind, the fiscal stimulus is associated with the American Restoration and Recovery Act—the \$784 billion package of temporary spending increases and tax cuts passed in February 2009. In fact, the stimulus began in the spring of 2008 with the mailing of tax rebate checks.¹⁸ Smaller stimulus measures followed the ARRA, including cash for clunkers, a tax credit for homebuyers that expired in June, a payroll tax credit for employers to hire unemployed workers, and other measures. In total, the stimulus provided under both the Bush and Obama administrations amounts to more than \$1 trillion, about 7% of GDP (see Table 10).¹⁹

Some form of fiscal stimulus has been part of the government's response to nearly every recession since the 1930s, but the current effort is the largest. For comparison, the stimulus provided during the double-dip downturn of the early 1980's equaled almost 3% of GDP, and the stimulus provided a decade ago after the tech bust totaled closer to 1.5% of GDP.²⁰

Extended or expanded unemployment insurance benefits have been a common form of stimulus, as has financial help to state and local governments. Since nearly all states are legally bound to balance their budgets, and since nearly all face significant budget shortfalls during recessions, they would have been forced to cut spending and raise taxes even more in the absence of federal aid, thus add-

ing to the economy's weakness. Aside from additional UI and state aid, fiscal policymakers have generally relied more on tax cutting than on increased spending as a stimulus. The massive public works projects of the Great Depression are an exception.

The unusually large amount of fiscal stimulus provided recently is consistent both with the extraordinarily severe downturn and the reduced effectiveness of monetary policy as interest rates approach zero. The Federal Reserve's job is further complicated by the still significant risk of deflation. Falling prices cause *real* interest rates to rise, since the Fed can not lower nominal rates further. This situation stands in sharp contrast to the early 1980s—the last time unemployment reached double digits—when interest rates and inflation were both much higher and the Federal Reserve had substantially more latitude to adjust monetary policy.

The greater use of government spending rather than tax cuts as a fiscal stimulus during the current period is also consistent with the record length of the recession and the persistently high unemployment.²¹ Historically, the principal weakness of government spending, for example infrastructure projects, is that it takes too long to affect economic activity. Given the length and depth of the recent recession, however, the time-lag issue is less of a concern.

Tax cuts

Tax cuts have played an important role in recent stimulus efforts. Indeed, tax cuts

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Table 10

Fiscal Stimulus Policy Efforts

\$ bil	Originally Committed	Currently Provided	Ultimate Cost
Total Fiscal Stimulus	1,067	712	1,067
Spending Increases	682	340	682
Tax Cuts	383	371	383
Economic Stimulus Act of 2008	170	170	170
American Recovery and Reinvestment Act of 2009	784	473	784
Infrastructure and Other Spending	147	56	147
<i>Traditional Infrastructure</i>	38	14	38
<i>Nontraditional Infrastructure</i>	109	42	109
Transfers to state and local governments	174	119	174
<i>Medicaid</i>	87	69	87
<i>Education</i>	87	51	87
Transfers to persons	271	109	271
<i>Social Security</i>	13	13	13
<i>Unemployment Assistance</i>	224	66	224
<i>Food stamps</i>	10	10	10
<i>Cobra Payments</i>	24	20	24
Tax cuts	190	188	190
<i>Businesses & other tax incentives</i>	40	40	40
<i>Making Work Pay</i>	64	62	64
<i>First-time homebuyer tax credit</i>	14	14	14
<i>Individuals excluding increase in AMT exemption</i>	72	71	72
<i>Cash for Appliances</i>	0.3	0.2	0.3
Cash for Clunkers	3	3	3
HIRE Act (Job Tax Credit)	17	8	17
Worker, Homeownership, and Business Assistance Act of 2009	91	57	91
Extended of unemployment insurance benefits (Mar 16)	6	6	6
Extended of unemployment insurance benefits (Apr 14)	12	12	12
Extended of unemployment insurance benefits (May 27)	3	3	3
Extended of unemployment insurance benefits (July 22)	34		34
Extended/expanded net operating loss provisions of ARRA*	33	33	33
Extended/extension of homebuyer tax credit	3	3	3
Department of Defense Appropriations Act of 2010	>2	>3	>2
Extended guarantees and fee waivers for SBA loans	>1	>1	>1
Expanded COBRA premium subsidy	>1	>1	>1

Sources: CBO, Treasury, Recovery.gov, IRS, Department of Labor, JCT, Council of Economic Advisors, Moody's Analytics

for individuals and businesses account for 36% of the total stimulus, nearly \$400 billion. Lower- and middle-income households have received tax rebate checks, paid less in payroll taxes, and benefited from tax credits to purchase homes and appliances. All together, individuals will receive almost \$300 billion in tax cuts.

