

Economic Trends

July 2012 (June 13, 2012-July 11, 2012)

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FEDERAL RESERVE BANK
of CLEVELAND

How Many U.S. Mortgages Are Linked to Libor?

07.10.12

by Guhan Venkatu

The London interbank offered rate, or Libor, has served as a baseline for many bank-to-bank transactions in U.S. dollars since it was established in 1986. It has also increasingly become the basis for many financial transactions not occurring between banks. As such, recent revelations about Libor-fixing will affect these transactions, which include many U.S. mortgages.

Libor is an average of the interest rates on uncollateralized loans made between banks in London for some term, ranging from overnight to one year, for 10 different currencies. It is determined by the British Bankers' Association, which each day polls its panel of banks on their respective borrowing costs. (More information on the specific way in which Libor is calculated can be found here: <http://www.bbalibor.com/bbalibor-explained>.)

The following table shows the fraction of U.S. mortgages that are linked to Libor and other indexes as of May 2012, according to data from Lender Processing Services, Inc. (LPS). LPS assembles these data primarily from the servicing portfolios of the largest residential mortgage servicers in the U.S. These data cover about two-thirds of residential installment-type mortgage loans. While about 3 percent of the LPS sample is identified as subprime, other sources, for example the Mortgage Bankers Association, estimate that the subprime fraction of all U.S. residential installment mortgages is closer to 10 percent.

Among the prime loans in this sample, almost 45 percent are indexed to Libor. For subprime loans, the proportion is substantially higher: close to 80 percent. Libor has historically been the dominant index for subprime loans. In 2000, for example, more than 80 percent of subprime adjustable rate mortgage (ARM) originations were linked to Libor, while in 2008, essentially all subprime ARM originations were linked to Libor. The popularity of Libor as an index for prime ARMs has grown more slowly, but by 2008, more than half of these originations were also linked to Libor.

First-Lien U.S. Mortgages by Type, May 2012

Prime	35,505,295
Fixed	31,602,412
ARM	3,772,655
Libor-indexed	1,629,599
Treasury-indexed	1,222,130
Other index	920,926
Other	130,228
Subprime	1,172,296
Fixed	700,263
ARM	470,746
Libor-indexed	368,991
Treasury-indexed	66,642
Other index	35,113
Other	1,287
Total	36,677,591

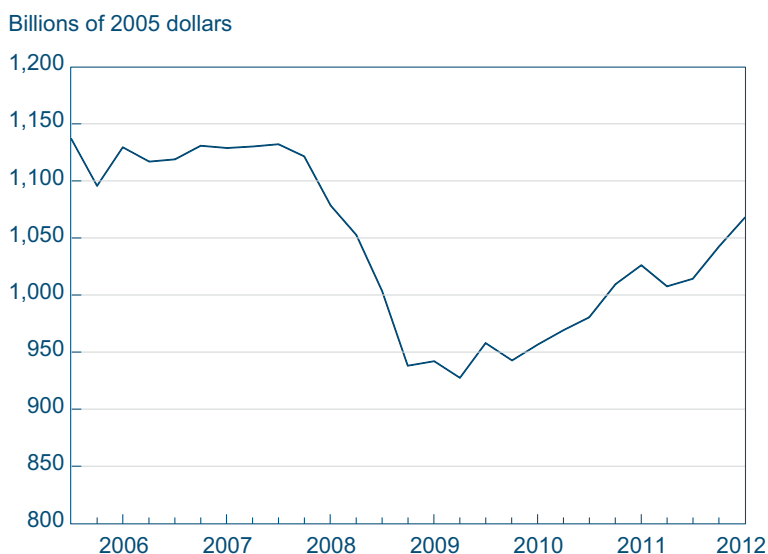
Note: "Libor-indexed" in the table refers to loans indexed to the 6-month US dollar Libor, while "Treasury-indexed" refers to loans indexed to the 1-year U.S. Treasury bill.
Source: Lender Processing Services, Inc.

Durable Goods Consumption and GDP

07.06.12

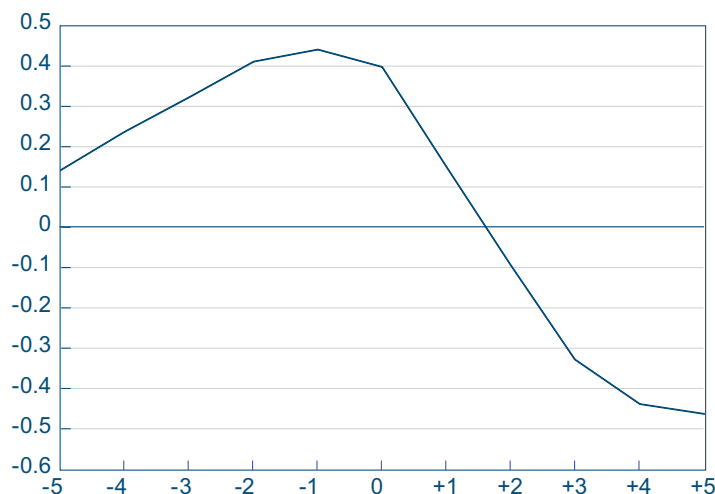
by Daniel Carroll

Durable Consumption



Source: Bureau of Economic Analysis.

Correlation between Percentage Deviation from Trend of Durable Consumption and Current GDP



Sources: Bureau of Economic Analysis; author's calculation.

The most recent information on durable goods consumption has remained positive. In real terms, the series rose 2.4 percent in the first quarter of 2012 and 4.1 percent year-over-year. Relative to nondurables and services, the other broad subcategories of consumption, durables is small, on average about 12.7 percent of total consumption over the past 30 years. Nevertheless, forecasters pay attention to the direction of this subcategory.

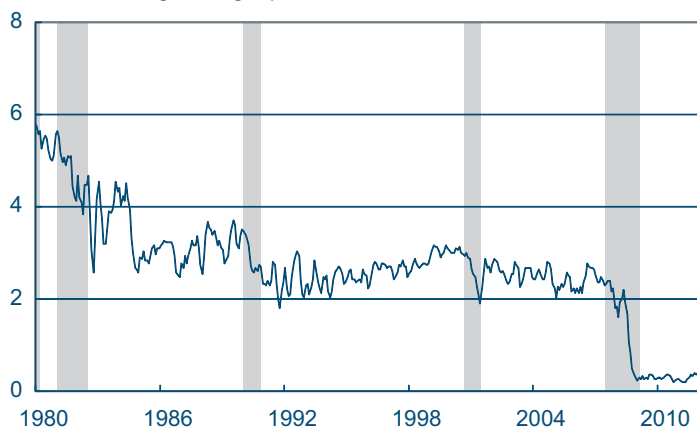
One reason that economists watch durable goods consumption is that it leads GDP over the business cycle. When durable goods consumption is above its trend, GDP one quarter ahead will more often than not also be above trend as well. While this is not a sure sign, it is one indicator about the future path of GDP.

One reason why durable consumption leads GDP may be the size of durable goods. Goods like cars, appliances, and furniture tend to have larger sticker prices than gallons of milk or haircuts. In recessions, households put off replacing or updating their durable goods, waiting for positive signals of their future income. It is safe to assume that individuals get information for their own income growth before economists do.

Unfortunately, households' expectations of their future income does not look too rosy right now. Since late in the recession, the median household expectation for its income growth over the next year has been near zero, and the most recent numbers are barely up. Nevertheless, durable consumption has risen in real terms over the period. The disconnect between these two observations may be a result of statistical complexities. It may be that the household with the median expectation is not the same as the household with the median income. If the middle household in the income distribution has a more positive outlook for income, its durables consumption could well be higher, which would push up durables consumption overall.

Median Expected Change in Family Income in the Next Year

3-month moving average, percent



Note: Shaded bars indicate recessions.

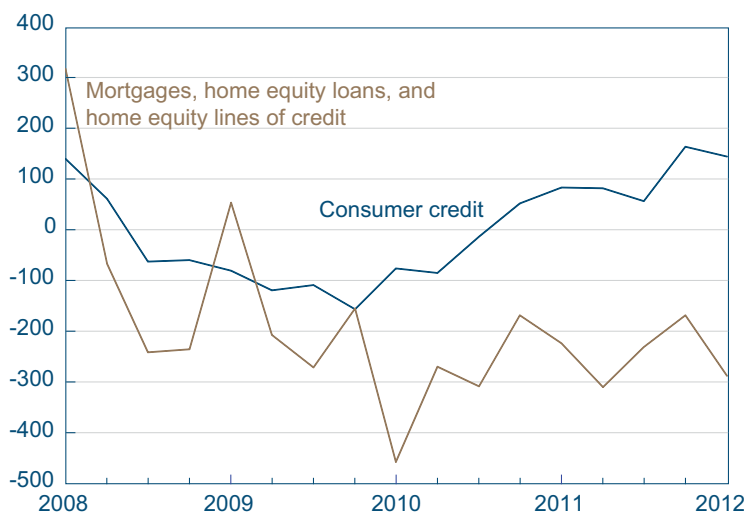
Sources: University of Michigan, *Survey of Consumers*; Census Bureau.