The cash for clunkers program and housing tax credits were particularly well-timed and potent tax breaks. Cash for clunkers gave households a reason to trade in older gas-guzzling vehicles for new cars in the summer of 2009, when GM and Chrysler were struggling to navigate bankruptcy. Sales jumped, clearing out inventory and setting up a rebound in vehicle production and employment. The program was very short-lived, however, and sales naturally weakened in the immediate wake of the program. But they have largely held their own since.

Three rounds of tax credits for home purchasers were also instrumental in stemming the housing crash. The credit that expired in November was particularly helpful in breaking the deflationary psychology that was gripping the market. Until that point, potential homebuyers were on the sidelines, partly because they expected prices to fall even further. The tax credit offered a reason to buy sooner, helping to stabilize house prices. The credit was especially helpful in preventing the large number of foreclosed properties then hitting the market from depressing prices. The expiration of the most recent tax credit, in June, was followed by a sharp decline in sales. But this may have been partly due to potential homebuyers expecting Congress to offer yet another tax credit.

The fiscal stimulus also provided businesses with approximately \$100 billion in tax cuts, including accelerated depreciation benefits and net operating loss rebates. While such incentives have historically not been particularly effective as a stimulus—they do not induce much extra near-term investment—they may be more potent in the current environment, when businesses face severe credit constraints.²² It is also important to consider that accelerated-depreciation and operating-loss credits are ultimately not very costly to taxpayers. The tax revenue lost

TABLE 11

Fiscal Stimulus Bang for the Buck

Tax Cuts	Bang for the Buck
Non-refundable Lump-Sum Tax Rebate	1.01
Refundable Lump-Sum Tax Rebate	1.22
Temporary Tax Cuts	
Payroll Tax Holiday	1.24
Job Tax Credit	1.30
Across the Board Tax Cut	1.02
Accelerated Depreciation	0.25
Loss Carryback	0.22
Housing Tax Credit	0.90
Permanent Tax Cuts	
Extend Alternative Minimum Tax Patch	0.51
Make Bush Income Tax Cuts Permanent	0.32
Make Dividend and Capital Gains Tax Cuts Permanent	0.37
Cut in Corporate Tax Rate	0.32
Spending Increases	
Extending Unemployment Insurance Benefits	1.61
Temporary Federal Financing of Work-Share Programs	1.69
Temporary Increase in Food Stamps	1.74
General Aid to State Governments	1.41
Increased Infrastructure Spending	1.57
Low Income Home Energy Assistance Program (LIHEAP)	1.13

Source: Moody's Analytics

Note: The bang for the buck is estimated by the one year \$ change in GDP for a given \$ reduction in federal tax revenue or increase in spending.

to the Treasury upfront is largely paid back in subsequent years when businesses have higher tax liabilities.

Government spending increases

A potpourri of temporary spending increases were also included in the fiscal stimulus. Additional unemployment insurance beyond the regular 26-week benefit period has been far and away the most costly type of stimulus spending, with a total price tag now approaching \$300 billion. The high rate and surprisingly long duration of unemployment—well over half the jobless have been out of work more than 26 weeks—have added to the bill.

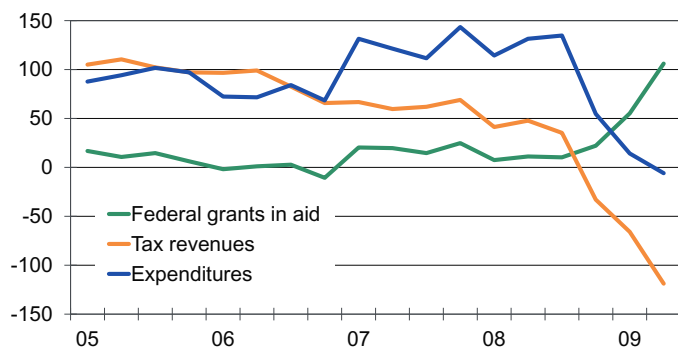
Yet UI benefits are among the most potent forms of economic stimulus available. Additional unemployment insurance

produces very high economic activity per federal dollar spent (see Table 11).²³ Most unemployed workers spend their benefits immediately; and without such extra help, laid-off workers and their families have little choice but to slash their spending. The loss of benefits is debilitating not only for unemployed workers, but also for friends, family, and neighbors who may have been providing financial help themselves.

The fiscal stimulus also provided almost \$50 billion in other income transfers, including Social Security, food stamps, and COBRA payments to allow unemployed workers to retain access to healthcare. Food stamps are another particularly powerful form of stimulus, as such money flows quickly into the economy. COBRA and Social Security

Chart 5: States Avoid Massive Budget Cutting

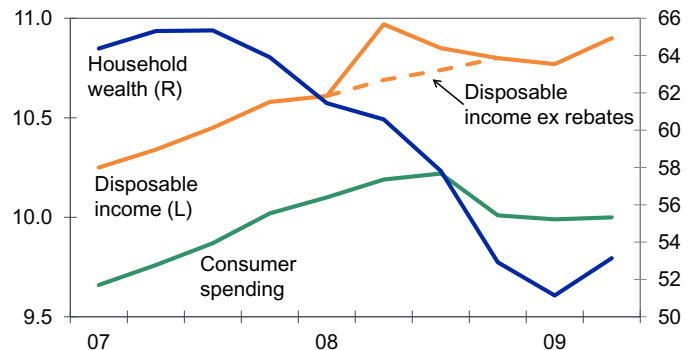
Change yr ago, \$ bil



Source: BEA

Chart 6: Tax Cuts Have Supported Spending

\$ tril



Sources: BEA, FRB, Moody's Analytics

have smaller multipliers, as not all of the aid is spent quickly.

Strapped state and local governments have also received significant additional aid through the Medicaid program, which states fund jointly with the federal government, and through education. As part of the ARRA, states will receive almost \$175 billion through the end of 2010. This money went a long way to filling states' budget holes during their just-ended 2010 fiscal year (see Chart 5). States were still forced to cut jobs and programs and raise taxes, but fairly modestly given their budget problems. Budget cutting has intensified in most states this summer, because the budget problems going into fiscal 2011 are still massive, and prospects for further help from the federal government are dwindling.

State and local government aid is another especially potent form of stimulus with a large multiplier. It is defensive stimulus, forestalling draconian cuts in government services, as well as the tax increases and

weaker consumer spending that would have surely occurred without such help. In the nomenclature of the debate surrounding the merits of the stimulus, this stimulus saves jobs rather than creates them.

Funds for infrastructure projects generally do not generate spending quickly, as it takes time to get projects going. That is not a bad thing: rushing raises the risks of financing unproductive projects. But infrastructure spending does pack a significant economic punch, particularly to the nation's depressed construction and manufacturing industries. Almost \$150 billion in ARRA infrastructure spending is now flowing into the economy, and is particularly welcome, as the other stimulus fades while the economy struggles.

The ARRA has also been criticized for including a hodgepodge of infrastructure spending, ranging from traditional outlays on roads and bridges to spending on electric power grids and the internet. Given the uncertain payoff of such projects, diversification is probably a plus. As Japan taught ev-

eryone in the 1990s, infrastructure spending produces diminishing returns. Investing only in bridges, for example, ultimately creates bridges to nowhere.

Arguments that temporary tax cuts have not supported consumer spending are also overstated. This is best seen in the 2008 tax rebates. While these payments significantly lifted after-tax income, consumer spending did not follow, at least not immediately. One reason was the income caps attached to the rebates. Higher-income households did not receive them, and because of rapidly falling stock and house prices, these same households were saving significantly more and spending less (see Chart 6). The saving rate for households in the top quintile of the income distribution surged from close to nothing in early 2007 to double digits by early 2008. Lower- and middle-income households did spend a significant part of their tax rebates, but the sharp pullback by higher-income households significantly diluted the impact of the tax cut on overall spending.

Appendix B: Methodological Considerations

The Moody's Analytics model of the U.S. economy was used to quantify the economic impact of the various financial and fiscal stimulus policies implemented during the crisis and recession. This model is used regularly for a range of purposes, including economic forecasting, scenario and sensitivity analysis, and most relevant for the work presented here, the assessment of the economic impact of monetary and fiscal policies. It is used by a wide range of global companies, federal, state and local governments, and policymakers.

The model was already well equipped to assess the economic impact of the various fiscal stimulus measures. But several adjustments to the model were necessary to deal with the financial policies, many of which were innovative. In the context of the model, this mainly meant estimating the effects of the policies on credit conditions. Credit conditions are measured by interest rates, including both Treasury rates and credit spreads, and bank underwriting standards. The key financial policy levers included in the model are Federal Reserve assets, the capital raised by financial institutions (as a result of the CPP and the stress tests), the conforming mortgage loan limit (which was increased as part of fiscal stimulus), and the FHA share of purchase mortgage originations, which surged as the private mortgage market collapsed.