Another possibility is that households with access to credit have been taking advantage of the low interest rate environment, and this has been keeping durable consumption up. This explanation is supported by data on consumer credit, which has risen to levels typical before the financial crisis. Meanwhile, other major sources of credit such as mortgages, home equity loans, and home equity lines of credit continue to remain low.

Moving forward, economists will continue to look to durable consumption as one signal of where the economy is heading.

Household Credit

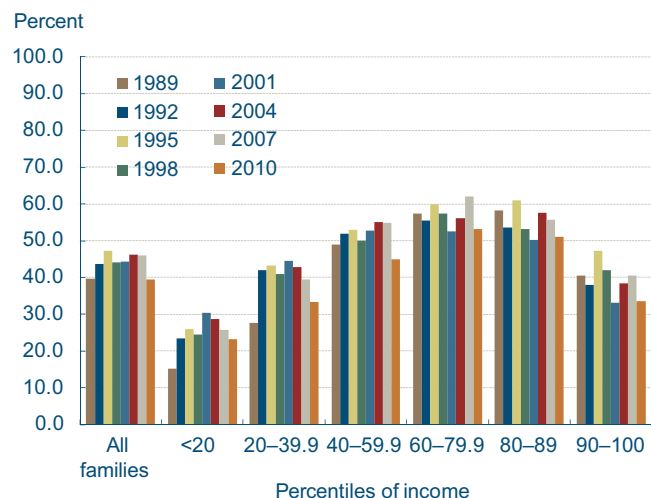
Billions of Dollars



Source: Board of Governors of the Federal Reserve System.

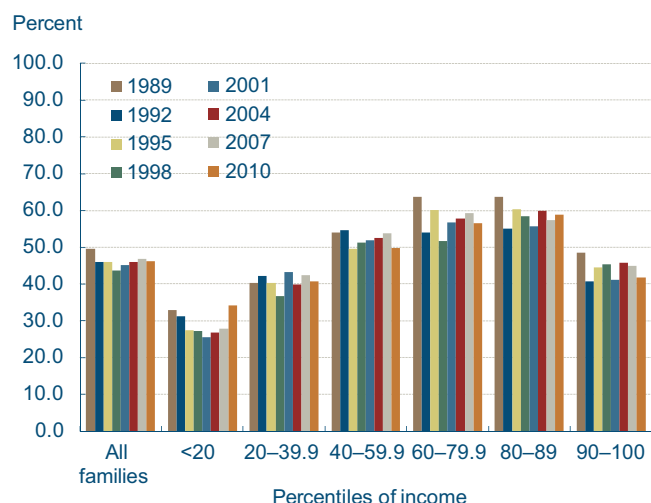
Consumer Deleveraging May Be Over

Families Holding Credit Card Debt



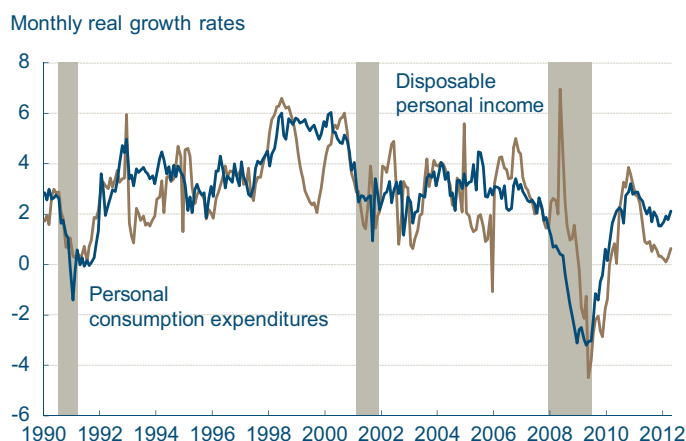
Source: Survey of Consumer Finances.

Families Holding Installment Loans



Source: Survey of Consumer Finances.

Personal Income and Expenditures



Note: Shaded bars indicate recessions.
Source: Bureau of Economic Analysis.

06.27.2012

by O. Emre Ergungor and Patricia Waiwood

The recently published results of the Federal Reserve's triennial 2010 Survey of Consumer Finances show that many families cut up their credit cards during the financial crisis. The number of families holding credit card debt of any amount declined to its lowest levels in more than 20 years. The decline was pronounced in all family-income percentiles.

Meanwhile, families in the lowest-income percentile have been reporting an increasing use of installment debt since the 2007 survey. Installment debt, which is nonrevolving and used for purchasing large durable items like autos, is relatively more stable. The lowest-income families are holding their highest levels of installment debt since 1989.

However, with the exception of a brief period that covers the second half of 2010, real growth in consumption expenditures has outpaced that of personal income every month since the second quarter of 2009. The last time the deficit was so consistently high was in late 2005.

To finance increasing outlays when the money coming in doesn't grow as fast, consumers can either increase their level of borrowing or save less of their income. Our data suggests that consumers are tapping both sources.

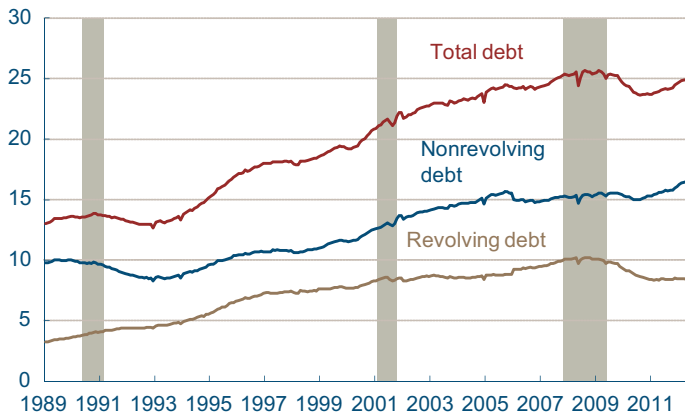
Total household borrowing as a share of disposable income has been increasing since the second quarter of 2009. This increase comes principally from nonrevolving debt, not revolving debt like credit cards. In fact, the nonrevolving debt as a percent of disposable income is at its highest level ever.

On the other hand, household savings, which we report also as a share of disposable income, has fallen by half since it peaked at 6 percent in June 2010.

Yet if households are truly "in the red," why has their debt burden been declining smoothly since the end of the recession? The reason is historically

Household Borrowing

Percent of disposable personal income



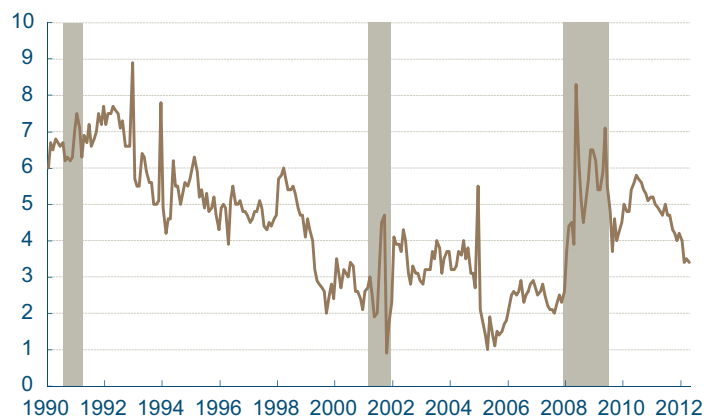
Note: Shaded bars indicate recessions.
Source: Federal Reserve Board.

low interest rates. Low rates are translating into smaller percentages of consumers' income being dedicated to servicing their financial obligations.

Our renewed affection for debt may be just warming up. The Senior Loan Officer Opinion Survey recently reported a sharp increase in demand for consumer loans. On the supply side, the same survey reported the highest willingness by lenders to make consumer loans since the early 1990s. The net easing of consumer lending standards confirms that financial institutions are indeed willing to lend more in both the revolving and nonrevolving debt categories. Even though the events of the recent crisis are fresh in our collective memories, it looks like consumer debt markets may be getting ready to party like it's 2003.

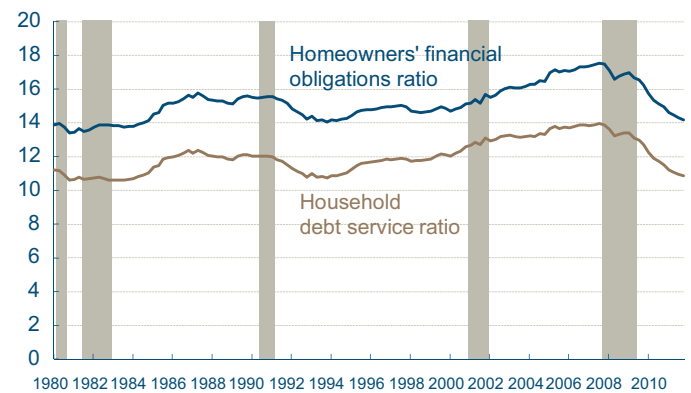
Savings Rate

Percent of disposable personal income



Note: Shaded bars indicate recessions.
Source: Bureau of Economic Analysis.