In broad terms, here is how the model works: In the short run, fluctuations in economic activity are determined primarily by shifts in *aggregate demand*, including personal consumption, business investment, international trade and government expenditures. The level of resources and technology available for production are taken as given. Prices and wages adjust slowly to equate aggregate demand and supply. In the long run, however, changes in *aggregate supply* determine the economy's growth potential. Thus the rate of expansion of the resource and technology base of the economy is the principal determinant of economic growth.

Aggregate demand

Real consumer spending is modeled as a function of real household cash flow, housing

wealth, and financial wealth.²⁴ Household cash flow equals the sum of personal disposable income, capital gains realizations on the sale of financial assets, and *net* new borrowing—including mortgage equity withdrawal. Changes in household cash flow were substantially greater than those of disposable income during the boom and the bubble.

Mortgage equity withdrawal was a major difference between cash flow and disposable income in the boom. It is in turn driven by capital gain realizations on home sales and home equity borrowing—both of which are determined by mortgage rates and the availability of mortgage credit (see Chart 7). Fixed mortgage rates are modeled as a function of the 10-year Treasury yield, the refinancing share of mortgage originations, the foreclosure rate, and the value of Federal Reserve assets.²⁵ The latter variable was added to the model explicitly for this exercise. Including Fed assets captures the impact of the Fed's credit easing efforts, which involved expanding the assets it owns largely through the purchases of Treasury bonds and mortgage securities. The availability of mortgage credit is measured by the Federal Reserve's Senior Loan Officer Survey question regarding residential mortgage underwriting standards; it is modeled as a function of the foreclosure rate, the conforming loan limit, and the FHA share of purchase originations.²⁶

These policy efforts have also had significant impacts on residential investment, which is determined in the model by household formation, the inventory of vacant homes, the availability of credit to homebuilders, and the difference between house prices and the costs of construction. Housing starts closely follow the number of household formations, abstracting from the number of demolitions and second and vacation homes. Inventories of homes depend significantly on home sales, which are driven by real household income, the age composition of the population, mortgage rates, and the availability of mortgage credit. The availability of credit to builders is also important, particularly in the current period given the reluctance of lenders to make construction

and land development loans. The availability of such loans is proxied by the Federal Reserve's Senior Loan Officer Survey question regarding commercial real estate mortgage underwriting standards; it is modeled as a function of the delinquency rate on commercial banks' commercial real estate mortgage loans, and the spread between three-month Libor and the three-month Treasury bill yield. This so-called TED spread is one of the two key credit spreads in the Moody's model and thus one main channel via which the unconventional financial policies operated.

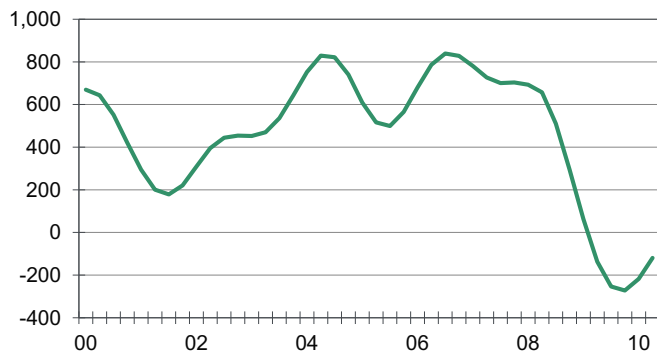
Business investment is another important determinant of aggregate demand and the business cycle. It both responds to and amplifies shifts in output. Investment also influences the supply side of the economy since it is the principal determinant of potential output and labor productivity in the long run. Investment spending not only adds to the stock of capital available per worker, but also determines the extent to which the capital stock embodies the latest and most efficient technology.

The investment equations in the model are specified as a function of changes in output and the cost of capital.²⁷ The cost of capital is equal to the implicit cost of leasing a capital asset, and therefore reflects the real after-tax cost of funds, tax and depreciation laws, and the price of the asset. More explicitly, the cost of funds is defined as the weighted-average after-tax cost of debt and equity capital. The cost of debt capital is proxied by the "junk" (below investment grade) corporate bond yield, which is the second of the two key credit spreads in the Moody's model. The cost of equity capital is the sum of the 10-year Treasury bond yield plus an exogenously set equity risk premium. Changes in the cost of capital, which have a significant impact on investment, reflect the fallout from the financial crisis, any benefit from the various business tax cuts, and the policy efforts to stabilize the financial system.

The availability of credit is also an important determinant of business investment and is measured by the Federal Reserve's Senior

Chart 7: Mortgage Equity Withdrawal Falls

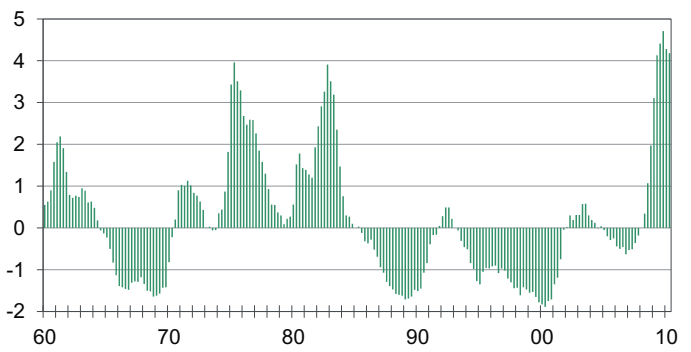
\$ bil, annualized



Sources: BEA, Equifax, Moody's Analytics

Chart 8: The Output Gap Is Wide

Difference between actual unemployment rate and NAIRU



Sources: BLS, Moody's Analytics

Loan Officer Survey question regarding underwriting standards for commercial and industrial loans. This is modeled as a function of the interest coverage ratio—the share of nonfinancial corporate cash flow going to servicing debt—and the three-month TED spread.

The international trade sector of the model captures the interactions among foreign and domestic prices, interest rates, exchange rates, and product flows.²⁸ The key determinants of export volumes are global real GDP growth and the real trade-weighted value of the U.S. dollar. Real imports are determined by specific domestic spending categories and relative prices. Global real GDP growth comes from the Moody's Analytics international model system and is provided exogenously to the U.S. model. The value of the dollar is determined endogenously based on relative U.S. and global interest rates, global growth, and the U.S. current account deficit.

Most federal government spending is treated as exogenous in the model since legislative and administrative decisions do not respond predictably to economic conditions. The principal exception is transfer payments for unemployment benefits, which are modeled as a function of unemployment and net interest payments. Total federal government receipts are the sum of personal tax receipts, contributions for social insurance, corporate profits tax receipts, and indirect tax receipts. Personal taxes (income plus payroll) account for the bulk of federal tax collections, and are equal to the product of the average effective income tax rate and the tax base, which is

defined as personal income less nontaxable components of income including other labor income and government transfers. The average effective tax rate is modeled as a function of marginal rates, which are exogenous and form a key policy lever in the model.

State and local government spending is modeled as a function of the sum of tax revenues, which are the product of average effective tax rates and their corresponding tax base, and exogenously determined federal grants-in-aid. Given balanced budget requirements in most states, government spending is closely tied to revenues. Grants-in-aid are also an important policy lever in an assessment of the economic impact of fiscal stimulus.

Aggregate supply

The supply side of the economy describes the economy's capabilities for producing output. In the model, aggregate supply or potential GDP is estimated from a Cobb-Douglas production function that combines factor input growth and improvements in total labor productivity. Factor inputs include labor and business fixed capital. Factor supplies are defined by estimates of the full-employment labor force and the existing capital stock of private nonresidential equipment and structures. Total factor productivity is calculated as the residual from the Cobb-Douglas production function, estimated at full employment. Potential total factor productivity is derived from a regression of actual TFP on business-cycle specific trend variables.

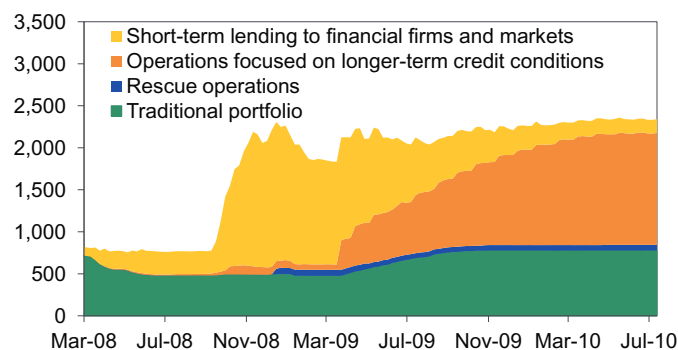
The key unknown in estimating aggregate supply is the full-employment level of labor, which is derived from a measure of potential labor supply and the long-run equilibrium unemployment rate. This rate, often referred to as the Non-Accelerating Inflation Rate of Unemployment, or NAIRU, is the unemployment rate consistent with steady price and wage inflation. It is also the unemployment rate at which actual GDP equals potential GDP. NAIRU, which is estimated from an expectations-augmented Phillips curve, is currently estimated to be near 5.5%.²⁹ Given the current 9.5% unemployment rate, the economy is operating well below its potential (see Chart 8). This output gap is the key determinant of prices in the model. It is thus not surprising that inflation is decelerating, raising concerns that the economy may suffer outright deflation.