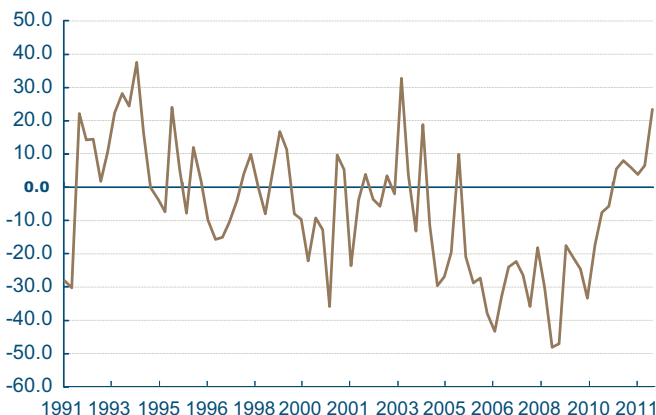
Debt Burden



Note: Shaded bars indicate recessions.
Source: Federal Reserve Board.

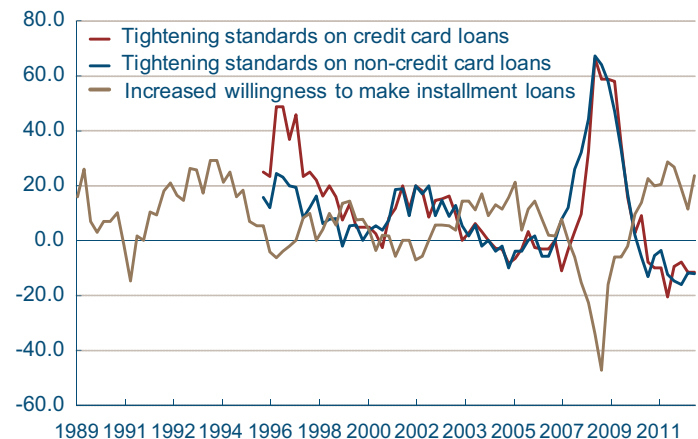
Survey Measure of Demand for Consumer Loans

Percent reporting stronger demand for all consumer loans



Source: Senior Loan Officer Opinion Survey.

Survey Measure of Supply of Consumer Loans



Source: Senior Loan Officer Opinion Survey.

Survey Measures of Inflation Expectations

07.02.12

by Mehmet Pasaogullari

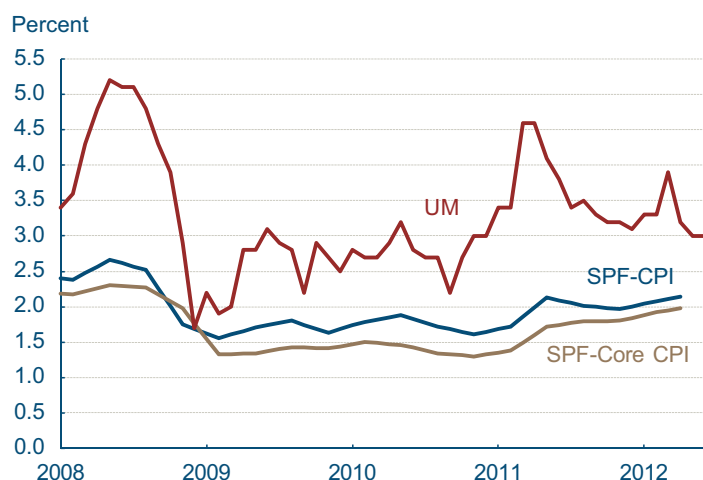
According to the latest figures, the monthly CPI inflation rate decelerated in May, continuing its recent trend after a short-lived spike in early 2012 caused mainly by oil prices. The year-over-year change in the CPI was 1.7 percent at the end of May, which represents the continuation of a steady decline that began last September when the rate was 3.9 percent. The monthly (annualized) rate even came in negative at -3.4 percent. By comparison, it was 5 percent in February.

Both the year-over-year and month-to-month figures largely reflect the effect of energy prices, which make the CPI relatively volatile. On the other hand, the inflation rate for all items excluding food and energy, the so-called core inflation rate, increased 2.4 percent in annualized terms in May. The annual change in that measure has hovered between 2.2 percent and 2.3 percent in the last six months. So, while CPI inflation has fallen since early spring, core inflation has been stable.

The inflation question on everyone's mind is whether the recent pace of inflation will continue in the short and long term. To gauge what households and professional forecasters think about that, we look at two surveys: the University of Michigan's Survey of Consumer Attitudes and Behavior (UM expectations) and the Philadelphia Fed's Survey of Professional Forecasters (SPF expectations). The University of Michigan survey is conducted monthly, while the SPF is quarterly. The most recent UM survey was in June, and the most recent SPF was in May. The University of Michigan does not specify a particular basket for its questions on inflation expectations, whereas professional forecasters are asked their opinions on the CPI and the core CPI.

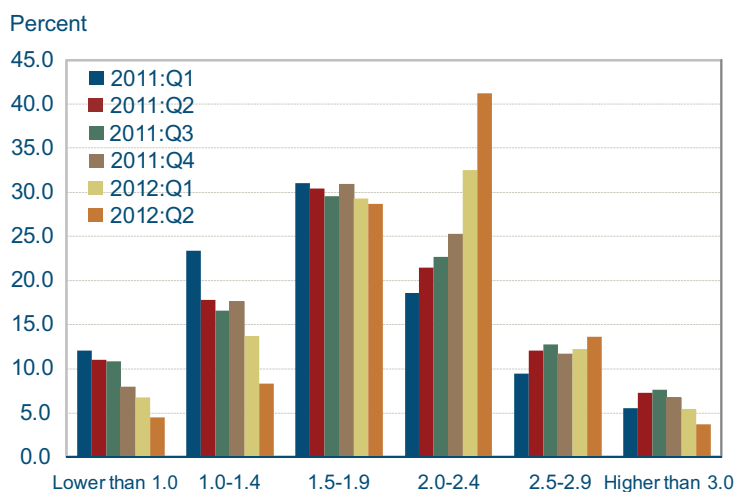
The one-year inflation expectations of households spiked in March, reaching 3.9 percent, most probably due to higher energy costs in the early spring. Recently, households' inflation expectations and energy prices have been closely linked. Their

One-Year Inflation Expectations from Surveys



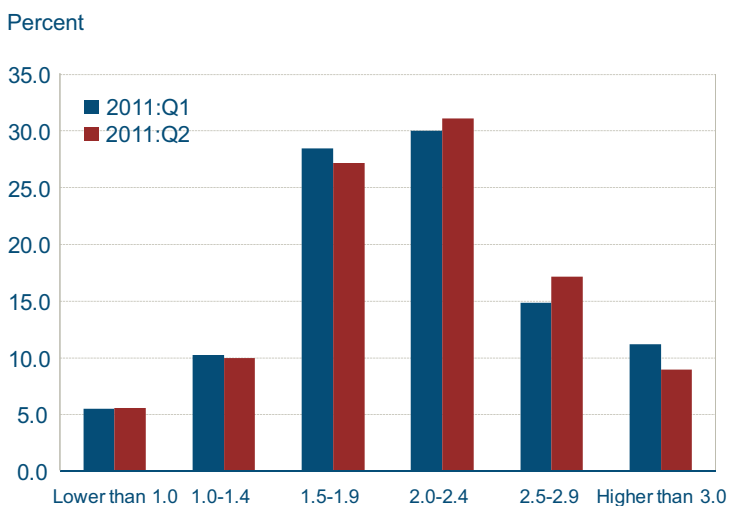
Source: Federal Reserve Bank of Philadelphia, University of Michigan.

2012:Q4 Core CPI Probabilities



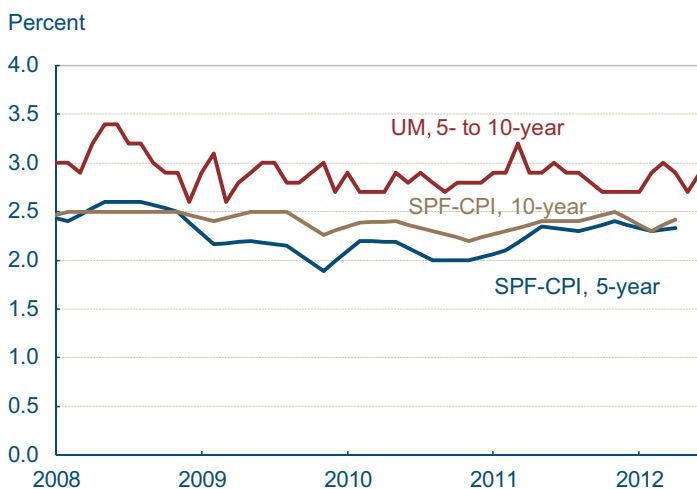
Source: Federal Reserve Bank of Philadelphia.

2013:Q4 Core CPI Probabilities



Source: Federal Reserve Bank of Philadelphia.

Long-Term Inflation Expectations from Surveys



Sources: Federal Reserve Bank of Philadelphia, University of Michigan.

expectations eased in recent months, falling to 3.0 percent in June, following the decline in gas prices. Professional forecasters, on the other hand, slightly raised their 1-year expectations for both the CPI and the core CPI in the last survey, though they are currently at 2.2 percent and 2 percent, respectively.