Monetary policy, interest rates and stock prices

Monetary policy is principally captured in the model through the federal funds rate target.³⁰ The funds rate equation is an FOMC reaction function that is a modified Taylor rule. In this framework, the real funds rate target is a function of the economy's estimated real growth potential, the difference between the actual and target inflation rate (assumed to be 2% for core CPI), and the difference between the actual unemployment rate and NAIRU. This specification is augmented to include the difference between the presumed 2% inflation target and inflation expecta-

Chart 9: The Fed Expands Its Balance Sheet

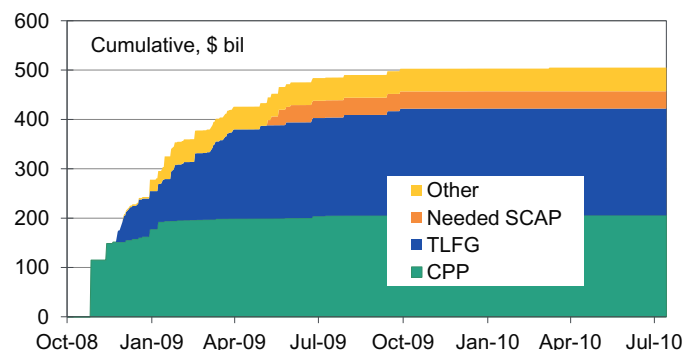
Composition of Federal Reserve's balance sheet, \$ bil



Sources: Federal Reserve, Moody's Analytics

Chart 10: Capital Raised Thanks to Policy Support

Bank capital raised through:



Sources: Treasury, SEC, Moody's Analytics

tions, as measured by five-year, five-year-forward Treasury yields.

Because of the Federal Reserve's extensive use of quantitative easing to respond to the financial crisis, Federal Reserve assets were added to the model for this exercise. Fed assets are specified as a function of the federal funds rate target described above. When the funds rate implied by the equation falls below zero, the Fed's balance sheet expands. And the more negative the implied funds rate, the greater the assumed balance sheet expansion. Specifically, for every 100 basis points that the desired (but unachievable) funds rate becomes negative, the Fed is presumed to expand its balance sheet by \$1.2 trillion.³¹ At present, the implied funds rate is near negative 2%, which suggests that the Fed should be holding close to \$3 trillion in assets—compared with the Fed's actual current holdings of \$2.4 (see Chart 9).

The most important private short-term interest rate in the model is the three-month Libor rate, which in turn drives home-equity and credit-card lending rates as well as the rate on adjustable residential mortgages. The TED spread between three-month Libor and

three-month Treasury bill yields (which is tied closely to the funds rate) is modeled as a function of the delinquency rate on commercial bank loans and leases, the market value of equity lost in failing financial institutions during the financial crisis, and the amount of capital raised by the banking system via the CPP and stress tests (see Chart 10). The latter variable was added explicitly for these stimulations. The rationales are straightforward: As the delinquency rate increases, banks demand higher interest to lend to other banks. The equity lost in failing institutions captures the growing panic that investors felt as the crisis intensified. The capital raised by banks either from the federal government or in the equity market captures the benefit of the financial policy response in restoring stability to short-term funding markets.

The most important long-term interest rate in the model is the yield on the 10-year Treasury bond, which is a key determinant of both mortgage rates and corporate bond rates. The 10-year Treasury yield is modeled as a function of the federal funds rate, inflation expectations, the federal budget deficit as a share of GDP, and Federal Reserve assets;

the latter was added to the model to capture the impact of recent quantitative easing efforts. Bond investors' expectations of future monetary policy are assumed to be driven by current inflation expectations and the federal government's future fiscal situation.

The junk bond yield is another important interest rate in the model, as it impacts businesses' cost of capital. It is driven by the 10-year Treasury yield, the interest coverage ratio for nonfinancial corporate businesses, and capacity utilization. Higher interest coverage—the greater the share of cash flow businesses must devote to meeting debt payments to remain current—and lower capacity utilization push junk yields up relative to the risk-free Treasury yield.

Stock prices, measured by the S&P 500 stock index, are modeled based on a traditional earnings discount model. The principal determinants of stock prices in this framework are thus corporate profits and the Baa corporate bond yield.³² Changing stock prices have an important impact on consumer spending through the wealth effect and on business investment through the cost of capital.

Endnotes

JULY 28, 2010 1 P.M. CORRECTION: This article now contains corrected figures for our estimate of 2010 GDP with and without the stimulus. As the article now reflects, GDP in 2010 would be about 11.5% lower without the government's response, and the fiscal stimulus has raised GDP by about 3.4%.

1. Princeton University and Moody's Analytics, respectively. These affiliations are for identification only. None of the views expressed here should be attributed to any organization with which we are affiliated.
2. The CBO's estimates of the economic impact of ARRA can be found at <http://www.cbo.gov/ftpdocs/115xx/doc11525/05-25-ARRA.pdf>. The Council of Economic Advisors' most recent estimates of the economic impact of ARRA can be found at http://www.whitehouse.gov/files/documents/cea_4th_arra_report.pdf.
3. Alan Krueger, the Assistant Treasury Secretary for Economic Policy, estimated that the capital injections into banks *alone* may have added roughly 900,000 to 1.8 million jobs. See his Remarks to the American Academy of Actuaries, Washington, DC, July 20, 2009 (at www.treasury.gov/offices/economic-policy/AK-Actuaries-07-20-2009.pdf) A Federal Reserve Bank of New York staff report estimated that the Fed's purchases of long-term assets (Treasury securities and MBS) *alone* lowered long-term interest rates on a range of securities by 30-80 basis, with effects on mortgage rates about 50 basis points higher than that. See Joseph Gagnon, Matthew Raskin, Julie Remache, and Brian Sack, "Large-Scale Asset Purchases by the Federal Reserve: Did They Work?," Federal Reserve Bank of New York Staff Report No. 441, March 2010.
4. The new credit facilities include the Term Auction Facility, the Term Securities Loan Facility, the Term Asset-Backed Securities Loan Facility, the Commercial Paper Funding Facility, the Money Market Investor Funding Facility, and currency swap lines.
5. These include, among others, the cash-for-clunkers tax incentive in the fall of 2009, the extension and expansion of the housing tax credit through mid-2010, the passage of a job tax credit through year-end 2010, and several extensions of emergency UI benefits.
6. We refer here to the *response* to the crisis, once it occurred. Many government policies and regulatory lapses contributed to bringing on the crisis, however.
7. The pace of change also explains why the fiscal stimulus will soon turn into a drag on economic growth. The government's policies have added just over \$80 billion per quarter to the economy since late 2009, a flow that will dry up to essentially nothing over the next several quarters.
8. Under the baseline and no-financial-policy scenarios, an additional \$80 billion in fiscal stimulus is assumed through mid-2011, including approximately \$50 billion for additional emergency UI benefits, \$25 billion in state government aid and \$5 billion in other stimulus including increased funding for small business lending. It is also assumed under all the scenarios that tax rates rise only for the top 2% of income earners and that these higher rates are phased in over two years. In all the scenarios, monetary policy is treated endogenously, with the federal funds rate target constrained to be non-negative and the Fed engaging in credit easing consistent with the degree to which the model calls for a negative federal funds rate. The broad trade-weighted dollar is also endogenously determined and falls in the scenarios, supporting an improvement in the trade balance and cushioning the economic downturn. This benefit is overstated in the scenarios, however, as global economic growth excluding the U.S. is held exogenously in order to simplify the analysis.
9. We make no attempt to decompose the financial-policy effects into portions attributable to TARP, to the Fed's quantitative easing policies, etc.
10. The CBO's estimates of the economic impact of ARRA can be found at <http://www.cbo.gov/ftpdocs/115xx/doc11525/05-25-ARRA.pdf>.
11. See *The Wall Street Journal*, July 24, 2009.
12. The Treasury's Office of Financial Stability recently published updated cost estimates of TARP using publicly available data through March 31, 2010. See <http://www.treas.gov/press/releases/tg713.htm>. Treasury currently expects TARP losses to be \$105 billion. If much of the projected loss on GM stock is recouped, this figure will drop substantially.
13. This is another huge sum. But remember that the three-stage commitment to AIG amounted to over \$180 billion.
14. In our (apparently minority) view, it is unfortunate that TARP wasn't used more for its original purpose, namely the purchase of toxic assets from financial institutions using, for example, a reverse auction process. This idea was quickly shelved when the rapid unraveling of the financial system forced the Treasury to change objectives from asset purchases to direct capital infusions into financial institutions.
15. TALF has supported \$58 billion in asset-backed securities, along with \$12 billion of securitization for commercial mortgages. Using a combination of TARP and private capital, Public-Private Investment Funds have purchased, to date, \$12 billion of securities from banks.