The SPF also asks respondents to assign probabilities to particular ranges for the end of the current year's and the next year's annual core CPI inflation rate. Over time, the respondents have shifted their opinions about the range they deem most likely for the core CPI at the end of 2012. Currently, the average probability they assign for the 2.0-2.5 percent range is over 40 percent, about 13 percent higher than the second-most likely range of 1.5-1.9 percent. As for the annual core CPI at the end of 2013, they think that the same 2.0-2.5 percent range is the most likely outcome, with an average probability of 31 percent. These probabilities show that, although there has been an increase in core CPI expectations, the increase is consistent with where the core CPI stands now, at slightly over 2.0 percent.

Finally, we look at long-term inflation expectations from both surveys. Long-term expectations have been more stable than short-term expectations. Households' long-term expectations hovered between 2.7 percent and 3 percent in 2012, while currently they are at 2.9 percent. The SPF 5- and 10-year ahead inflation expectations are even more stable and are currently at 2.4 percent and 2.5 percent, respectively. Both surveys show firm anchoring of long-term expectations and reflect no fear of high inflation or deflation in the long term.

Fourth District Labor Markets: Cleveland's Puzzling Data

07.06.12

by Kyle Fee and Timothy Dunne

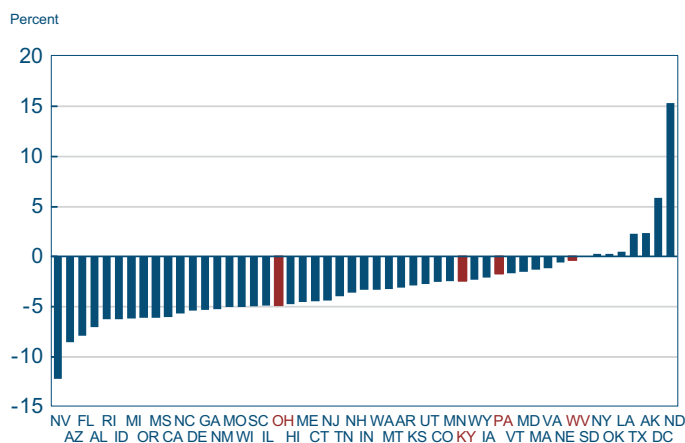
The Great Recession had very different effects on regional labor markets in the United States, and not surprisingly, the recovery has also proceeded at different speeds across regions. Currently, very few U.S. states have employment levels higher than they were at the start of the recession, and no state has an unemployment rate lower than it was then. States hard hit by the housing bust—Nevada, Arizona, and Florida—have employment levels that are more than 7 percent below their 2007 levels, and only a handful of states have experienced positive employment growth over the period. Many of the labor markets experiencing net employment gains are in states whose output is heavily focused on natural resources, such as North Dakota, Texas, and Alaska.

Like the rest of the country, improvements in the Fourth District's labor market have been relatively uneven. The Fourth District states of Kentucky, Ohio, Pennsylvania, and West Virginia are spread out across the employment-growth distribution. Ohio has had the lowest employment growth from December 2007 to May 2012 (–5 percent), while West Virginia is close to break-even growth over the period (–0.3 percent). Pennsylvania and Kentucky each have shed roughly 2 percent of their employment over the same period.

Unemployment rates have remained elevated across the country, with almost half of all states having unemployment rates 3 percentage points above their pre-recession levels. In Fourth District states, unemployment rates are between 1.5 and 3 percentage points higher than in December 2007. Relative to the nation, all Fourth District states have unemployment rates either at or below the national rate of 8.2 percent.

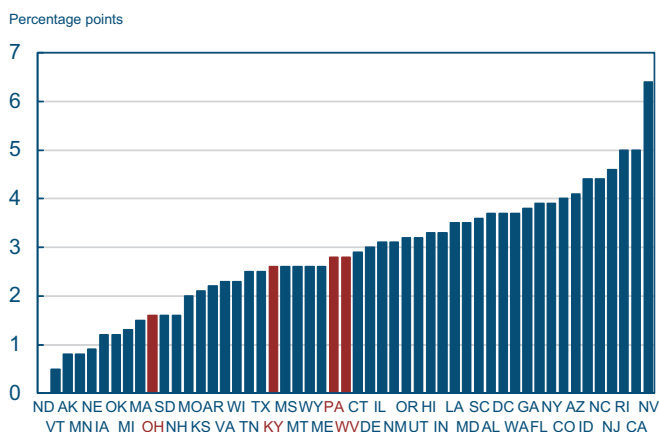
Within the Fourth District, large metropolitan areas are spread across the employment-growth distribution, with Cleveland having the lowest employment growth rate (–6.9 percent) and Pitts-

Payroll Employment Growth,
December 2007–May 2012



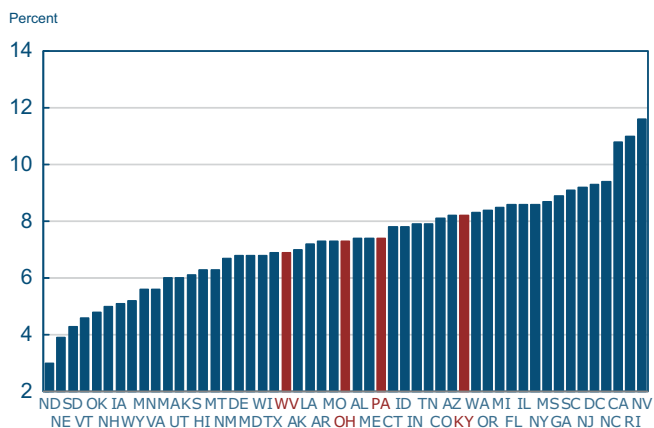
Source: Bureau of Labor Statistics.

Unemployment Rate Change,
December 2007–May 2012



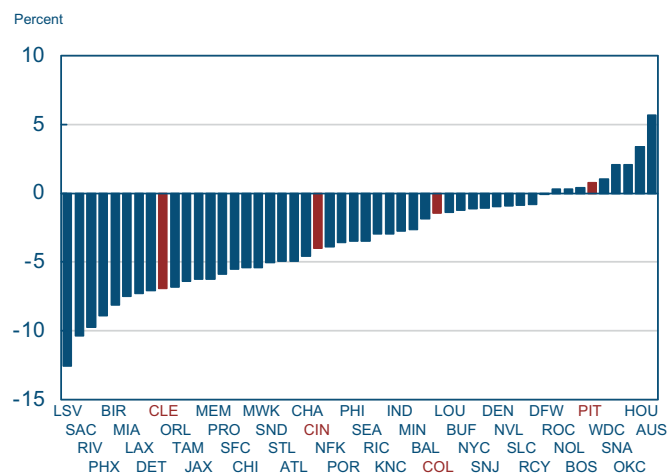
Source: Bureau of Labor Statistics.

Unemployment Rate, May 2012



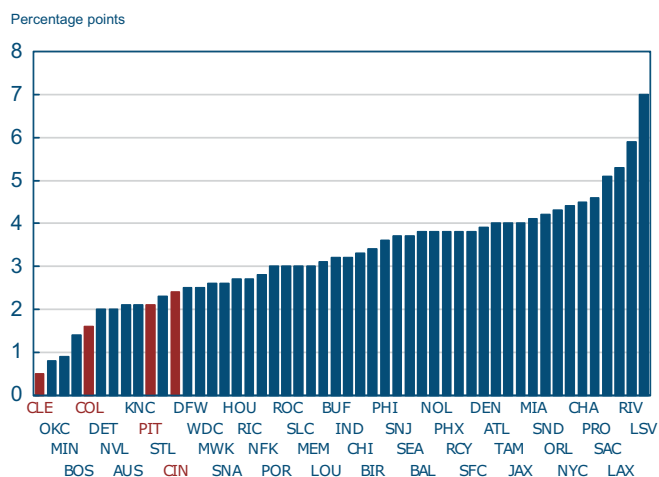
Source: Bureau of Labor Statistics.

Payroll Employment Growth in the Top 50 Most-Populous MSAs, December 2007–May 2012



Source: Bureau of Labor Statistics.

Unemployment Rate Change, December 2007–May 2012



Source: Bureau of Labor Statistics.

burgh the highest (+0.8 percent). Columbus and Cincinnati are in between at -1.4 percent and -4.0 percent, respectively. If we look at changes in unemployment rates over the same period, we see a markedly different pattern for the large metro areas of the Fourth District. Of the top 50 metro areas in the country, Cleveland has the smallest rise in the unemployment rate over the December 2007 to May 2012 period, and all four large metro areas in the Fourth District are in the lower tail of the distribution.

For Cleveland, these are strikingly different results. How can we explain such distinct differences in the paths of employment growth and the unemployment rate? One answer is that labor force growth in Cleveland has been relatively weak—declining by an estimated 1.4 percent over the December 2007 to May 2012 period. This weak labor force growth means that the Cleveland labor market did not have to add a large number of new jobs to reduce its unemployment rate.

However, the magnitude of the decline in the labor force is too small to explain the very large difference in the paths of employment and unemployment for Cleveland. A more likely reason for the difference is the fact that the data on unemployment and employment come from two different data sources, and these data sources simply do not agree in the case of Cleveland.

We can see this more clearly by comparing estimates of employment at the metro level from both sources. Unemployment rates are derived from data gathered from a survey of households (the household survey) augmented with administrative data and model estimates, and employment statistics are based on data from a survey of businesses (the payroll survey). While the household survey is used to construct the unemployment rate, the unemployment data also contain an alternative measure of employment. To be sure, employment is defined somewhat differently than in the payroll survey, and coverage and geography are not identical. Importantly, the data from the household survey include the self-employed and measure employment by place of residence, whereas the payroll survey excludes the self-employed, counts the multiple

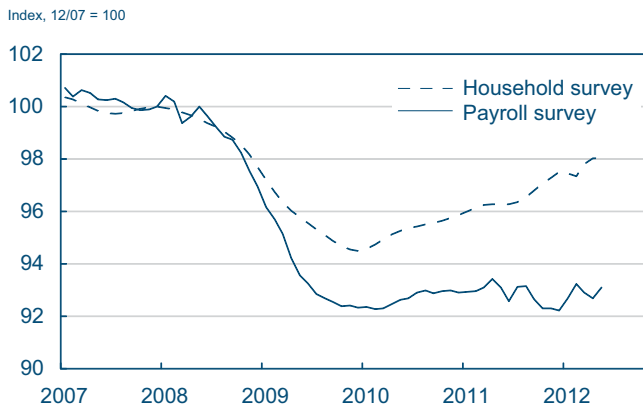
jobs of a single worker, and measures employment by place of work. Nevertheless, the comparison is informative.

At the national level, employment loss from the payroll series exceeds the household series by 0.8 percentage points over the December 2007 to May 2012 period. For Cleveland, on the other hand, the difference between the two series is substantial. Where the payroll statistics show a decline in employment of 7 percent, the household-based statistics show a decline of only 2 percent over the same period. Moreover, the path of employment from the payroll survey shows Cleveland making no progress in expanding employment during the recovery—whereas a solid employment recovery is reflected in the data from the household survey.

This wide gap in the paths of employment from the two survey programs is not present for the other large metropolitan areas in the Fourth District; however, for other metropolitan areas across the country such differences do exist. We can see this in the scatter plot below, which shows employment growth from December 2007 to May 2012 from the two surveys across the 50 largest metropolitan areas in the country. If a metropolitan area is near the line in the plot, it means that the surveys generally agree. If the metropolitan area's data point is above the line, then employment growth in the household survey exceeds employment growth in the payroll survey. Alternatively, if the metropolitan area's data point is below the line, then employment growth in the household survey falls short of employment growth observed in the payroll survey.

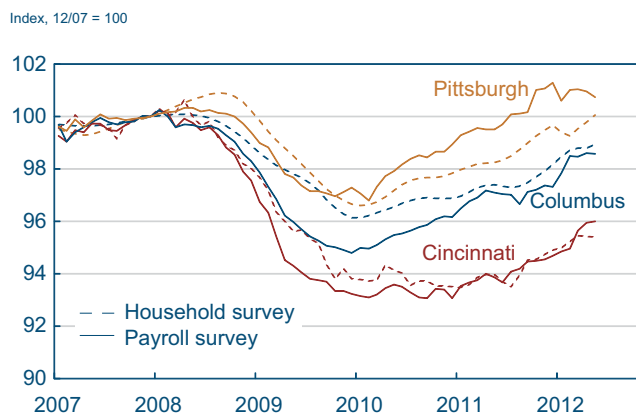
One can see that there are metropolitan areas above and below the line, but most metropolitan areas lie above it. This agrees with the national data, which show that household employment growth was somewhat above employment growth from the payroll survey. In the scatter plot, Cleveland's data point is less of an outlier, but it still is on the upper edge of metropolitan areas that lie above the line. Las Vegas is the clear outlier in the chart. In the payroll survey, the decline in Las Vegas's employment currently stands at a little over 12 percent, whereas in the household survey the decline is only 4 percent. These data paint very different pictures

Cleveland Employment,
December 2007–May 2012



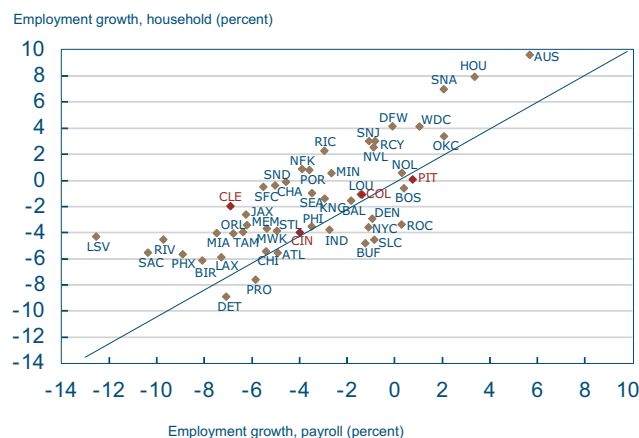
Source: Bureau of Labor Statistics.

Fourth District Employment,
December 2007–May 2012



Source: Bureau of Labor Statistics.

Employment Growth, Payroll and Household Surveys, December 2007–May 2012



Source: Bureau of Labor Statistics.

of the magnitudes of employment loss in Las Vegas over the period.

There are some other general patterns in the chart as well. All the major Texas metro areas lie well above the line—showing that estimates of household employment growth exceed payroll estimates in these locales. The opposite is true for metropolitan areas in New York. This suggests that there may be differences in data collection programs at the state level that systematically influence the observed gaps at the metropolitan level. However, in the case of Ohio, no clear pattern emerges. The data series from both surveys were in close agreement for Columbus and Cincinnati, while the Cleveland data series showed wide disagreement.

What lessons do we draw from these data? First, we know that the statistics from both data programs will be revised, so that some of the differences that we observe today may be reduced through the revision process. One should be especially cautious in interpreting movements in the near-term data, as these can be quite volatile in certain states. Second, analysts of labor market data should look at multiple data sources to characterize labor market developments in local areas. The data from these programs rely on statistical samples, and for local areas, sampling variability can be substantial. Data from multiple sources may help to paint a more complete picture of the local labor market.

A Quick Look at Fed Forecasting

06.22.2012

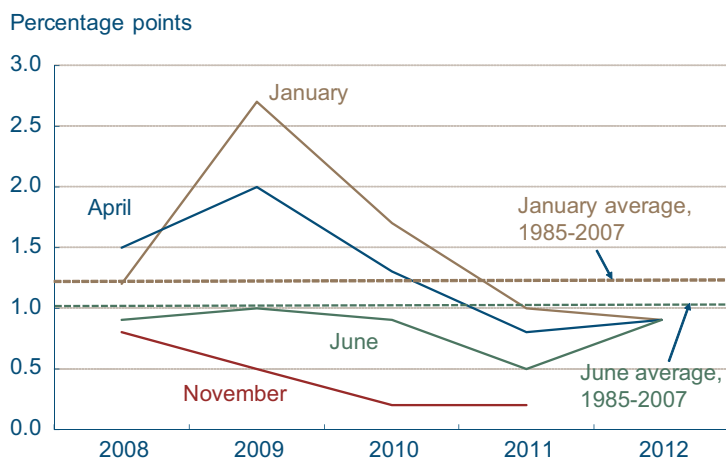
by Todd Clark and John Lindner

During the Chairman Bernanke's recent press conferences, the first topic that he addressed was the Federal Open Market Committee's (FOMC) set of economic projections. He outlined the Committee's expectations for economic growth, inflation, and the unemployment rate for the next few years and the longer run. The numbers that he presented, however, offer only a snapshot of the Committee's views.

A more complete picture is painted in the Summary of Economic Projections (SEP), which is released with the FOMC meeting minutes. The SEP reports the range of FOMC participants' projections, along with a central tendency, which excludes the top three and bottom three estimates, kind of like a trimmed range. The SEP also contains detailed information on the uncertainty associated with the projections and the perceived risks to them. A close look at that information shows that the uncertainty in forecasts has increased over the past few years, but the dispersion of forecasts across FOMC participants has narrowed and returned to historical norms.

One way to measure the dispersion in the forecasts is to look at the difference between the top and bottom of the ranges. For example, charting the differences in ranges for the real GDP forecasts in the year the projections were made shows that the dispersion in the projections widened during the years of the financial crisis. There were varying views on the Committee about how severely the crisis would affect real economic growth. However, after the brief spike in the width of ranges, the dispersion of the forecasts returned to historical averages. Note that we split the projections by month since FOMC participants clearly will have more information about that year's economic growth in November than in January. For example, the projections for 2009 economic growth that were made in January 2009 will be much more dispersed than

SEP Forecast Distributions: Current Year Real GDP Growth Ranges



Source: Federal Reserve Board, *Summary of Economic Projections*; David Romer; Federal Reserve Bank of Philadelphia.

those made in November 2009. It is expected that the ranges later in the year will be narrower, which is what we see.

To gauge uncertainty, we make use of the average historical projection error ranges that are reported for each variable in the SEP. These are simple averages of the root mean squared error for private and government forecasts over the previous 20 years. As noted in the SEP, “under certain assumptions, there is about a 70 percent probability that actual outcomes will be in the ranges implied by the average size of projection errors made in the past.”