HOW THE GREAT RECESSION WAS BROUGHT TO AN END

16. In April and May, Treasury sold roughly 20% of the government's stake for \$6.2 billion, \$1.3 billion above its cost. The Treasury is in the process of selling another 1.5 billion shares, and plans to liquidate the remainder of its stake in an orderly fashion by the end of 2010.
17. Introducing the HAMP in spring 2009, President Obama said he expected between 3 million and 4 million loan modifications. Even with the more recent changes to the plan, the number of permanent modifications is likely to be well under half that amount.
18. These costs do not include adjustments to the Alternative Minimum Tax, which was included as part of the ARRA, but which would have been passed by Congress regardless. They do include the added costs of providing unemployment insurance benefits, which were underestimated in the original cost estimate for the ARRA.
19. The U.S. hasn't been alone in using fiscal stimulus during the current period. Nearly all major economies did so, with total global fiscal stimulus approaching \$5 trillion. The Chinese were the most aggressive, adding nearly twice as much stimulus as the U.S. as a share of GDP.
20. This includes only the cost of the tax cuts from 2001 to 2003. The tax cuts instituted in this period largely expire at the end of this year.
21. The Great Recession likely lasted at least 18 months between December 2007 and June 2009. This is the longest downturn since the Great Depression and compares with an average of 10 months for recessions since World War II. The recovery over the past year has also been among the weakest in the post war period.
22. See Cohen, D. and Cummins, J. "A Retrospective Evaluation of the Effects of Temporary Partial Expensing," Federal Reserve Board, Finance and Economics Discussion Series Working Paper No. 2006-19 (April 2006). Also see House C. and Shapiro, M. "Temporary Investment Tax Incentives: Theory with Evidence from Bonus Depreciation," NBER Working Paper 12514, September 2006.
23. These multipliers are calculated based on simulations of the Moody's Analytics macroeconomic model of the U.S. economy.
24. Consumer spending in the model is actually disaggregated into various durable goods, nondurable goods, and services categories.
25. The refinance share proxies for the prepayment risk in mortgage loans.
26. The Federal Reserve's Senior Loan Officer Survey is conducted quarterly. Loan officers are asked by the Fed how their underwriting standards and loan demand have changed since the last time they responded to the survey the quarter before. Equations for three questions from this survey were added to the model for the purposes of this study.
27. The specification is based largely on the neoclassical theory of the firm. Fixed investment is divided into five categories of producers' durable equipment, and nine categories of nonresidential structures. Additional drivers important to the different categories of investment are also included in the equations. Investment in industrial equipment, for example, is also driven by capacity utilization and investment in transportation equipment is driven by vehicle sales to account for vehicle purchases by vehicle lessors.
28. Exports in the model are divided into eight different categories and imports are divided into ten categories.
29. Estimates of NAIRU were closer to 5% before the recession. They have risen because the lengthening duration of unemployment is eroding the ability of jobless workers to return to the labor market, and because of the large number of underwater homeowners whose ability to relocate for employment is limited.
30. The federal funds rate equation is estimated over the period beginning in late 1987, which coincides with Alan Greenspan's and Ben Bernanke's tenures as chairman of the Federal Reserve. Prior to this period monetary policy was much less transparent, and for a time during the late 1970s and early 1980s was based on targeting money supply growth.
31. This result is consistent with research done by Goldman Sachs. See "No Rush for the Exit," Jan Hatzius, et al, Goldman Sachs Global Economics Paper No. 200, June 30, 2010. It is also consistent with results in "The Fed's Exit Strategy for Monetary Policy," Glenn Rudebusch, San Francisco Federal Reserve Board Economic Letter, 2010-18, June 14, 2010 <http://www.frbsf.org/publications/economics/letter/2010/el2010-18.html>.
32. The single-A corporate bond yield is used in the equation for the S&P 500 stock index instead of the junk corporate bond yield as the larger companies in the index have closer to a single-A rating. Single-A corporate bonds are modeled as a function of Baa bonds, which are in turn modeled as a function of junk corporate bonds.