We’ve pulled out the average projection error ranges for real GDP forecasts over the past four years.

Looking specifically at the error ranges reported for the GDP forecasts in the June SEP in each of these years, one can see that the error ranges in the current-year GDP forecasts have stayed roughly the same size. However, as the projections shift further out into the future, the recent recession and financial market strains have significantly increased the error ranges.

Just in the last year, more information has been provided about Committee participants’ uncertainty in their forecasts. In addition to submitting their projections, participants have been asked to give an opinion on whether they thought the historical error ranges were an accurate portrayal of the amount of uncertainty in their projections. In the past four meetings where projections were submitted, most Committee participants viewed the uncertainty around their forecasts as higher than normal. At most, only four participants believed that the amount of uncertainty in today’s economic projections is similar to the past. No Committee participants believed there was less uncertainty about economic conditions than had prevailed over the past 20 years.

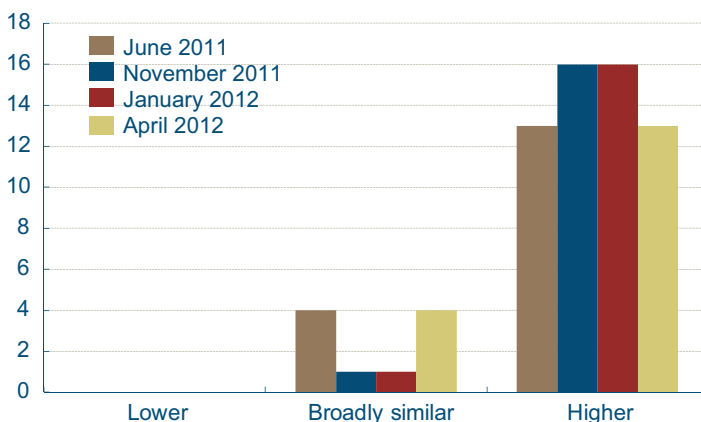
The SEP also includes information on whether FOMC participants believe outside risks to the economy are more likely to cause their projections to miss above or below the actual outcome. Currently, no participants see the balance of economic risks creating conditions in which economic performance would exceed their projections. Until the April meeting, most participants felt that their

June SEP Real GDP Projection Error Ranges

	Projection year	One year forward	Two years forward
2008	+/-0.9	+/-1.3	+/-1.4
2009	+/-1.0	+/-1.5	+/-1.6
2010	+/-1.0	+/-1.6	+/-1.8
2011	+/-0.9	+/-1.6	+/-1.8

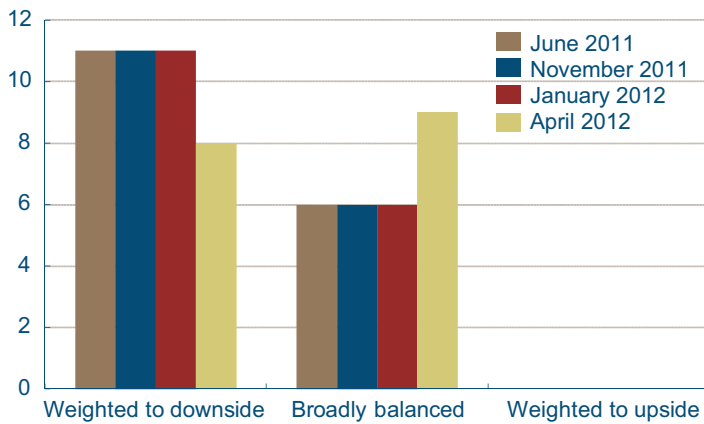
Note: The central tendency excludes the three highest and three lowest projections for each variable in each year. The range includes all participants’ projections, from lowest to highest, in that year.
Sources: Federal Reserve Bank of Philadelphia; Summary of Economic Projections, January 2012 and April 2012, Federal Reserve Board; Bureau of Economic Analysis; Bureau of Labor Statistics; authors’ calculations..

Uncertainty about GDP Growth



Source: Federal Reserve Board, *Summary of Economic Projections*.

Risks to GDP Growth



Source: Federal Reserve Board, *Summary of Economic Projections*.

projections would turn out to be too rosy, if they missed at all. In April, those risks shifted such that the perception among the majority of participants was that it is equally likely that positive or negative shocks would affect economic growth.

What does this information on uncertainty say about the current outlook for economic growth? If we use the midpoint of the central tendency for real GDP growth projections in the June SEP to represent the Committee's average projection, we would say that the Committee generally projects a 2.2 percent increase in 2012 and a 2.5 percent increase in 2013. When we factor in historical forecast accuracy, we would say that there's roughly a 70 percent probability that real GDP will grow between 1.3 percent and 3.1 percent in 2012 and 0.9 percent and 4.1 percent in 2013. But since most FOMC participants believe that the historical forecast accuracy overstates how certain they are about their projections, a slightly larger range is implied. Given the risks to the economy, which participants reported to be either weighted to the downside or roughly balanced over the past year, we would put a little more probability on growth falling short of the midpoint forecast than on growth exceeding the midpoint forecast.

Yield Curve and Predicted GDP Growth, June 2012

Covering May 19, 2012–June 27, 2012

by Joseph G. Haubrich and Patricia Waiwood

Overview of the Latest Yield Curve Figures

Over the past month, the yield curve has flattened, as short rates stayed even and long rates fell. The three-month Treasury bill stayed steady at 0.09 percent (for the week ending June 22), even with May's number and just up from April's 0.08 percent. The ten-year rate dropped back again, coming in at 1.64 percent, down from May's 1.74 percent, which itself was a drop of over one-quarter of a percentage point from April's 2.00 percent. The ten-year rate is now more than a full half-point below March's 2.21 percent. The twist dropped the slope to 155 basis points, down from May's 165 basis points and April's 192 basis points.

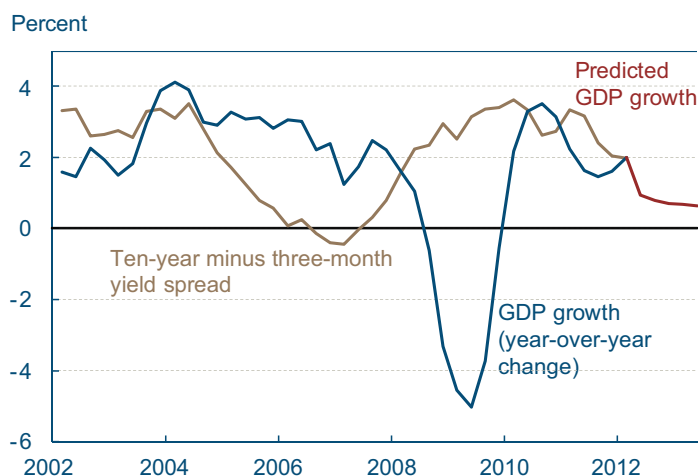
The flatter slope was not enough to have an appreciable effect on projected future growth, however. Projecting forward using past values of the spread and GDP growth suggests that real GDP will grow at about a 0.6 percent rate over the next year, down a hair from the 0.7 percent rate that has been predicted in the past several months. The strong influence of the recent recession is leading toward relatively low growth rates. Although the time horizons do not match exactly, our forecast comes in on the more pessimistic side of other predictions, but like them, it does show moderate growth for the year.

The flatter slope did lead to a less optimistic outlook on the recession front. Using the yield curve to predict whether or not the economy will be in recession in the future, we estimate that the expected chance of the economy being in a recession next June is 9.7 percent, up from May's 8.7 percent and April's 6.4 percent. Although our approach is somewhat pessimistic as regards the level of growth over the next year, it is still quite optimistic about the recovery continuing.

Highlights

	June	May	April
3-month Treasury bill rate (percent)	0.09	0.09	0.08
10-year Treasury bond rate (percent)	1.64	1.74	2.00
Yield curve slope (basis points)	155	165	192
Prediction for GDP growth (percent)	0.6	0.7	0.7
Probability of recession in 1 year (percent)	9.7	8.7	6.4

Yield Curve Predicted GDP Growth



Sources: Bureau of Economic Analysis, Federal Reserve Board, authors' calculations.

The Yield Curve as a Predictor of Economic Growth

The slope of the yield curve—the difference between the yields on short- and long-term maturity bonds—has achieved some notoriety as a simple forecaster of economic growth. The rule of thumb is that an inverted yield curve (short rates above long rates) indicates a recession in about a year, and yield curve inversions have preceded each of the last seven recessions (as defined by the NBER). One of the recessions predicted by the yield curve was the most recent one. The yield curve inverted in August 2006, a bit more than a year before the current recession started in December 2007. There have been two notable false positives: an inversion in late 1966 and a very flat curve in late 1998.

More generally, a flat curve indicates weak growth, and conversely, a steep curve indicates strong growth. One measure of slope, the spread between ten-year Treasury bonds and three-month Treasury bills, bears out this relation, particularly when real GDP growth is lagged a year to line up growth with the spread that predicts it.

Predicting GDP Growth

We use past values of the yield spread and GDP growth to project what real GDP will be in the future. We typically calculate and post the prediction for real GDP growth one year forward.

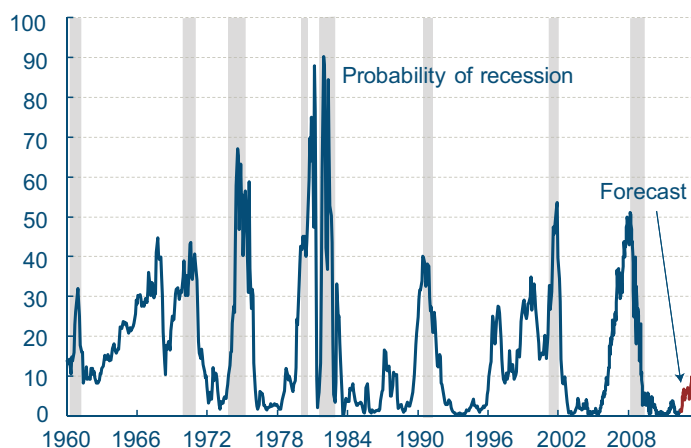
Predicting the Probability of Recession

While we can use the yield curve to predict whether future GDP growth will be above or below average, it does not do so well in predicting an actual number, especially in the case of recessions. Alternatively, we can employ features of the yield curve to predict whether or not the economy will be in a recession at a given point in the future. Typically, we calculate and post the probability of recession one year forward.

Of course, it might not be advisable to take these numbers quite so literally, for two reasons. First, this probability is itself subject to error, as is the case with all statistical estimates. Second, other researchers have postulated that the underlying determinants of the yield spread today are materi-

Recession Probability from Yield Curve

Percent probability, as predicted by a probit model

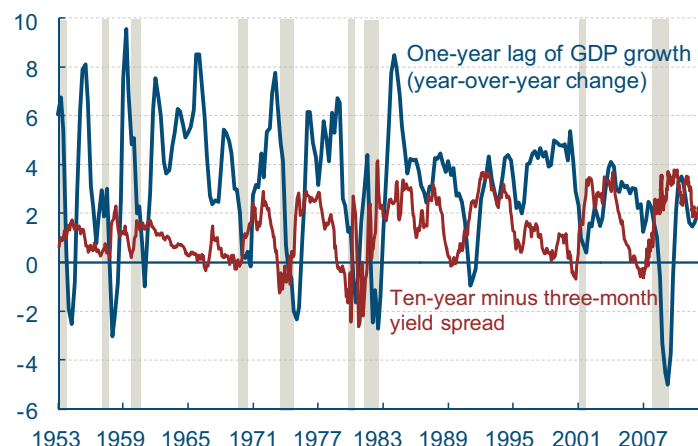


Note: Shaded bars indicate recessions.

Sources: Bureau of Economic Analysis, Federal Reserve Board, authors' calculations.

Yield Curve Spread and Real GDP Growth

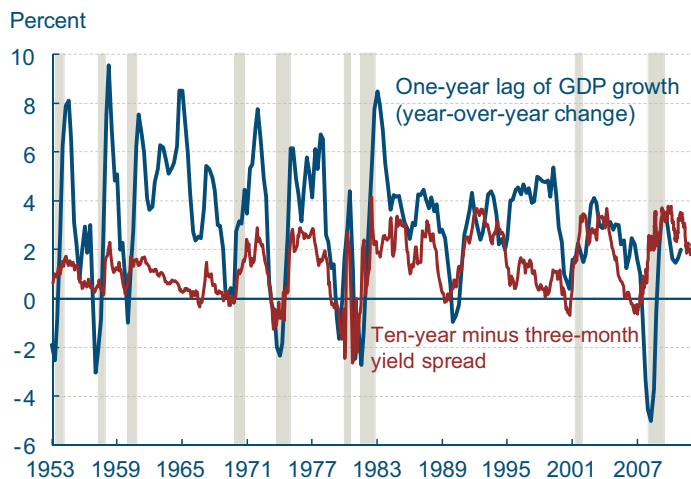
Percent



Note: Shaded bars indicate recessions.

Source: Bureau of Economic Analysis, Federal Reserve Board.

Yield Spread and Lagged Real GDP Growth



Note: Shaded bars indicate recessions.

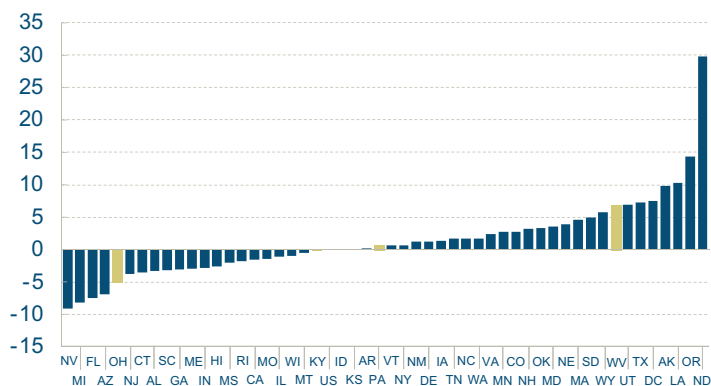
Sources: Bureau of Economic Analysis, Federal Reserve Board.

ally different from the determinants that generated yield spreads during prior decades. Differences could arise from changes in international capital flows and inflation expectations, for example. The bottom line is that yield curves contain important information for business cycle analysis, but, like other indicators, should be interpreted with caution. For more detail on these and other issues related to using the yield curve to predict recessions, see the *Commentary* “Does the Yield Curve Signal Recession?” Our friends at the Federal Reserve Bank of New York also maintain a website with much useful information on the topic, including their own estimate of recession probabilities.

Variation in State GDP Growth during the Recovery

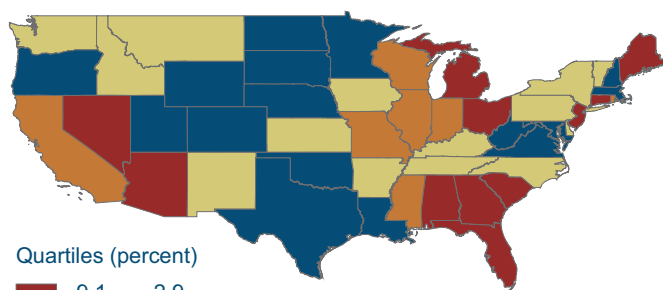
State GDP Growth: 2007-2011

Percent

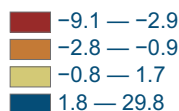


Source: Bureau of Economic Analysis.

State GDP Growth: 2007–2011



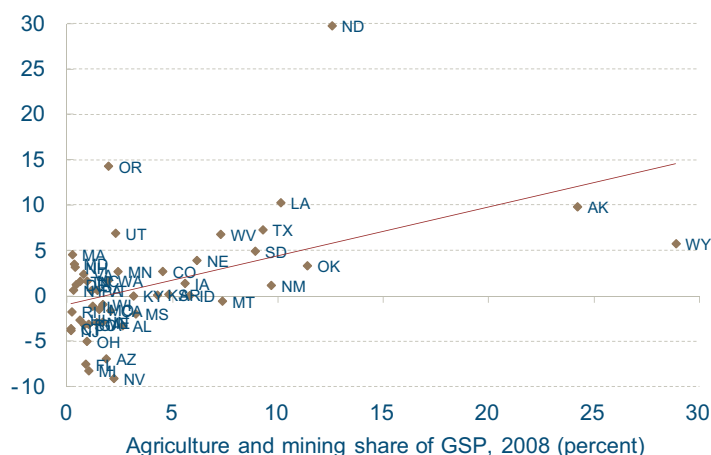
Quartiles (percent)



Source: Bureau of Economic Analysis.

State GDP Growth Versus Agriculture and Mining Share

GDP growth: 2007–2011 (percent)



Source: Bureau of Economic Analysis.

06.29.2012

by Timothy Dunne and Kyle Fee

The recovery from the U.S. recession has not been uniform across the 50 states. Recent data from the Bureau of Economic Analysis through 2011 show that 20 states still had levels of Gross Domestic Product (GDP) below their 2007 levels. Over this same period, the United States as a whole experienced essentially breakeven growth, with an overall rise of less than one-tenth of a percent.

The spread in growth rates from low to high is quite broad. The bottom five states had declines of 5 percent, while the top 5 states saw GDP expand by over 7 percent from 2007 to 2011. Regions with lagging performance included states hard-hit by the housing bust—including Nevada, Arizona, and Florida—and some manufacturing states like Michigan and Ohio. States with strong output growth included many farm and natural resource states. North Dakota is a particular outlier, having experienced real GDP growth of almost 30 percent over the four-year period.

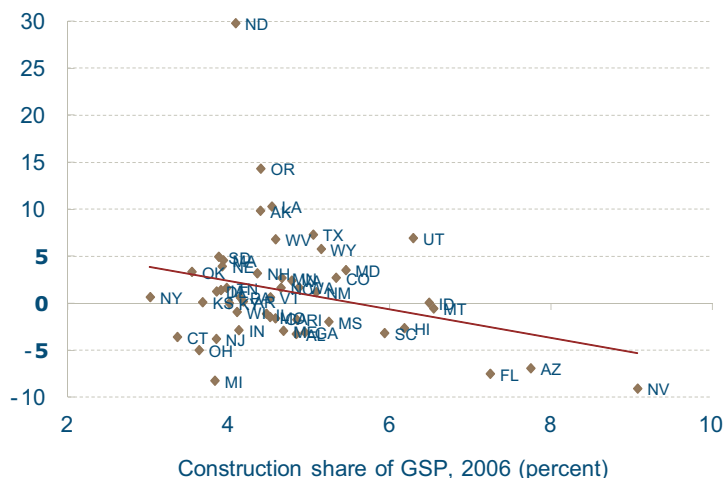
From a geographic perspective, we see that there were pockets of weaker growth in the Southwest, the Southeast, and the Great Lakes regions, while the Central and Southern Plains and Mountain states showed relative strength.

To formalize the relationships, we examine how GDP growth varies with the structure of a state's economy going into the last recession. We characterize states by the share of mining and agriculture activity to proxy for states focused on natural resources, by the share of construction activity at the end of the housing boom to proxy for states affected by the housing bubble, and by the share of manufacturing activity prior to the recession.

Looking first at the resource-intensive states, we see that most states have relatively low shares of mining and agricultural activity—these industries comprised no more than 5 percent of any state's GDP in 2008. However, one can see that states with relatively high shares of such activity had a

State GDP Growth Versus Construction Share

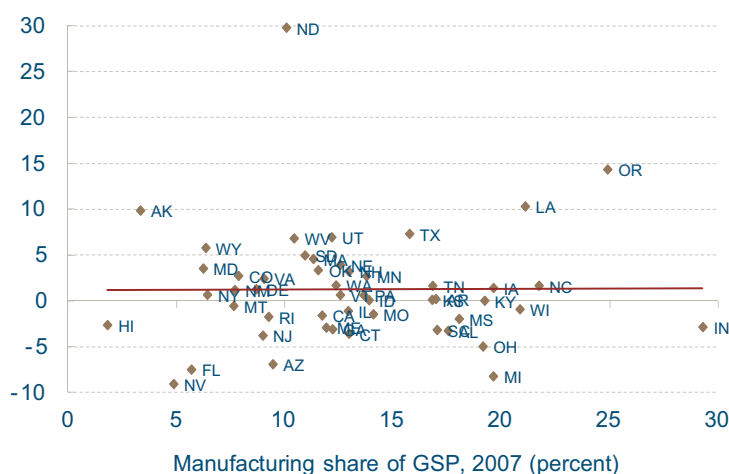
GDP growth: 2007-2011 (percent)



Source: Bureau of Economic Analysis.

State GDP Growth Versus Manufacturing Share

GDP growth: 2007-2011 (percent)



Source: Bureau of Economic Analysis

tendency to experience higher growth. The actual correlation coefficient is 0.49, indicating a modest positive relationship—as does the positive slope of the regression line in the chart. (The correlation statistic ranges between -1 and 1 , with values closer to 0 indicating a weaker linear relationship, values closer to 1 a stronger positive linear relationship, and values closer to -1 a stronger negative linear relationship.)

The share of construction activity at the end of the housing boom is negatively correlated to GDP growth between 2007 to 2011. However, the correlation is weaker in this case (-0.28). The housing boom-bust states of Arizona, Florida, and Nevada all had construction shares that were well above the national state average of 4.0 percent, and GDP growth well below the national average. These three states end up driving much of the negative correlation between GDP growth and construction activity.

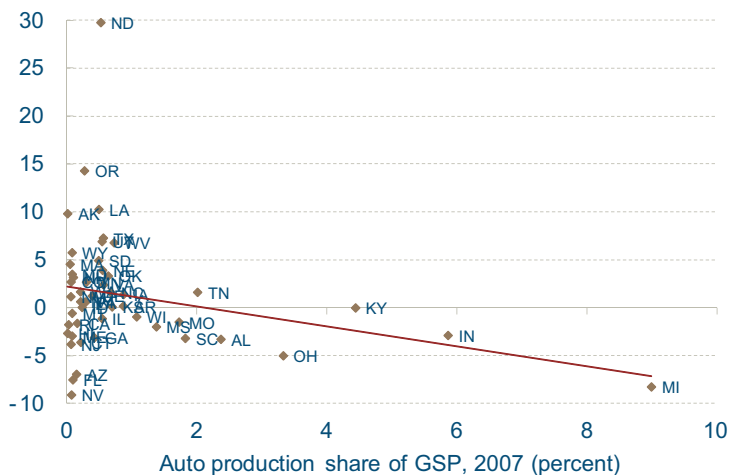
Finally, and perhaps somewhat surprising, there is very little correlation between the manufacturing share of activity prior to the recession and state GDP growth from 2007 to 2011. The horizontal trend line indicates that differences in manufacturing share do not explain differences in state-level GDP growth.

Some manufacturing-intensive states have experienced below-average growth (such as Ohio and Michigan), and this is linked, in part, to specialization in the automotive sector. Indeed, economic growth over the period tends to be lower in states with higher automotive shares. (The correlation coefficient is -0.27 .)

State growth relates directly to changes in the labor market, as well. With respect to employment growth, the link is relatively tight. Employment growth and state GDP growth have a correlation of 0.81 over the 2007 to 2011 period. A key difference between the two variables is that while many states' GDPs have fully recovered from the recession, few states' employment levels exceed their 2007 levels. In fact, only three states (Alaska, North Dakota, and Texas) and the District of Columbia have had positive employment growth over the period, while 30 states had positive GDP growth.

State GDP Growth Versus Auto Production Share

GDP growth: 2007-2011 (percent)



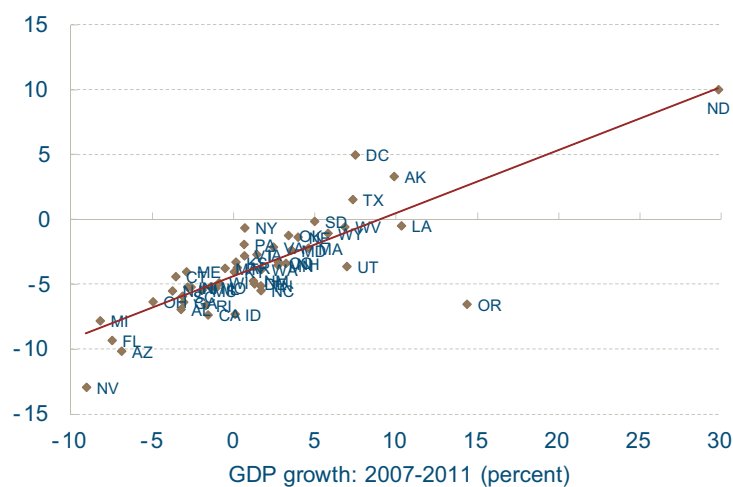
Source: Bureau of Economic Analysis.

These patterns reflect the fact that productivity has expanded over the period, allowing firms to increase production with fewer employees.

The relationship between the change in the unemployment rate and state GDP growth, on the other hand, while negative (with a correlation coefficient of -0.52), is clearly not as tight as the relationship between employment growth and state GDP. For example, both Ohio and Massachusetts observed increases in unemployment rates of roughly 3.0 percentage points over the four-year period. However, these states had quite different GDP growth rates, roughly -5.0 percent and $+5.0$ percent, respectively, and quite different employment growth rates, -6.0 percent and -2.0 percent. Why did Ohio's unemployment rate change in a similar way to Massachusetts, even though it experienced much weaker GDP and employment growth? In part, it is due to the fact that Ohio's labor force has declined while Massachusetts's labor force has grown modestly. With the decline in the overall labor force, Ohio has not had to create as many jobs to bring its unemployment rate down—a point sometimes overlooked when comparing changes in regional unemployment rates.

State GDP Growth Versus Payroll Employment Growth

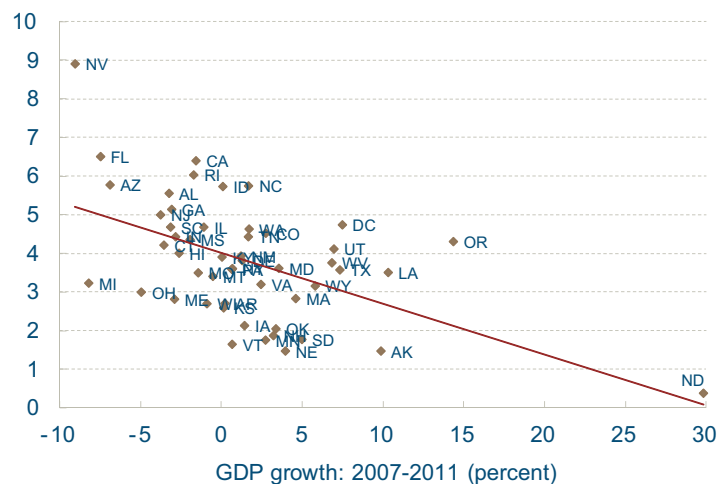
Employment growth: 2007-2011 (percent)



Sources: Bureau of Economic Analysis, Bureau of Labor Statistics.

State GDP Growth Versus Unemployment rate Change

Change in unemployment rate: 2007-2011 (percentage points)



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